FANUC Robot series

R-30*i*A/R-30*i*B/R-30*i*B Plus

INTERBUS Function for Phoenix Contact PCI Board

OPERATOR'S MANUAL

B-82664EN/03

- **Original Instructions**

Thank you very much for purchasing FANUC Robot.
Before using the Robot, be sure to read the "FANUC Robot SAFETY HANDBOOK (B-80687EN)" and understand the content.

SAFETY PRECAUTIONS

This chapter describes the precautions which must be followed to ensure the safe use of the robot.
Before using the robot, be sure to read this chapter thoroughly.

For detailed functions of the robot operation, read the relevant operator's manual to understand fully its specification.
For the safety of the operator and the system, follow all safety precautions when operating a robot and its peripheral equipment installed in a work cell.
In addition, refer to the "FANUC Robot SAFETY HANDBOOK (**B-80687EN**)".

1 DEFINITION OF USER

The user can be defined as follows.

Operator:
- Turns ON/OFF power to the robot
- Starts the robot program from the operator's panel

Programmer:
- Operates the robot
- Teaches the robot inside the safety fence

Maintenance engineer:
- Operates the robot
- Teaches the robot inside the safety fence
- Performs maintenance (repair, adjustment, replacement)

- Operator is not allowed to work in the safety fence.
- Programmers and maintenance engineers are allowed to work in the safety fence. The work inside the safety fence includes lifting, setting, teaching, adjustment, maintenance, etc.
- To work inside the safety fence, the person must receive a professional training for the robot.

During the operation, programming, and maintenance of your robotic system, the programmer, operator, and maintenance engineer should take additional care of their safety by wearing the following safety items.

- Adequate clothes for the operation
- Safety shoes
- A helmet

2 DEFINITION OF SAFETY NOTATIONS

To ensure the safety of users and prevent damage to the machine, this manual indicates each precaution on safety with "**WARNING**" or "**CAUTION**" according to its severity. Supplementary information is indicated by "**NOTE**". Read the contents of each "**WARNING**", "**CAUTION**" and "**NOTE**" before using the robot.

Symbol	Definitions
⚠**WARNING**	Used if hazard resulting in the death or serious injury of the user will be expected to occur if he or she fails to follow the approved procedure.
⚠**CAUTION**	Used if a hazard resulting in the minor or moderate injury of the user, or equipment damage may be expected to occur if he or she fails to follow the approved procedure.
NOTE	Used if a supplementary explanation not related to any of WARNING and CAUTION is to be indicated.

- Check this manual thoroughly, and keep it handy for the future reference.

3 SAFETY OF THE USER

User safety is the primary safety consideration. Because it is very dangerous to enter the operating space of the robot during automatic operation, adequate safety precautions must be observed. The following lists the general safety precautions. Careful consideration must be made to ensure user safety.

(1) Have the robot system users attend the training courses held by FANUC.

FANUC provides various training courses. Contact our sales office for details.

(2) Even when the robot is stationary, it is possible that the robot is still in a ready to move state, and is waiting for a signal. In this state, the robot is regarded as still in motion. To ensure user safety, provide the system with an alarm to indicate visually or aurally that the robot is in motion.
(3) Install a safety fence with a gate so that no user can enter the work area without passing through the gate. Install an interlocking device, a safety plug, and so forth in the safety gate so that the robot is stopped as the safety gate is opened.

The controller is designed to receive this interlocking signal of the door switch. When the gate is opened and this signal received, the controller stops the robot (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type). For connection, see Fig. 3 (b).

(4) Provide the peripheral equipment with appropriate earth (Class A, Class B, Class C, and Class D).
(5) Try to install the peripheral equipment outside the robot operating space.
(6) Draw an outline on the floor, clearly indicating the range of the robot operating space, including the tools such as a hand.
(7) Install a mat switch or photoelectric switch on the floor with an interlock to a visual or aural alarm that stops the robot when a user enters the work area.
(8) If necessary, install a safety lock so that no one except the user in charge can turn on the power of the robot.

The circuit breaker installed in the controller is designed to disable anyone from turning it on when it is locked with a padlock.

(9) When adjusting each peripheral equipment independently, be sure to turn off the power of the robot.
(10) Operators should be ungloved while manipulating the operator panel or teach pendant. Operation with gloved fingers could cause an operation error.
(11) Programs, system variables, and other information can be saved on memory card or USB memories. Be sure to save the data periodically in case the data is lost in an accident. (refer to Controller OPERATOR'S MANUAL.)
(12) The robot should be transported and installed by accurately following the procedures recommended by FANUC. Wrong transportation or installation may cause the robot to fall, resulting in severe injury to workers.
(13) In the first operation of the robot after installation, the operation should be restricted to low speeds. Then, the speed should be gradually increased to check the operation of the robot.
(14) Before the robot is started, it should be checked that no one is inside the safety fence. At the same time, a check must be made to ensure that there is no risk of hazardous situations. If detected, such a situation should be eliminated before the operation.
(15) When the robot is used, the following precautions should be taken. Otherwise, the robot and peripheral equipment can be adversely affected, or workers can be severely injured.
- Avoid using the robot in a flammable environment.
- Avoid using the robot in an explosive environment.
- Avoid using the robot in an environment full of radiation.
- Avoid using the robot under water or at high humidity.
- Avoid using the robot to carry a person or animal.
- Avoid using the robot as a stepladder. (Never climb up on or hang from the robot.)
- Outdoor

(16) When connecting the peripheral equipment related to stop (safety fence etc.) and each signal (external emergency, fence etc.) of robot, be sure to confirm the stop movement and do not take the wrong connection.
(17) When preparing footstep, please consider security for installation and maintenance work in high place according to Fig. 3 (c). Please consider footstep and safety belt mounting position.

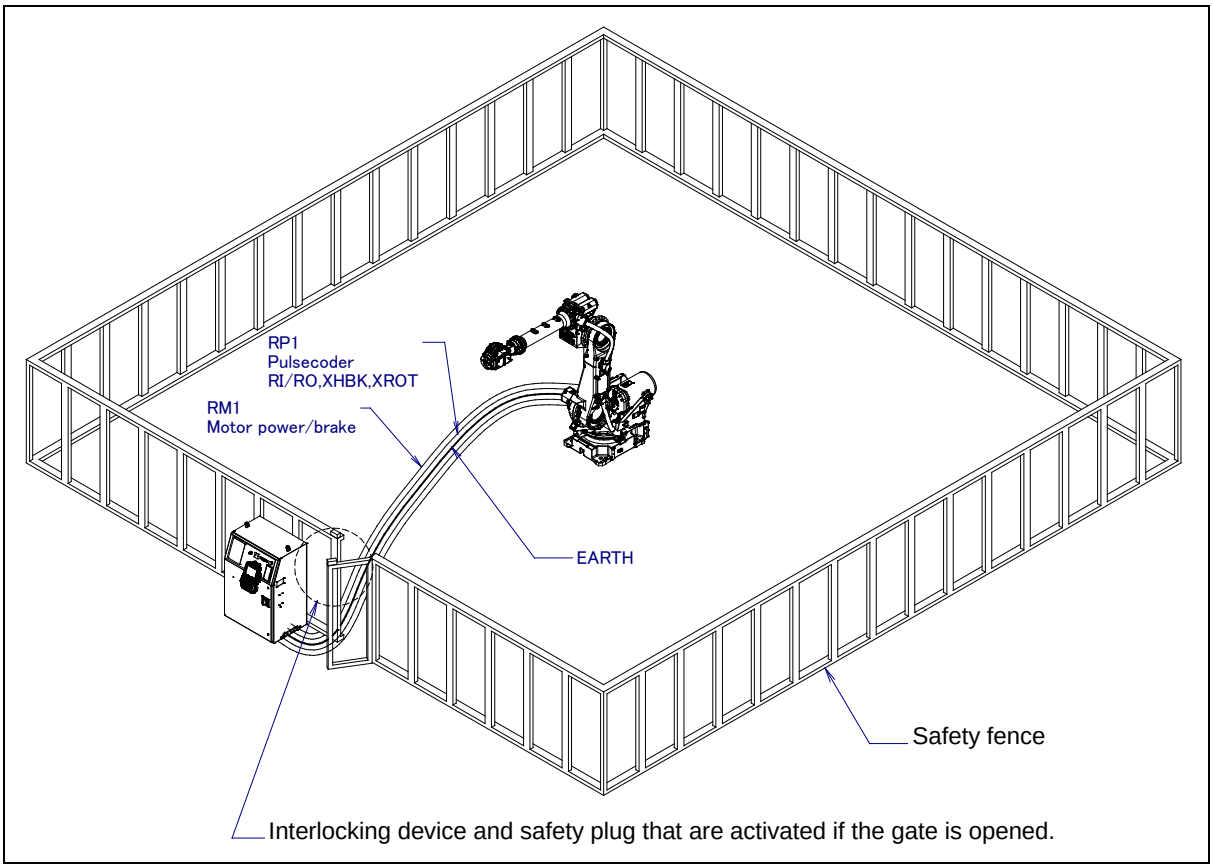

Fig. 3 (a) Safety fence and safety gate

> ⚠ **WARNING**
> When you close a fence, please confirm that there is not a person from all directions of the robot.

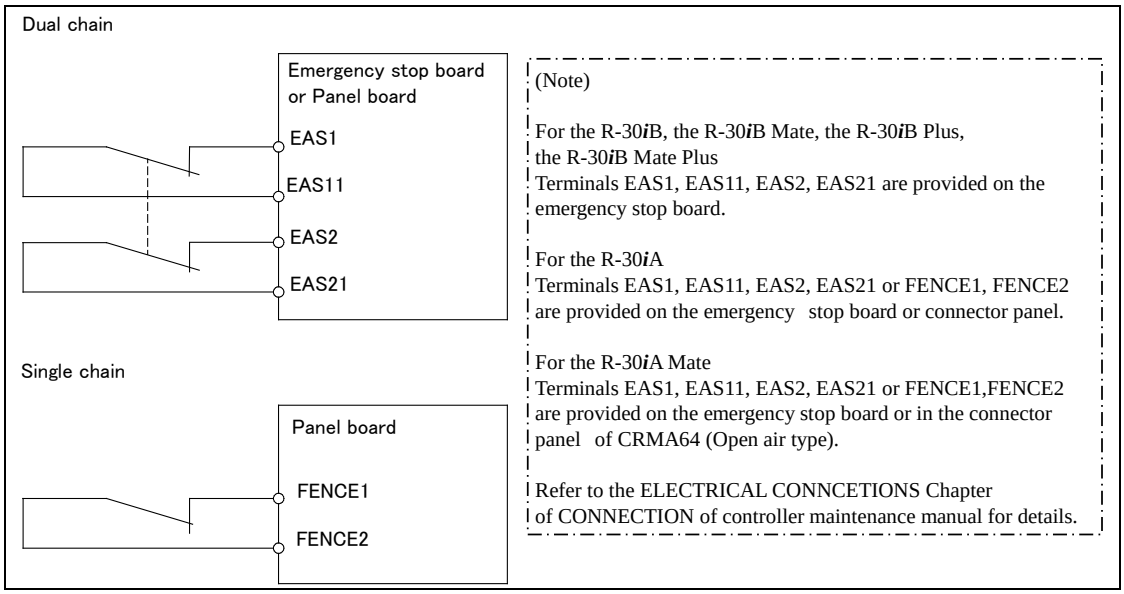

Fig. 3 (b) Connection diagram for the signal of safety fence

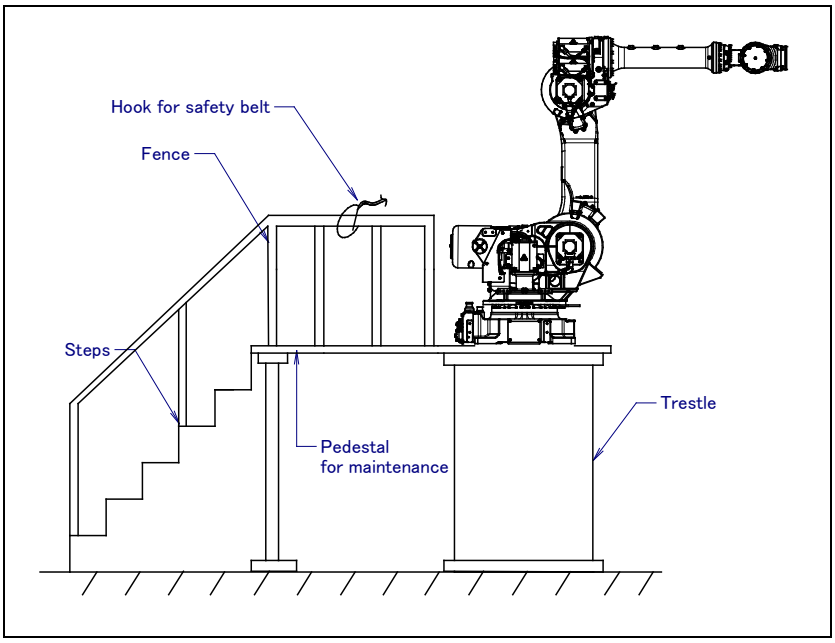

Fig. 3 (c) Pedestal for maintenance

3.1 SAFETY OF THE OPERATOR

An operator refers to a person who turns on and off the robot system and starts a robot program from, for example, the operator panel during daily operation.
Operators cannot work inside of the safety fence.

(1) If the robot does not need to be operated, turn off the robot controller power or press the EMERGENCY STOP button during working.
(2) Operate the robot system outside the operating space of the robot.
(3) Install a safety fence or safety door to avoid the accidental entry of a person other than an operator in charge or keep operator out from the hazardous place.
(4) Install the EMERGENCY STOP button within the operator's reach.

The robot controller is designed to be connected to an external EMERGENCY STOP button. With this connection, the controller stops the robot operation (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type) when the external EMERGENCY STOP button is pressed. See the diagram below for connection.

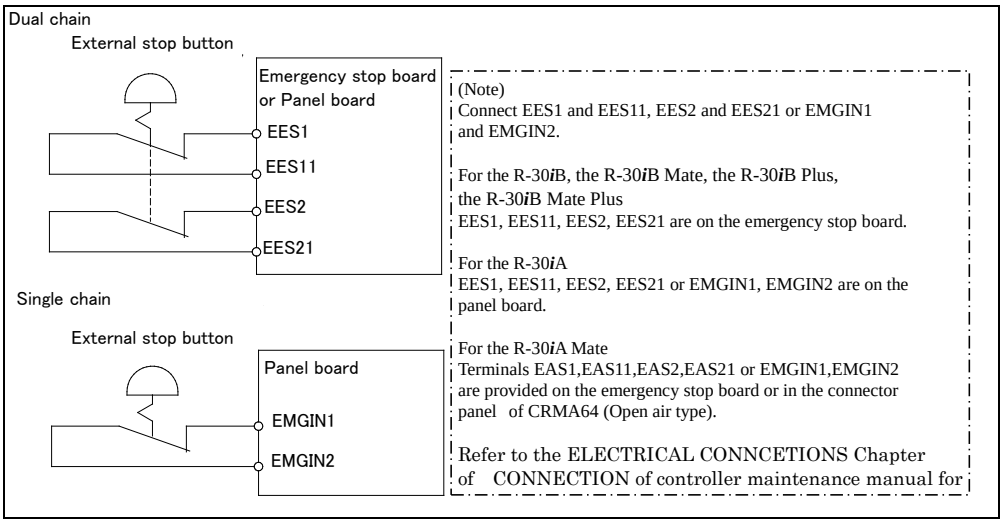

Fig. 3.1 Connection diagram for external emergency stop button

3.2 SAFETY OF THE PROGRAMMER

While teaching the robot, the operator may need to enter the robot operation area. The programmer must ensure the safety especially.

(1) Unless it is specifically necessary to enter the robot operating space, carry out all tasks outside the operating space.
(2) Before teaching the robot, check that the robot and its peripheral equipment are all in the normal operating condition.
(3) If it is inevitable to enter the robot operating space to teach the robot, check the locations, settings, and other conditions of the safety devices (such as the EMERGENCY STOP button, the DEADMAN switch on the teach pendant) before entering the area.
(4) The programmer must be extremely careful not to let anyone else enter the robot operating space.
(5) Programming should be done outside the area of the safety fence as far as possible. If programming needs to be done inside the safety fence, the programmer should take the following precautions:
   - Before entering the area of the safety fence, ensure that there is no risk of dangerous situations in the area.
   - Be prepared to press the emergency stop button whenever necessary.
   - Robot motions should be made at low speeds.
   - Before starting programming, check the whole robot system status to ensure that no remote instruction to the peripheral equipment or motion would be dangerous to the user.

Our operator panel is provided with an emergency stop button and a key switch (mode switch) for selecting the automatic operation mode (AUTO) and the teach modes (T1 and T2). Before entering the inside of the safety fence for the purpose of teaching, set the switch to a teach mode, remove the key from the mode switch to prevent other people from changing the operation mode carelessly, then open the safety gate. If the safety gate is opened with the automatic operation mode set, the robot stops (Please refer to "**STOP TYPE OF ROBOT**" in SAFETY PRECAUTIONS for detail of stop type). After the switch is set to a teach mode, the safety gate is disabled. The programmer should understand that the safety gate is disabled and is responsible for keeping other people from entering the inside of the safety fence. (In case of R-30*i*A Mate Controller standard specification, there is no mode switch. The automatic operation mode and the teach mode is selected by teach pendant enable switch.)

Teach pendant is provided with a switch to enable/disable robot operation from teach pendant and DEADMAN switch as well as emergency stop button. These button and switch function as follows:
(1) Emergency stop button: Causes the stop of the robot (Please refer to "STOP TYPE OF ROBOT" in SAFETY PRECAUTIONS for detail of stop type) when pressed.
(2) DEADMAN switch: Functions are different depending on the teach pendant enable/disable switch setting status.
   (a) Enable: Servo power is turned off and robot stops when the operator releases the DEADMAN switch or when the operator presses the switch strongly.
   (b) Disable: The DEADMAN switch is disabled.
   (Note)The DEADMAN switch is provided to stop the robot when the operator releases the teach pendant or presses the pendant strongly in case of emergency. The R-30*i*B Plus/R-30*i*B Mate Plus /R-30*i*B/R-30*i*B Mate/R-30*i*A/R-30*i*A Mate employs a 3-position DEADMAN switch, which allows the robot to operate when the 3-position DEADMAN switch is pressed to its intermediate point. When the operator releases the DEADMAN switch or presses the switch strongly, the robot stops immediately.

The operator's intention of starting teaching is determined by the controller through the dual operation of setting the teach pendant enable/disable switch to the enable position and pressing the DEADMAN switch. The operator should make sure that the robot could operate in such conditions and be responsible in carrying out tasks safely.

Based on the risk assessment by FANUC, number of operation of DEADMAN switch should not exceed about 10000 times per year.

The teach pendant, operator panel, and peripheral device interface send each robot start signal. However the validity of each signal changes as follows depending on the mode switch and the DEADMAN switch of the operator panel, the teach pendant enable switch and the remote condition on the software.

For the R-30*i*B Plus/R-30*i*B Mate Plus/R-30*i*B/R-30*i*B Mate/R-30*i*A Controller or CE or RIA specification of the R-30*i*A Mate Controller

Mode	Teach pendant enable switch	Software remote condition	Teach pendant	Operator panel	Peripheral device
AUTO mode	On	Local	Not allowed	Not allowed	Not allowed
		Remote	Not allowed	Not allowed	Not allowed
	Off	Local	Not allowed	Allowed to start	Not allowed
		Remote	Not allowed	Not allowed	Allowed to start
T1, T2 mode	On	Local	Allowed to start	Not allowed	Not allowed
		Remote	Allowed to start	Not allowed	Not allowed
	Off	Local	Not allowed	Not allowed	Not allowed
		Remote	Not allowed	Not allowed	Not allowed

T1,T2 mode: DEADMAN switch is effective.

For the standard specification of R-30*i*A Mate Controller

Teach pendant enable switch	Software remote condition	Teach pendant	Peripheral device
On	Ignored	Allowed to start	Not allowed
Off	Local	Not allowed	Not allowed
	Remote	Not allowed	Allowed to start

(6) (Only when R-30*i*B Plus/R-30*i*B Mate Plus/R-30***i***B/R-30*i*B Mate /R-30*i*A Controller or CE or RIA specification of R-30*i*A Mate controller is selected.) To start the system using the operator panel, make certain that nobody is in the robot operating space and that there are no abnormal conditions in the robot operating space.

(7) When a program is completed, be sure to carry out the test operation according to the following procedure.
   (a) Run the program for at least one operation cycle in the single step mode at low speed.
   (b) Run the program for at least one operation cycle in the continuous operation mode at low speed.
   (c) Run the program for one operation cycle in the continuous operation mode at the intermediate speed and check that no abnormalities occur due to a delay in timing.
   (d) Run the program for one operation cycle in the continuous operation mode at the normal operating speed, and check that the system operates automatically without trouble.
   (e) After checking the completeness of the program through the test operation above, execute it in the automatic operation mode.

(8) While operating the system in the automatic operation mode, the teach pendant operator must leave the safety fence.

3.3 SAFETY OF THE MAINTENANCE ENGINEER

For the safety of maintenance engineer personnel, pay utmost attention to the following.

(1) During operation, never enter the robot operating space.

(2) A hazardous situation may arise when the robot or the system, are kept with their power-on during maintenance operations. Therefore, for any maintenance operation, the robot and the system should be put into the power-off state. If necessary, a lock should be in place in order to prevent any other person from turning on the robot and/or the system. In case maintenance needs to be executed in the power-on state, the emergency stop button must be pressed.

(3) If it becomes necessary to enter the robot operating space while the power is on, press the emergency stop button on the operator box or operator panel, or the teach pendant before entering the range. The maintenance worker must indicate that maintenance work is in progress and be careful not to allow other people to operate the robot carelessly.
(4) When entering the area enclosed by the safety fence, the worker must check the whole robot system in order to make sure no dangerous situations exist. In case the worker needs to enter the safety area whilst a dangerous situation exists, extreme care must be taken, and whole robot system status must be carefully monitored.
(5) Before the maintenance of the pneumatic system is started, the supply pressure should be shut off and the pressure in the piping should be reduced to zero.
(6) Before the start of maintenance work, check that the robot and its peripheral equipment are all in the normal operating condition.
(7) Do not operate the robot in the automatic operation while anybody is in the robot operating space.
(8) When you maintain the robot alongside a wall or instrument, or when multiple users are working nearby, make certain that their escape path is not obstructed.
(9) When a tool is mounted on the robot, or when any movable device other than the robot is installed, such as belt conveyor, pay careful attention to its motion.
(10) If necessary, have a user who is familiar with the robot system stand beside the operator panel and observe the work being performed. If any danger arises, the user should be ready to press the EMERGENCY STOP button at any time.
(11) When replacing a part, please contact your local FANUC representative. If a wrong procedure is followed, an accident may occur, causing damage to the robot and injury to the user.
(12) When replacing or reinstalling components, take care to prevent foreign material from entering the system.
(13) When handling each unit or printed circuit board in the controller during inspection, turn off the circuit breaker to protect against electric shock.
If there are two cabinets, turn off the both circuit breaker.
(14) A part should be replaced with a part recommended by FANUC. If other parts are used, malfunction or damage would occur. Especially, a fuse that is not recommended by FANUC should not be used. Such a fuse may cause a fire.
(15) When restarting the robot system after completing maintenance work, make sure in advance that there is no person in the operating space and that the robot and the peripheral equipment are not abnormal.
(16) When a motor or brake is removed, the robot arm should be supported with a crane or other equipment beforehand so that the arm would not fall during the removal.
(17) Whenever grease is spilled on the floor, it should be removed as quickly as possible to prevent dangerous falls.
(18) The following parts are heated. If a maintenance user needs to touch such a part in the heated state, the user should wear heat-resistant gloves or use other protective tools.
- Servo motor
- Inside the controller
- Reducer
- Gearbox
- Wrist unit

(19) Maintenance should be done under suitable light. Care must be taken that the light would not cause any danger.
(20) When a motor, reducer, or other heavy load is handled, a crane or other equipment should be used to protect maintenance workers from excessive load. Otherwise, the maintenance workers would be severely injured.
(21) The robot should not be stepped on or climbed up during maintenance. If it is attempted, the robot would be adversely affected. In addition, a misstep can cause injury to the worker.
(22) When performing maintenance work in high place, secure a footstep and wear safety belt.
(23) After the maintenance is completed, spilled oil or water and metal chips should be removed from the floor around the robot and within the safety fence.

(24) When a part is replaced, all bolts and other related components should put back into their original places. A careful check must be given to ensure that no components are missing or left not mounted.
(25) In case robot motion is required during maintenance, the following precautions should be taken :
- Foresee an escape route. And during the maintenance motion itself, monitor continuously the whole robot system so that your escape route will not become blocked by the robot, or by peripheral equipment.
- Always pay attention to potentially dangerous situations, and be prepared to press the emergency stop button whenever necessary.

(26) The robot should be periodically inspected. (Refer to the robot mechanical manual and controller maintenance manual.) A failure to do the periodical inspection can adversely affect the performance or service life of the robot and may cause an accident
(27) After a part is replaced, a test execution should be given for the robot according to a predetermined method. (See TESTING section of "Controller operator's manual".) During the test execution, the maintenance worker should work outside the safety fence.

4 SAFETY OF THE TOOLS AND PERIPHERAL EQUIPMENT

4.1 PRECAUTIONS IN PROGRAMMING

(1) Use a limit switch or other sensor to detect a dangerous condition and, if necessary, design the program to stop the robot when the sensor signal is received.
(2) Design the program to stop the robot when an abnormality occurs in any other robots or peripheral equipment, even though the robot itself is normal.
(3) For a system in which the robot and its peripheral equipment are in synchronous motion, particular care must be taken in programming so that they do not interfere with each other.
(4) Provide a suitable interface between the robot and its peripheral equipment so that the robot can detect the states of all devices in the system and can be stopped according to the states.

4.2 PRECAUTIONS FOR MECHANISM

(1) Keep the component cells of the robot system clean, operate the robot where insulated from the influence of oil, water, and dust.
(2) Don't use unconfirmed liquid for cutting fluid and cleaning fluid.
(3) Adopt limit switches or mechanical stoppers to limit the robot motion, and avoid the robot from collisions against peripheral equipment or tools.
(4) Observe the following precautions about the mechanical unit cables. Failure to follow precautions may cause problems.
- Use mechanical unit cable that have required user interface.
- Do not add user cable or hose to inside of the mechanical unit.
- Please do not obstruct the movement of the mechanical unit when cables are added to outside of mechanical unit.
- In the case of the model that a cable is exposed, please do not perform remodeling (Adding a protective cover and fix an outside cable more) obstructing the behavior of the outcrop of the cable.
- When installing user peripheral equipment on the robot mechanical unit, please pay attention that the device does not interfere with the robot itself.

(5) The frequent power-off stop for the robot during operation causes the trouble of the robot. Please avoid the system construction that power-off stop would be operated routinely. (Refer to bad case example.) Please perform power-off stop after reducing the speed of the robot and stopping it by

hold stop or cycle stop when it is not urgent. (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type.)
(Bad case example)

- Whenever poor product is generated, a line stops by emergency stop and power-off of the robot is incurred.
- When alteration is necessary, safety switch is operated by opening safety fence and power-off stop is incurred for the robot during operation.
- An operator pushes the emergency stop button frequently, and a line stops.
- An area sensor or a mat switch connected to safety signal operates routinely and power-off stop is incurred for the robot.
- Power-off stop is regularly incurred due to an inappropriate setting for Dual Check Safety (DCS).

(6) Power-off stop of Robot is executed when collision detection alarm (SRVO-050) etc. occurs. Please try to avoid unnecessary power-off stops. It may cause the trouble of the robot, too. So remove the causes of the alarm.

5 SAFETY OF THE ROBOT MECHANICAL UNIT

5.1 PRECAUTIONS IN OPERATION

(1) When operating the robot in the jog mode, set it at an appropriate speed so that the operator can manage the robot in any eventuality.
(2) Before pressing the jog key, be sure you know in advance what motion the robot will perform in the jog mode.

5.2 PRECAUTIONS IN PROGRAMMING

(1) When the operating spaces of robots overlap, make certain that the motions of the robots do not interfere with each other.
(2) Be sure to specify the predetermined work origin in a motion program for the robot and program the motion so that it starts from the origin and terminates at the origin. Make it possible for the operator to easily distinguish at a glance that the robot motion has terminated.

5.3 PRECAUTIONS FOR MECHANISMS

Keep the robot operation area clean, and operate the robot in an environment free of grease, water, and dust.

5.4 PROCEDURE TO MOVE ARM WITHOUT DRIVE POWER IN EMERGENCY OR ABNORMAL SITUATIONS

For emergency or abnormal situations (e.g. persons trapped in or pinched by the robot), brake release unit can be used to move the robot axes without drive power.
Please refer to controller maintenance manual and mechanical unit operator’s manual for using method of brake release unit and method of supporting robot.

6 SAFETY OF THE END EFFECTOR

6.1 PRECAUTIONS IN PROGRAMMING

(1) To control the pneumatic, hydraulic and electric actuators, carefully consider the necessary time delay after issuing each control command up to actual motion and ensure safe control.
(2) Provide the end effector with a limit switch, and control the robot system by monitoring the state of the end effector.

7 STOP TYPE OF ROBOT (R-30*i*A, R-30*i*A Mate)

The following three robot stop types exist:

Power-Off Stop (Category 0 following IEC 60204-1)

Servo power is turned off and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.
The following processing is performed at Power-Off stop.
- An alarm is generated and servo power is turned off.
- The robot operation is stopped immediately. Execution of the program is paused.

Frequent Power-Off stop of the robot during operation can cause mechanical problems of the robot.
Avoid system designs that require routine or frequent Power-Off stop conditions.

Controlled stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.
The following processing is performed at Controlled stop.
- The alarm "SRVO-199 Controlled stop" occurs along with a decelerated stop. Execution of the program is paused.
- An alarm is generated and servo power is turned off.

Hold (Category 2 following IEC 60204-1)

The robot is decelerated until it stops, and servo power remains on.
The following processing is performed at Hold.
- The robot operation is decelerated until it stops. Execution of the program is paused.

⚠ WARNING

1 The stopping distance and time of Controlled stop is longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time is necessary when Controlled stop is used. Please refer to the operator's manual of a particular robot model for the data of stopping distance and time.
2 In multi arm system, the longest stopping distance and time of Controlled Stop among each robot are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the multi arm system.
3 In the system which has extended axis, the longer stopping distance and time of Controlled Stop among robot and extended axis are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the system which has extended axis. Please refer to the extended axis setup procedure of the controller operator's manual for considering the stopping distance and time of the extended axis.
4 In case of Controlled stop, motor power shutdown is delayed for a maximum of 2 seconds. In this case, a risk assessment for the whole robot system is necessary, including the 2 seconds delay.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Power-Off stop or Controlled stop. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the controller type or option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Servo disconnect
A	AUTO	P-Stop	P-Stop	C-Stop	C-Stop	P-Stop
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
B	AUTO	P-Stop	P-Stop	P-Stop	P-Stop	P-Stop
	T1	P-Stop	P-Stop	-	P-Stop	P-Stop
	T2	P-Stop	P-Stop	-	P-Stop	P-Stop
C	AUTO	C-Stop	C-Stop	C-Stop	C-Stop	C-Stop
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop

P-Stop: Power-Off stop
C-Stop: Controlled stop
-: Disable

The following table indicates the Stop pattern according to the controller type or option configuration.

Option	R-30*i*A				R-30*i*A Mate		
	Standard (Single)	Standard (Dual)	RIA type	CE type	Standard	RIA type	CE type
Standard	B (*)	A	A	A	A (**)	A	A
Stop type set (Stop pattern C) (A05B-2500-J570)	N/A	N/A	C	C	N/A	C	C

(*) R-30*i*A standard (single) does not have servo disconnect.

(**) R-30*i*A Mate Standard does not have servo disconnect, and the stop type of SVOFF input is Power-Off stop.

The stop pattern of the controller is displayed in "Stop pattern" line in software version screen. Please refer to "Software version" in operator's manual of controller for the detail of software version screen.

"Controlled stop by E-Stop" option

When "Stop type set (Stop pattern C) (A05B-2500-J570) option is specified, the stop type of the following alarms becomes Controlled stop but only in AUTO mode. In T1 or T2 mode, the stop type is Power-Off stop which is the normal operation of the system.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open. (R-30*i*A controller)
SRVO-194 Servo disconnect	Servo disconnect input (SD4-SD41, SD5-SD51) is open. (R-30*i*A controller)
SRVO-218 Ext. E-stop/Servo Disconnect	External emergency stop input (EES1-EES11, EES2-EES21) is open. (R-30*i*A Mate controller)
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Controlled stop is different from Power-Off stop as follows:

- In Controlled stop, the robot is stopped on the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Controlled stop, physical impact is less than Power-Off stop. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End Of Arm Tool) should be minimized.
- The stopping distance and stopping time of Controlled stop is longer than the stopping distance and stopping time of Power-Off stop, depending on the robot model and axis. Please refer to the operator's manual of a particular robot model for the data of stopping distance and stopping time.

For the R-30***i***A or R-30***i***A Mate, this function is available only in CE or RIA type hardware.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and stopping time of Controlled stop are longer than the stopping distance and stopping time of Power-Off stop. A risk assessment for the whole robot system, which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

8 STOP TYPE OF ROBOT (R-30*i*B, R-30*i*B Mate)

There are following four types of Stopping Robot.

Power-Off Stop (Category 0 following IEC 60204-1)

Servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.

"**Power-Off stop**" performs following processing.

- An alarm is generated, and then the servo power turns off. Instantly the robot stops.
- Execution of the program is paused.

Frequent Power-Off stop of the robot during operation can cause mechanical problems of the robot.
Avoid system designs that require routine or frequent Power-Off stop conditions.

Controlled stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.

"**Controlled stop**" performs following processing.

- The alarm "**SRVO-199 Controlled stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.

Smooth stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.

"**Smooth stop**" performs following processing.

- The alarm "**SRVO-289 Smooth Stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.
- In Smooth stop, the robot decelerates until it stops with the deceleration time shorter than Controlled stop.

Hold (Category 2 following IEC 60204-1)

The robot is decelerated until it stops, and servo power remains on.

"**Hold**" performs following processing.

- The robot operation is decelerated until it stops. Execution of the program is paused.

⚠ WARNING

1 The stopping distance and time of Controlled stop and Smooth stop are longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time is necessary when Controlled stop or Smooth Stop is used. Please refer to the operator's manual of a particular robot model for the data of stopping distance and time.

2 In multi arm system, the longest stopping distance and time of Controlled Stop or Smooth Stop among each robot are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the multi arm system.

3 In the system which has extended axis, the longer stopping distance and time of Controlled Stop or Smooth Stop among robot and extended axis are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the system which has extended axis. Please refer to the extended axis setup procedure of the controller operator's manual for considering the stopping distance and time of the extended axis.

4 When Smooth stop occurs during deceleration by Controlled stop, the stop type of robot is changed to Power-Off Stop.
When Smooth stop occurs during deceleration by Hold, the stop type of robot is changed to Power-Off Stop.

5 In case of Controlled stop or Smooth Stop, motor power shutdown is delayed for a maximum of 2 seconds. In this case, a risk assessment for the whole robot system is necessary, including the 2 seconds delay.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Power-Off stop, Controlled stop, or Smooth stop. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Deadman switch (*)
A	AUTO	P-Stop	P-Stop	C-Stop	C-Stop	-
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
C	AUTO	C-Stop	C-Stop	C-Stop	C-Stop	-
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
D	AUTO	S-Stop	S-Stop	C-Stop	C-Stop	-
	T1	S-Stop	S-Stop	-	C-Stop	S-Stop
	T2	S-Stop	S-Stop	-	C-Stop	S-Stop

P-Stop: Power-Off stop
C-Stop: Controlled stop
S-Stop: Smooth stop
-: Disable
(*) The stop pattern of NTED input is same as Deadman switch.

The following table indicates the Stop pattern according to the controller type or option configuration.

Option	R-30*i*B/ R-30*i*B Mate
Standard	A(**)
Controlled stop by E-Stop (A05B-2600-J570)	C(**)
Smooth E-Stop (A05B-2600-J651)	D(**)

(**)R-30*i*B Mate does not have SVOFF input.

The stop pattern of the controller is displayed in "Stop pattern" line in software version screen. Please refer to "Software version" in operator's manual of controller for the detail of software version screen.

"Controlled stop by E-Stop" option

When "**Controlled stop by E-Stop**" (A05B-2600-J570) option is specified, the stop type of the following alarms become Controlled stop but only in AUTO mode. In T1 or T2 mode, the stop type is Power-Off stop which is the normal operation of the system.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Controlled stop is different from **Power-Off stop** as follows:

- In Controlled stop, the robot is stopped on the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Controlled stop, physical impact is less than Power-Off stop. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End Of Arm Tool) should be minimized.
- The stopping distance and time of Controlled stop is longer than those of Power-Off stop, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Controlled stop are longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

"Smooth E-Stop Function" option

When "**Smooth E-Stop Function**" (A05B-2600-J651) option is specified, the stop type of the following alarms becomes Smooth stop in all operation modes (AUTO, T1 and T2 mode).

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-003 Deadman switch released	Both deadman switches on Teach pendant are released.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-037 IMSTP input (Group: %d)	IMSTP input (*IMSTP signal for a peripheral device interface) is OFF.

Alarm	Condition
SRVO-232 NTED input	NTED input (NTED1-NTED11, NTED2-NTED21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.
SRVO-410 DCS SSO NTED input	In DCS Safe I/O connect function, SSO[5] is OFF.
SRVO-419 DCS PROFIsafe comm. error	PROFINET Safety communication error occurs.

Smooth stop is different from **Power-Off stop** as follows:

- In Smooth stop, the robot is stopped along the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Smooth stop, physical impact is less than Power-Off stop. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End Of Arm Tool) should be minimized.
- The stopping distance and time of Smooth stop is longer than those of Power-Off stop, depending on the robot model and axis.

Smooth stop is different from **Controlled stop** as follows:

- The stopping distance and time of Smooth stop is normally shorter than those of Controlled stop, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Smooth stop are longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

9 STOP TYPE OF ROBOT (R-30*i*B Plus, R-30*i*B Mate Plus)

There are following three types of Stop Category.

Stop Category 0 following IEC 60204-1 (Power-off Stop)

Servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.

"**Stop Category 0**" performs following processing.

- An alarm is generated, and then the servo power turns off. Instantly the robot stops.
- Execution of the program is paused.

Frequent Category 0 Stop of the robot during operation can cause mechanical problems of the robot.
Avoid system designs that require routine or frequent Category 0 Stop conditions.

Stop Category 1 following IEC 60204-1 (Controlled Stop, Smooth Stop)

The robot is decelerated until it stops, and servo power is turned off.

"**Stop Category 1**" performs following processing.

- The alarm "**SRVO-199 Controlled stop**" or "**SRVO-289 Smooth Stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.

In Smooth stop, the robot decelerates until it stops with the deceleration time shorter than Controlled stop. The stop type of Stop Category 1 is different according to the robot model or option configuration. Please refer to the operator's manual of a particular robot model.

Stop Category 2 following IEC 60204-1 (Hold)

The robot is decelerated until it stops, and servo power remains on.
"**Stop Category 2**" performs following processing.

- The robot operation is decelerated until it stops. Execution of the program is paused.

> ⚠ **WARNING**
> 1 The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time is necessary when Stop Category 1 is used. Please refer to the operator's manual of a particular robot model for the data of stopping distance and time.
> 2 In multi arm system, the longest stopping distance and time of Stop Category 1 among each robot are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the multi arm system.
> 3 In the system which has extended axis, the longer stopping distance and time of Stop Category 1 among robot and extended axis are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the system which has extended axis. Please refer to the extended axis setup procedure of the controller operator's manual for considering the stopping distance and time of the extended axis.
> 4 When Stop Category 1 occurs during deceleration by Stop Category 2, the stop type of robot is changed to Stop Category 0.
> 5 In case of Stop Category 1, motor power shutdown is delayed for a maximum of 2 seconds. In this case, a risk assessment for the whole robot system is necessary, including the 2 seconds delay.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Stop Category 0 or Stop Category 1. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Deadman switch (*)
A	AUTO	Category 0	Category 0	Category 1	Category 1	-
	T1	Category 0	Category 0	-	Category 1	Category 0
	T2	Category 0	Category 0	-	Category 1	Category 0
C	AUTO	Category 1	Category 1	Category 1	Category 1	-
	T1	Category 0	Category 0	-	Category 1	Category 0
	T2	Category 0	Category 0	-	Category 1	Category 0
D	AUTO	Category 1	Category 1	Category 1	Category 1	-
	T1	Category 1	Category 1	-	Category 1	Category 1
	T2	Category 1	Category 1	-	Category 1	Category 1

Category 0: Stop Category 0
Category 1: Stop Category 1
-: Disable

(*) The stop pattern of NTED input is same as Deadman switch.
The following table indicates the Stop pattern according to the controller type or option configuration.
The case R651 is specified.

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	C(**)
Old Stop Function (A05B-2670-J680)	A(**)
All Smooth Stop Function (A05B-2670-J651)	D(**)

The case R650 is specified.

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	A(**)
Stop Category 1 by E-Stop (A05B-2670-J521)	C(**)
All Smooth Stop Function (A05B-2670-J651)	D(**)

(**)R-30*i*B Mate Plus does not have SVOFF input.

The stop pattern of the controller is displayed in "Stop pattern" line in software version screen. Please refer to "Software version" in operator's manual of controller for the detail of software version screen.

"Old Stop Function" option

When "**Old Stop Function**" (A05B-2670-J680) option is specified, the stop type of the following alarms becomes Stop Category 0 in AUTO mode.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Stop Category 0 is different from **Stop Category 1** as follows:

- In Stop Category 0, servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.
- The stopping distance and time of Stop Category 0 is shorter than those of Stop Category 1, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

"All Smooth Stop Function" option

When "**All Smooth Stop Function**" (A05B-2670-J651) option is specified, the stop type of the following alarms becomes Stop Category 1 in all operation modes (AUTO, T1 and T2 mode).

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-003 Deadman switch released	Both deadman switches on Teach pendant are released.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-037 IMSTP input (Group: %d)	IMSTP input (*IMSTP signal for a peripheral device interface) is ON.
SRVO-232 NTED input	NTED input (NTED1-NTED11, NTED2-NTED21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.
SRVO-410 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[5] is OFF.
SRVO-419 DCS PROFIsafe comm. error	PROFINET Safety communication error occurs.

Stop Category 1 is different from **Stop Category 0** as follows:

- In Stop Category 1, the robot is stopped along the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Stop Category 1, physical impact is less than Stop Category 0. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End of Arm Tool) should be minimized.
- The stopping distance and time of Stop Category 1 is longer than those of Stop Category 0, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

"Stop Category 1 by E-Stop" option

When "**Stop Category 1 by E-Stop**" (A05B-2670-J521) option is specified, the stop type of the following alarms become Category 1 Stop but only in AUTO mode. In T1 or T2 mode, the stop type is Category 0 Stop which is the normal operation of the system.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Stop Category 1 is different from **Stop Category 0** as follows:

- In Stop Category 1, the robot is stopped along the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Stop Category 1, physical impact is less than Stop Category 0. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End of Arm Tool) should be minimized.
- The stopping distance and time of Stop Category 1 is longer than those of Stop Category 0, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

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TABLE OF CONTENTS

1 GENERAL INFORMATION

This manual describes how to setup and use InterBus function for Phoenix Contact PCI board for FANUC robot controller. This manual is written for people who are skilled to handle the InterBus system. This manual is written as a useful complement but not a replacement of any documents from Phoenix Contact.

1.1 INTRODUCTION

This function enables the FANUC robot controller to use the InterBus system couplers of Phoenix Contact, IBS PCI SC/RI/I-T and IBS PCI SC/RI-LK. The system coupler provides an InterBus master function to the robot's peripheral I/O devices with an additional slave function for connecting to a higher network control system. The system coupler has a complete generation 4 functionality. In addition, the InterBus master-only controller board, IBS PCI SC-LK has been supported. Please refer to Appendix A for more details. Generally the descriptions of the master part of the system coupler are applied to the master-only controller board.

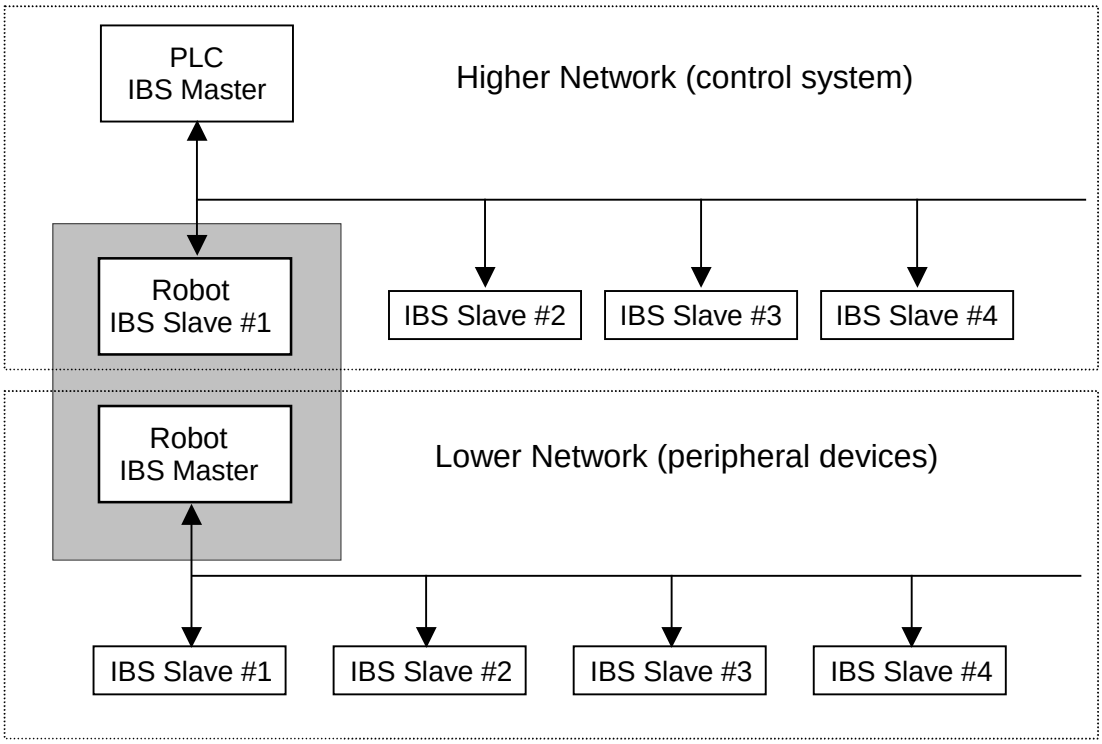


Fig 1.1 Robot controller as InterBus Master and Slave

NOTE
The files stored in the parameterization memory of InterBus system coupler are saved to IBBDFIL.IBA as an archive. InterBus system coupler must be installed to the controller for this operation, otherwise no file is stored to IBBDFIL.IBA.
IBBDFIL.IBA can be restored when InterBus system coupler is installed to the controller. The parameterization memory of InterBus system coupler is cleared during this process, and files are recovered from IBBDFIL.IBA.
The system might claim IBBDFIL.IBA during restore of “System files” or “All of above” at controlled start. Just skip IBBDFIL.IBA when it is not present on the selected device and there is no need to restore the files to the parameterization memory.
Please see the following for more details:
3.7 STORING AND RESTORING INTERBUS SETTINGS
6.2.3 CMD: Control setup screen
6.3.5 Storing the files in the parameterization memory of InterBus system coupler as IBBDFIL.IBA
6.3.6 Restoring files to the parameterization memory of InterBus system coupler by IBBDFIL.IBA

1.2 TWO TYPES OF USER INTERFACE MODE

The robot controller is not based on Windows technology, so that CMD Tool (1) is not integrated. Therefore, Teach Pendant (referred to as TP) provides two types of user interface modes that differ in the way of setup and functionality. TP also provides a software switch to select the two user interface modes (power off/on is required to change the modes).

(1) CMD Tool is a PC software product of Phoenix Contact that creates a configuration of the InterBus controller boards. FANUC is not responsible for CMD Tool.

1.2.1 TP Centered User Interface Mode (referred to as TP mode)

In TP mode, setup and operation management are done via the Teach Pendant. Not all functionalities are available in TP mode, but it provides some intelligent functions such as the automatic “Read In” function that automatically reads in the current InterBus network configuration.

1.2.2 CMD Centered User Interface Mode (referred to as CMD mode)

In CMD mode, CMD Tool is required to create the configuration of the InterBus. With CMD Tool, the configuration has to be stored as a SVC file to the parameterization memory of the system coupler via a RS-232 port. Then, the SVC file must be loaded to the robot controller by specifying the file name in the TP setup screen. Once the SVC file has been loaded, the robot controller can parameterize the system coupler according to the SVC file every time the robot controller is powered up. As the setup is based on the SVC file, all functions, supported by CMD Tool, are available in CMD mode.

NOTE
Config+ should be used instead of CMD tool for the master-only controller board, IBS PCI SC-LK. Please refer to Appendix A for more details.

1.3 MORE INFORMATION ABOUT INTERBUS, THE SYSTEM COUPLER AND ITS FIRMWARE

For more detailed information on the InterBus, the system coupler and its firmware, refer to the following documents of Phoenix Contact.

No.	Title	Designation
1	User Manual: General Introduction to the INTERBUS System	IBS SYS INTRO G4 UM E
2	User Manual: Configuring and Installing INTERBUS	IBS SYS PRO INST UM E
3	Diagnostic Guide	IBS SYS DIAG DSC UM E
4	User Manual: Firmware Services and Error Messages	IBS SYS FW G4 UM E
5	User Manual: Peripheral Communication Protocol (PCP)	IBS SYS PCP G4 UM E
6	Quick Start IBS CMD G4	IBS CMD SWT G4 4.6 QS UM E
7	Reference Manual: IBS CMD G4	IBS CMD SWT G4 UM E
8	User Manual: Installing and Starting Up the Controller Board for PC Systems	IBS PCI SC QS UM E
9	Data sheet: System coupler for PC systems with PCI Bus (optical)	IBS PCI SC/RI-LK
10	Data sheet: System coupler for PC systems with PCI Bus (optical)	IBS PCI SC/RI/I-T
11	INTERBUS Addressing	IBS SYS ADDRESS E
12	Reference Manual: INTERBUS Terms and Definitions	IBS TERM RG UM E
13	User Manual: Configuring and Installing the InterBus Inline Product Range	IB IL SYS PRO UM E
14	User Manual: Configuring and Installing the Rugged Line Product Range	IBS RL SYS PRO UM E

The actual manuals and other information can be downloaded from the Website of Phoenix Contact under "www.PhoenixContact.com".

2 SPECIFICATIONS

2.1 SPECIFICATION OF THE INTERBUS FUNCTION

Item	Specification
Supported Generation 4 controller board	IBS PCI SC/RI-LK (optical interface) IBS PCI SC/RI/I-T (copper interface) IBS PCI RI-LK (optical interface, master-only)
Supported firmware version	4.6X
Parameterization of controller board	With/Without CMD. (refer to section 1.2) Config+ can be used instead of CMD.
PCP function	Supported for the slave part of the system coupler (refer to chapter 9).
Alternative group switching	Supported for groups whose alternative number is not zero. Instructions in the TP program can also switch alternative groups.
Digital inputs	Up to 2048 inputs (total for slave and master)
Digital outputs	Up to 2048 outputs (total for slave and master)
Analog inputs	Up to 25 channels
Analog outputs	Up to 25 channels

2.2 SPECIFICATION OF THE SYSTEM COUPLER

Item	Specification
Manufacturer	Phoenix Contact
Type	IBS PCI SC/RI-LK (optical interface) IBS PCI SC/RI/I-T (copper interface)
Functionality	Generation 4 System Coupler
Interface	Copper / Optical fiber
Baud rate (copper interface)	500kbps; 2Mbps
Baud rate (optical interface)	500kbps; 2Mbps
Digital inputs of slave function	Up to 16 words
Digital outputs of slave function	Up to 16 words
PCP channel of slave function	Up to 4 words
External power supply of slave board	24V
Module representation	Refer to section 4.8.

2.3 SPECIFICATION OF TP MODE

2.3.1 Master Function

Item	Specification
Parameterization	On the setup screen of the robot's teach pendant
Number of devices	Up to 128 devices
Supported I/O signals by master function	DI/DO, AI/AO, WI/WO, WSTK IN/WSTK OUT, UI/UO, GI/GO
I/O Rack No.	93
I/O Slot No.	1-128 (equals to device no.)
Digital inputs/outputs	Configured by the setting of each device. Default setting is the process data size of the digital devices.
Analog inputs/outputs	Configured by the setting of each device. Default setting is the process data size of the analog devices.
MPM assignment	Automatic addressing (refer to section 5.4)

2.3.2 Slave Function

Item	Specification
Parameterization	On the setup screen of the robot's teach pendant
Supported I/O signals by slave function	DI/DO, UI/UO, GI/GO
I/O Rack No.	94
I/O Slot No.	1
Digital inputs/outputs	Configured by the process data length
MPM assignment	Automatic addressing (refer to section 5.4)

2.4 SPECIFICATION OF CMD MODE

Item	Specification
Parameterization	Based on the SVC file stored in the non-volatile memory (FROM) of the robot controller.
Supported I/O signals by master function	DI/DO, AI/AO, UI/UO, GI/GO
I/O Rack No.	95
I/O Slot No.	1
Digital inputs/outputs	Configurable range is 16-1800
Analog inputs/outputs	Configurable range is 0-25
MPM assignment	According to SVC file (refer to section 6.4)

3 OVERVIEW OF THE INTERBUS FUNCTIONS

This chapter briefly describes the functions of the InterBus option for various operations.

3.1 SETUP

There are two interface modes for configuring the InterBus and assigning the digital and analog I/O to the process data of each device in the system coupler's Multi Port Memory (MPM).

3.1.1 Setup in TP Mode

The setup in TP mode is done via the Teach Pendant. It is recommended to start the setup with the “Read In” function. This function creates a configuration frame and reads in the current InterBus network configuration from the system coupler. The ID code, the process data length and the bus level of each device are examined during “Read In”. If the device has the ID code of a digital device, the digital inputs and outputs of this device, equal to the process data length, are automatically set to the DI/DO length of the device. If the device has the ID code of an analog device, the analog inputs and outputs, equal to the process data length, are automatically set to the AI/AO length of the device. Refer to 5.2.5 for more details.

The I/O setting can be configured for each device. The process data area of a certain device can be shared by different I/O types, such as digital, analog and welding I/O (requires ArcTool). To share the process data area, a sub-area for the I/O type should be defined by setting the size of the sub-area and the offset position to the lowest bit of the process data. Up to two digital areas, two analog areas, one welding I/O area and one welding stick detect area are available for each type of input and output. This interface provides a flexible assignment for the I/O of robot and the process data area. Refer to 5.4 for more details.

The configuration, loaded by “Read In”, can be edited on the TP setting screens. If requested by the TP, the modified configuration can be sent to the system coupler at any time. The TP setting screens also provide an interface to change important parameters of the InterBus. These parameters are sent to the system coupler along with the configuration.

3.1.2 Setup in CMD Mode

Before starting the setup, a configuration must be created by using CMD Tool, a PC configuration software by Phoenix Contact. The configuration must then be saved as a SVC file and must be stored to the parameterization memory of the system. The robot controller loads the SVC file from the memory and stores the SVC file to the non-volatile memory (FROM) in the controller. The robot parameterizes the system coupler according to the commands in the SVC file every time the system is powered up or when requested by the TP. Config+ can be used to create a SVC file instead of CMD.

In CMD mode, the digital I/O and analog I/O of the robot are simply mapped to the MPM areas as a digital area and an analog area. By changing the process data assignment via CMD Tool, the process data can be assigned independently to digital I/O or analog I/O. The SVC file must be created and loaded to the robot again to enable new assignments after having changed the process data assignment.

3.2 I/O TRANSFER FUNCTION

The robot controller creates a mapping of the I/O of robot and the process data of the InterBus every time the system is powered up. The robot controller cyclically updates its I/O by reading/writing the process data on the system coupler by means of the mapping table. The update period is being changed according to the amount of I/O transfer. The period is a multiple of 8 ms. The minimum period is 8 ms. The maximum period is 24 ms. Actual cycle bus time is displayed in Master status screen (refer to 10.2.3).

3.3 I/O TRANSFER STATUS CONTROL ON THE TEACH PENDANT SCREEN

The I/O transfer state of the system coupler's master part can be seen and controlled on the “Control” setup screen. By selecting “Alarm Stop”, the state returns to the state “Ready”. By selecting “Stop data transfer”, the state returns to the state “Active”, if it has been prior in the state “Run”. By selecting “Start data transfer”, the state returns to the state “Run” again, provided that there is no error in the configuration and wiring of the InterBus.

3.4 DIAGNOSIS AND ERROR RECOVERY

3.4.1 Status Screens

Status screens display the status of the system coupler; both the master part and slave part, and the status of the devices connected to the master part. The status screens are updated dynamically by requesting the latest information from the system coupler.

3.4.2 Error Messages

The InterBus firmware reports an error message containing information such as error code and error location, every time an error occurs. In addition to the information, the robot displays a clear text message for most bus errors and errors during setup and configuration. The error code and text will help the operator to find out the cause and remedy.
Any error message that belongs to Phoenix Contact includes the clear text and, in addition, the error code from Phoenix Contact itself.
For some error messages, error location is displayed as the Segment.Position number with the device name.
For other error messages, additional information from the system coupler can be displayed. This additional information is shown in the second line from top at the Teach-Pendant.

3.4.3 Bus Error Recovery

When a bus error occurs, the system coupler automatically diagnoses the cause of the bus error and informs the robot by sending the error code. When receiving the notification, the robot will post the error message according to the error code. When the operator presses the reset button, the robot will try to recover from the bus error.

3.4.4 Outputting the Master Diagnostic Register to Digital Outputs

The value of the master diagnostic register can be copied to 16 consecutive digital outputs. This feature enables the higher master to monitor the status of the system coupler's master part via the digital output of the slave part.

3.4.5 Peripheral Fault

When the peripheral fault occurs, the system coupler notifies the robot. Then the robot will post a warning message. If the “Automatic Peripheral Fault Recovery” function is enabled, the robot cyclically will try to reset the peripheral fault.

3.5 PCP FUNCTIONALITY

In the MPM, the system coupler shares the process data of the master and the slave part. A PCP client that connects to the slave part can directly read or write in the MPM by accessing built-in PCP objects. Refer to chapter 9 for more details.

3.6 ALTERNATIVE GROUP SWITCHING

3.6.1 Switching on the TP Screen and with TP Program Instructions

The robot can switch alternative groups on the TP screen after they have been defined in the activated configuration. InterBus instructions of a TP program to switch alternative groups are provided. Refer to chapter 7 for more details.

3.6.2 Recovery of Alternative Groups at HOT Start

This function will recover the alternative groups, which were enabled when the last power failure occurred, and will enable them at HOT start. This function is not activated when the configuration or group setting has been modified since the last parameterization. In case the configuration has been modified, a warning message, “IB-S-482 Alternative Recovery Disabled”, will be posted to inform the operator.

3.7 STORING AND RESTORING INTERBUS SETTINGS

The InterBus setup data can be stored to IBPXC.SV from the file screen. IBPXC.SV can be loaded from “Setup InterBus: General settings” screen.
In CMD mode, the SVC file is stored as a PXC_SVC.DT file, where the original file name is written in a header of the text file.

The files stored in the parameterization memory of InterBus system coupler are saved to a file named IBBDFIL.IBA as an archive.
Perform backup of “System files” or “All of above” to create IBBDFIL.IBA. The system coupler needs to be installed to the controller, otherwise no file is stored to IBBDFIL.IBA.
Please verify message like, IB-S-559 “%d files saved as ibbdfil.iba” shows up to confirm backup is completed successfully. When FTP is used for backup, please verify the file size of IBBDFIL.IBA to know if the files are actually stored to it.
In CMD mode, IBBDFIL.IBA can be created by “BackUp board files” command on the control setup screen.

IBBDFIL.IBA can be loaded in order to recover the stored files to the parameterization memory of the system coupler. The system coupler need to be installed to the controller for this operation.
The parameterization memory of InterBus system coupler is cleared during this process, and files are recovered from IBBDFIL.IBA.
Please verify message like, IB-S-560 “%d files loaded as ibbdfil.iba” shows up to confirm restore is completed successfully.
In CMD mode, IBBDFIL.IBA can be loaded by “Restore board files” command on the control setup screen.

The system might claim IBBDFIL.IBA during restore of “System files” or “All of above” at controlled start. Just skip IBBDFIL.IBA when it is not present on the selected device and there is no need to restore the files to the parameterization memory.

4 HARDWARE

4.1 MASTER BOARD LED

LED	Color	Meaning
FC	Green	Reserved
SC	Green Flashing: ON:	InterBus ready/running The controller board is in the state READY or ACTIVE The controller board and the connected InterBus are in the state RUN
HF	Yellow ON:	Host Failure Host system failure; driver not started yet.
FAIL	Red ON:	Failure An error has occurred in the InterBus system.
PF	Yellow ON:	Peripheral Fault Peripheral failure of an InterBus device.
BSA	Yellow ON:	Bus segment aborted One or more bus segments are disconnected.

The system coupler with an optical fiber interface (IBS PCI SC/RI-LK) also has an LED to diagnose the outgoing optical fiber interface:

LED	Color	Meaning
FO3	Yellow ON:	Fiber optic 3 The FO3 LED is on if the initialization of the outgoing interface is not OK or if a MAU warning occurs due to a poor transmission quality on the path (this applies to the data forward path/transmitter for the following module, the state of the data return path/receiver is diagnosed from the following module).

4.2 SLAVE BOARD LED

LED	Color	Meaning
UL	Green ON:	U (Logic) Operating voltage present
RC	Green ON:	Remote bus check The higher-level controller board is connected
BA	Green Flashing: ON:	Bus active Bus is in the state ACTIVE Bus is in the state RUN
RD	Red ON:	Remote bus disabled The outgoing remote bus interface is disconnected
FO1	Yellow ON:	Fiber optic 1 The FO1 LED is on if the initialization of the incoming interface is not OK or if an MAU warning occurs due to a poor transmission quality on the path (this applies to the data return path/transmitter for the previous module, the state of the data forward path/receiver is diagnosed from the previous module).
FO2	Yellow ON:	Fiber optic 2 The FO2 LED is on if the initialization of the outgoing interface is not OK or if an MAU warning occurs due to a poor transmission quality on the path (this applies to the data forward path/transmitter for the following module, the state of the data return path/receiver is diagnosed from the following module).

NOTE
The FO1 and FO2 LEDs are not available on the system coupler with a D-SUB interface (IBS PCI SC/RI/I-T).

4.3 MASTER BOARD DIP SWITCH

Only the DIP switch 7 is used for configuring the Baud Rate. All other DIP switches are not used by the robot controller. Refer to IBS PCI SC QS UM for more details.

	Meaning	Setting for the robot controller
DIP 1-3	Board number	The board number is not important for the robot controller.
DIP 4-6	Reserved	Not used (must be set to OFF)
DIP 7	Baud Rate	The baud rate of the lower-level INTERBUS system can be set using the DIP switch 7 of the master board. The default setting upon delivery (switch position “OFF”) is “Automatic selection” (500 kBaud or 2MBaud will be set automatically). Alternatively, absolute 2 MBaud (switch position “ON”) can be set (only at IBS PCI SC/RI-LK (optical)). Note: With the IBS PCI SC/RI-LK system coupler (optical) the baud rate is selected automatically (firmware >= 4.60). Therefore the DIP switch 7 does not have to be set to ON. Note: With the IBS PCI SC/RI/I-T system coupler (copper), the baud rate is selected automatically. Therefore the DIP switch 7 does not have an effect.
DIP 8	Reserved	Not used (must be set to OFF)

4.4 SLAVE BOARD DIP SWITCH

For normal operation, the DIP switch 10 must be set to the OFF positionas the robot software configures the slave board. If the DIP switch 10 is OFF, the DIP switches 1-9 are ignored and a configuration is carried out by the robot software. Therefore, the DIP switches 1-10 should only be set when the slave is to be connected to the InterBus master before starting up the robot. Refer to IBS PCI SC QS UM for more details.

If the DIP switch 10 is set to ON, the system coupler's slave part is configured according to the switch positions of the DIP switches 1-9. The robot software performs the configuration except for the Baud-Rate though. If the Baud-Rate setting of the DIP switch is different from the setting held by the robot, an alarm message “IB-S-470 Slave DIP setting mismatch” is posted.

	Meaning	Setting
DIP 1-2	Slave ID code	Not important because software configures this setting.
DIP 3-6	Process data Length	Not important because software configures this setting.
DIP 7	Reset Behavior on a Host PC Reset	Not important because software configures this setting.
DIP 8	Reserved	Not used
DIP 9	Baud Rate	Not important when DIP 10 is OFF. If DIP 10 is ON, the DIP switch 9 will set the baud rate of the system coupler's slave part. In the OFF position, the baud rate is 500 kbaud (default value), in the ON position, 2 Mbaud. If the Baud-Rate setting of the DIP switch is different from the setting held by the robot controller, an alarm message “IB-S-470 Slave DIP setting mismatch” is posted as the software cannot change this setting.
DIP 10	Configuration	For normal operation, the DIP switch 10 should be set to OFF, as the robot software configures the slave board. If the DIP switch 10 is ON, the robot software cannot change the Baud-Rate setting, which results in the alarm message “IB-S-470 Slave DIP setting mismatch”.

4.5 INSTALLING THE INTERBUS PCI SYSTEM COUPLER TO THE PCI MOTHERBOARD

The InterBus PCI system coupler is installed on the PCI motherboard to be mounted on the robot controller afterwards.

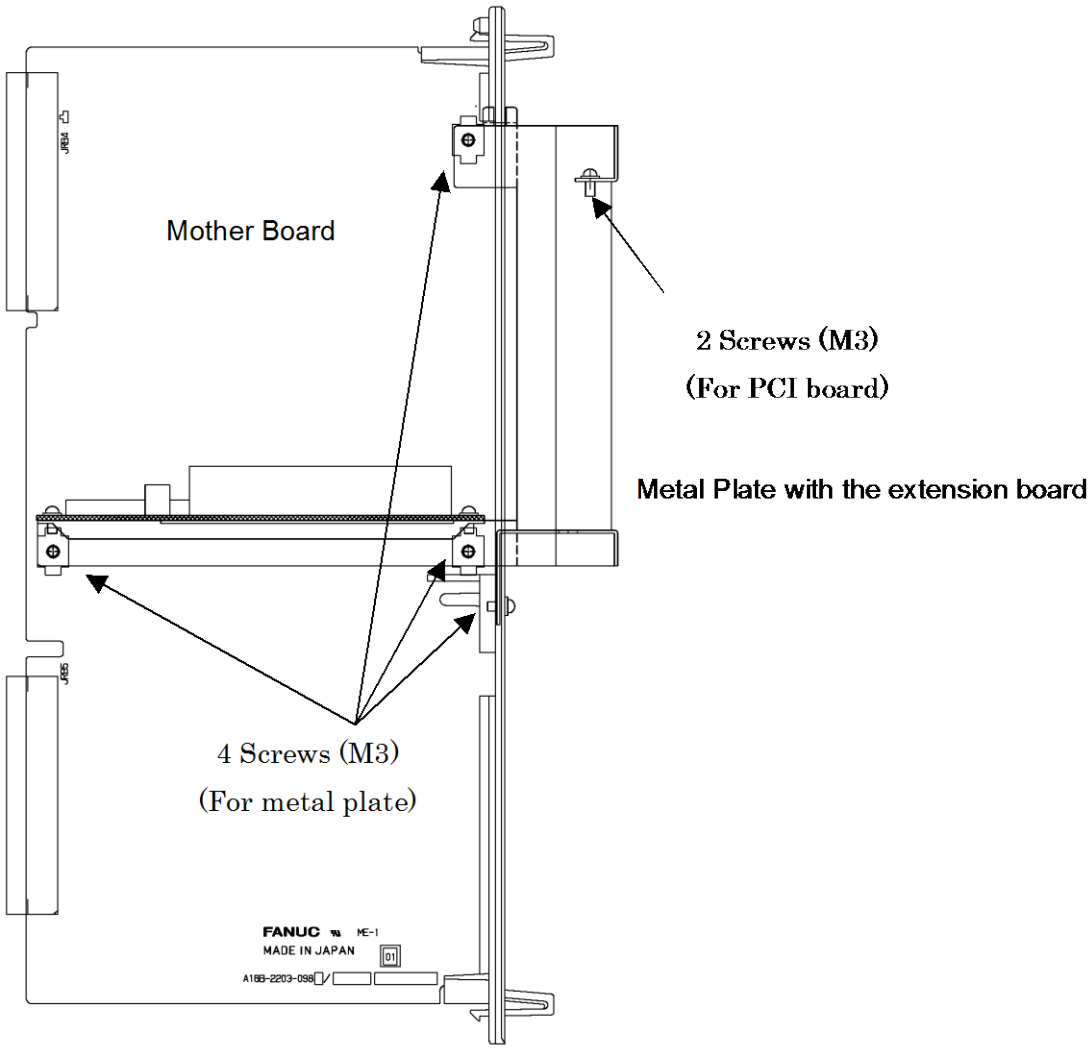


Fig 4.5 (a) PCI motherboard

Procedure Installing the InterBus PCI System Coupler to the PCI Motherboard

Steps

1. Remove the 4 screws that connect the metal plate to the extension board. Detach the metal plate and the extension board from the motherboard.
2. Remove the 2 screws which hold together the PCI boards.
3. Insert the InterBus system coupler boards into the PCI slot. The master board should be inserted into the upper slot. Mount each system coupler boards together with 2 screws.
4. Attach the extension boards to the motherboard. Do not bend the pin of the connector on the extension board.
5. Screw the extension boards together with 4 screws.

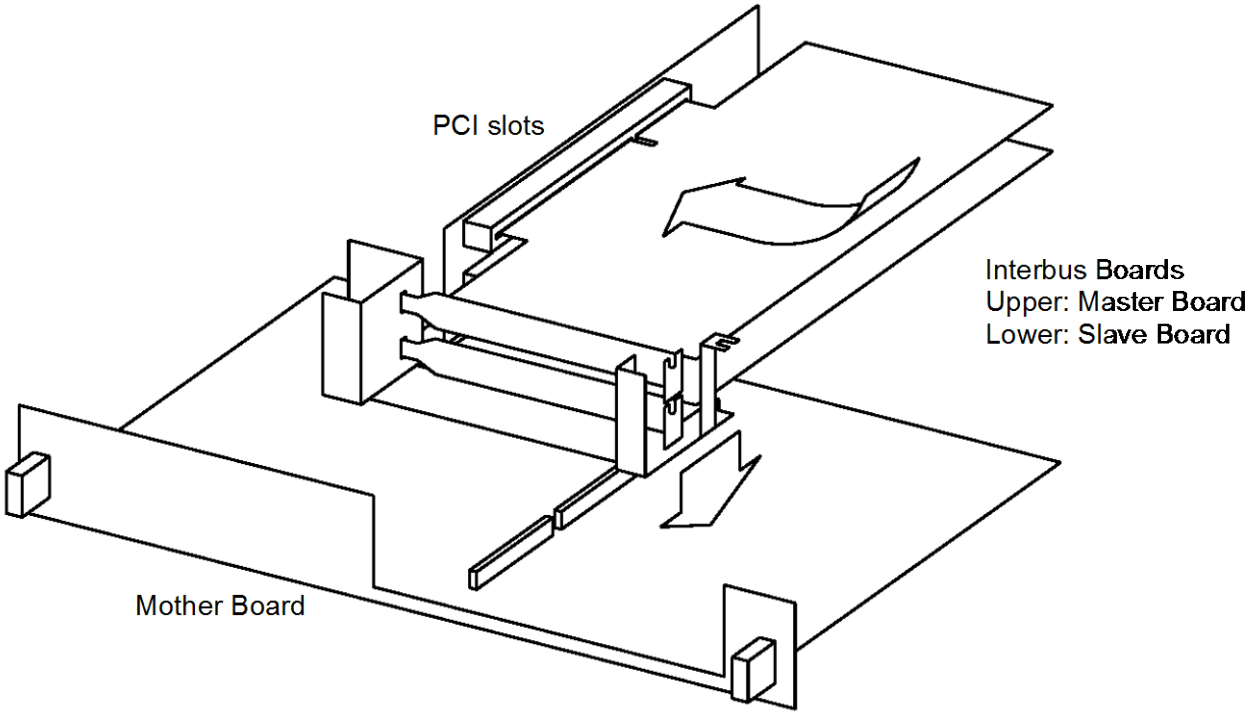


Fig 4.5 (b) Installing the InterBus PCI system coupler to the PCI motherboard

NOTE
1. The Master board must be installed into left PCI slot at the extension board (left = when the motherboard is mounted into the rack; see figure 4.6). The Slave board must be installed into right PCI slot at the extension board (right = when the motherboard is mounted into the rack; see figure 4.6). Otherwise, the robot controller cannot communicate with the system coupler.
2. The Master-only controller board (IBS PCI SC-LK) must be installed into left PCI slot at the extension board.

4.6 INSTALLING THE PCI MOTHERBOARD TO THE ROBOT CONTROLLER

The PCI motherboard is installed into the full slot of the robot controller.

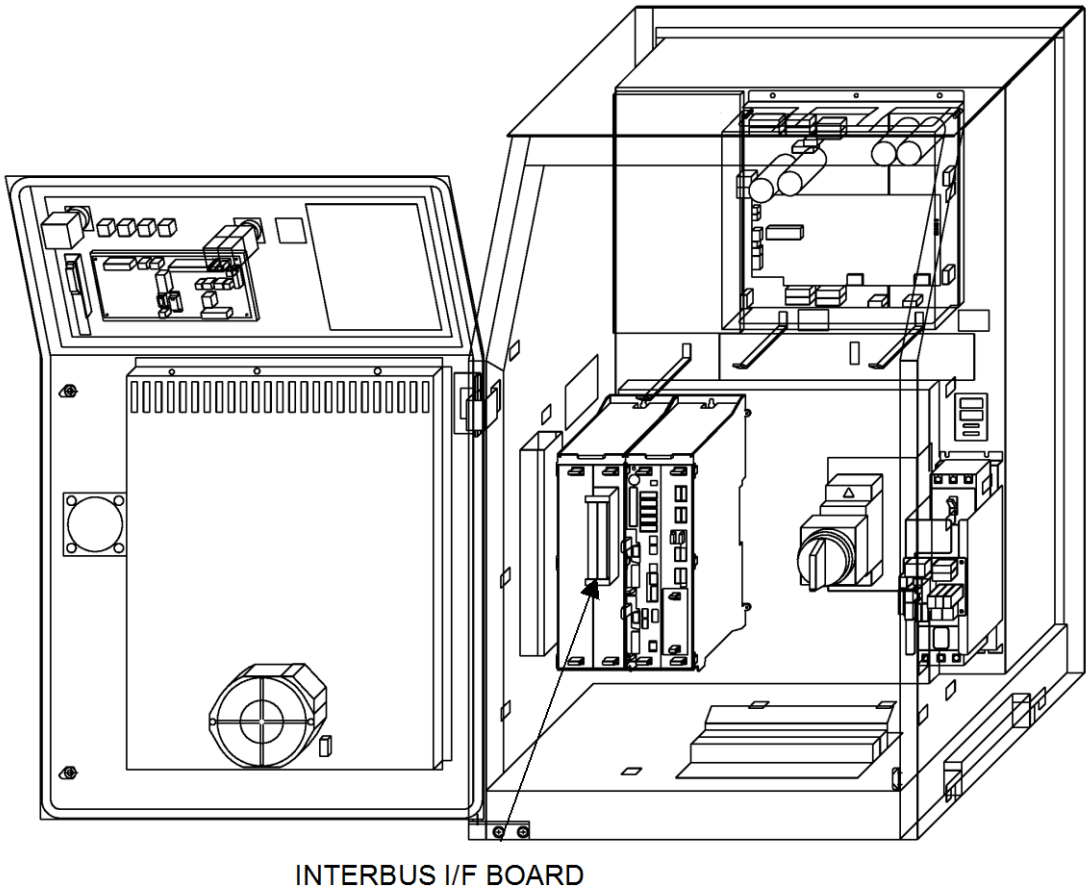


Fig 4.6 Installing the PCI motherboard to the robot controller

4.7 ORDERING INFORMATIONS

Table 4.7 (a) FANUC hardware ordering information

Hardware	Ordering specification	Part number (FANUC)
PCI Motherboard (R-30iA)	A05B-2500-J060	A16B-2203-0980
PCI Motherboard (R-30iB, R-30iB Plus)	A05B-2600-J060	A16B-2204-0220

Table 4.7 (b) Phoenix Contact hardware ordering information

Hardware	Order No. (1)(2)	Part number (FANUC)
System coupler optical	27 30 18 7 -09	IBS-PCI-SC/RI-LK
System coupler copper	27 30 08 0 -07	IBS-PCI-SC/RI/I-T
RS-232 cable	27 30 61 1	PRG-CAB-MINI-DIN

(1) The ordering no. of the system coupler has two additional digits after hyphen. The two digits specify the hardware and firmware version, which is required for operation at the robot.

(2) The two digits after hyphen are those for January, 2004 (for firmware version 4.6X). Therefore, the two digits might have changed since this manual is created.

Please contact Phoenix Contact for the latest information.

Table 4.7 (c) Phoenix Contact hardware ordering information according to hard- and firmware version

Hardware	Order No. (1)(2)	xy	Hardware version	Firmware version
System coupler optical	27 30 18 7 -xy	09	21	4.63
System coupler copper	27 30 08 0 -xy	07	21	4.63

NOTE
Please confirm the firmware version of the system coupler before ordering.
The firmware of the supported version must be installed in the system coupler.
Refer to 2.1 for the supported firmware version.
If the firmware version is old, refer to 11.2.2 for how to update the firmware and how to confirm the hardware and firmware version. Please make sure that the firmware version is supported by the hardware version before updating the firmware.

4.8 REPRESENTATION OF SYSTEM COUPLER BOARD IN INTERBUS

4.8.1 Representation of Slave Board at the Higher Master

To communicate with higher master, robot uses slave board of the system coupler. The slave board is represented as two devices at the higer master. The first device has ID code = 12 (Ch) without any process data. For the second device, ID code and process data length are variable. Refer to “5.2.2 Slave setup screen” for these setting.

NOTE
The icon for the FANUC robot is available in icon collection “Phoenix.ICL” as icon no. 750. This icon fits for the second device of the system coupler.

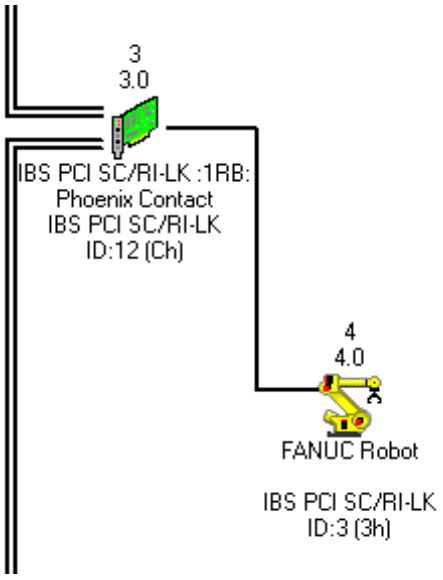


Fig 4.8.1 Slave board is represented as 2 devices

4.8.2 Representation of Optical Master Board (IBS PCI SC/RI-LK)

On the master board of optical fiber interface (IBS PCI SC/RI-LK), a slave device is integrated as a media converter to get the OPC functionality for the master board. The slave device is represented as the first slave module that has ID code = 8 (8h) and no process data.

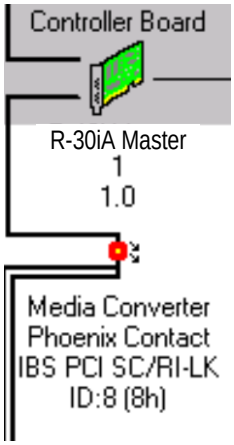


Fig 4.8.2 Optical master has an integrated slave device.

5 SETUP IN TP MODE

5.1 TP MODE SETUP SCREENS

The following figure shows a tree diagram of the sub screens that belong to the InterBus setup in TP mode. The operator can switch between the screens in a column of the [Other] function key menu. The operator can move to and from the branched screen.

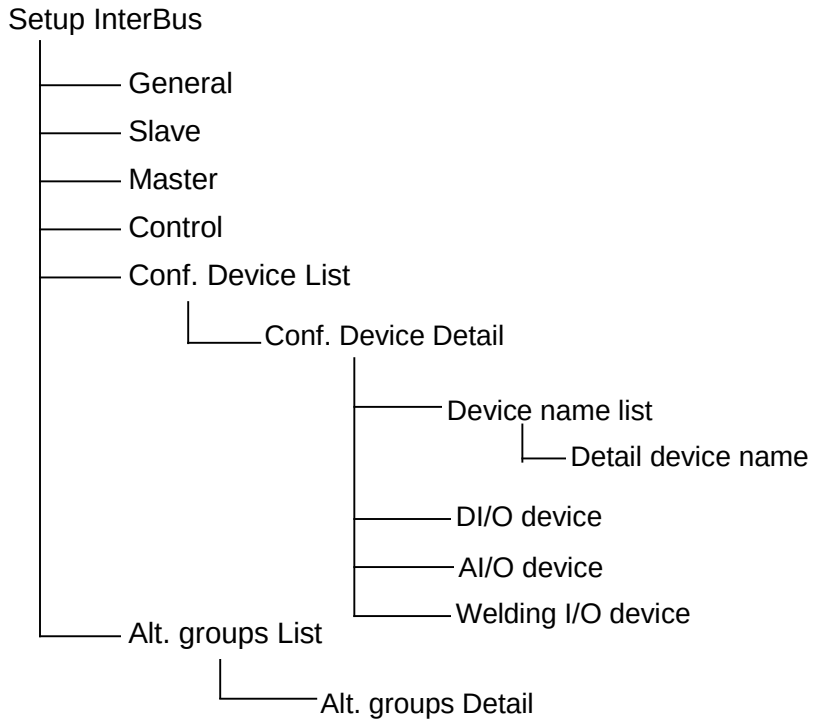


Fig 5.1 Tree diagram of the sub screens under SETUP InterBus

The following sections describe the setting items of each setting screen. When settings are changed, the new values will be held by the controller but will not be enabled until power off/on or "Execute Parameterization" (refer to 5.2.4 for more details) are performed. In such cases, an alarm message will be displayed at the top of the screen to inform the operator on how to enable the changes. Please follow the procedure for activating changes.

5.2 SUB MENU UNDER SETUP INTERBUS

The first level of the tree diagram consists of six main InterBus setup screens. To switch between these screens, press F3 [Other] and select one of the screens from the pop-up menu.

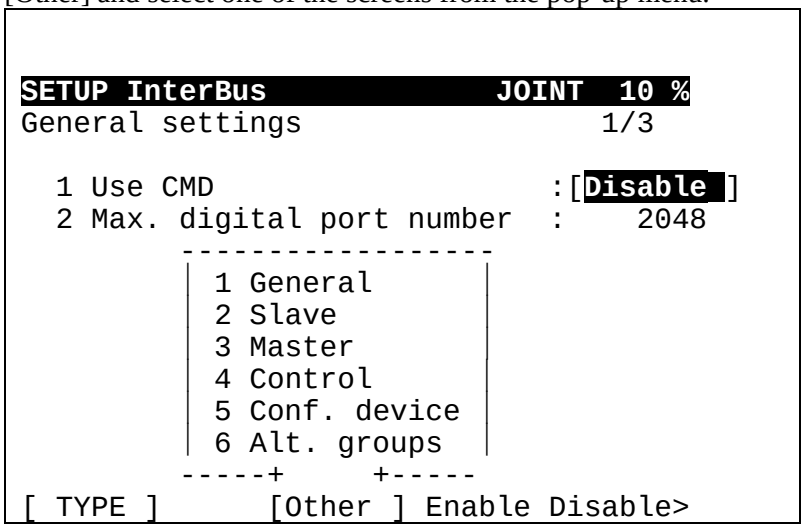


Fig 5.2 Sub menu under SETUP InterBus

Table 5.2 Submenus under setup InterBus

#	Menu item	Description	Refer to
1	General	General settings	5.2.1
2	Slave	Slave settings	5.2.2
3	Master	Master settings	5.2.3
4	Control	Master Control	5.2.4
5	Conf. devices	List of configured devices	5.2.5
6	Alt. groups	Connection of alternative groups	5.2.10, 7.2

5.2.1 General Setup Screen

In the general setup screen, the TP mode and CMD mode can be selected by choosing the setting “Use CMD”. A verification in the prompt line will appear, which must be confirmed to activate the change. Refer to 5.2.1.1 for more details.
On the next screen of the function key menu, the function key “LOAD_SV” can be found. Pressing the “LOAD_SV“ key results in loading the InterBus configuration data from the backup file (IBPXC.SV).

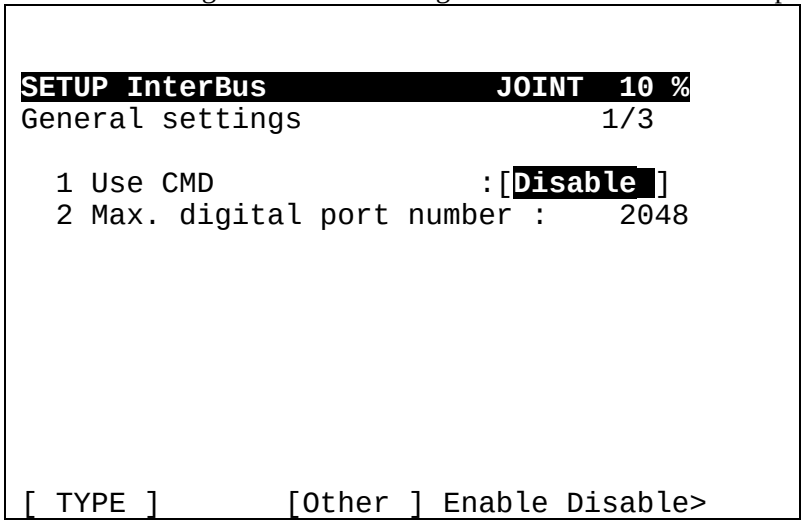


Fig 5.2.1 (a) General settings

Table 5.2.1 (a) General settings

#	TP word	Adjustable values (1)	Description
1 (a)	Use CMD	Disable Enable	The parameterization of the system coupler can only be done via the TP at the robot controller. The parameterization of the system coupler can only be done via CMD. Refer to chapter 6. Setup in CMD Mode After a change, a prompt message will be displayed, which has to be confirmed before the setting will be activated (refer to 5.2.1.1)
2	Max. digital port number	None	Maximal number of digital ports (Read Only)

(1) The respective upper entry in column ”Adjustable values“ shows the default setting.
(a) Power off/on is required to enable the change of this setting.

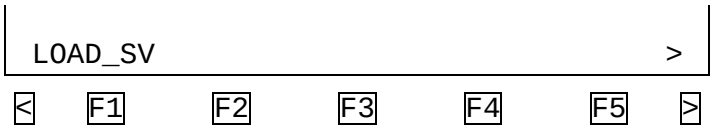


Fig 5.2.1 (b) Function keys “General settings”

Table 5.2.1 (b) Functions keys “General settings”

Function key	Words	Description of function keys
Next	>	
F1	LOAD_SV	Loading of system file (IBPXC.SV) *Load IBPXC.SV from selected device ?*
Next	>	

5.2.1.1 Changing the setting “Use CMD” from DISABLE to ENABLE

The following messages will be displayed in a separate window after the setting has been changed from Disabled to Enabled:

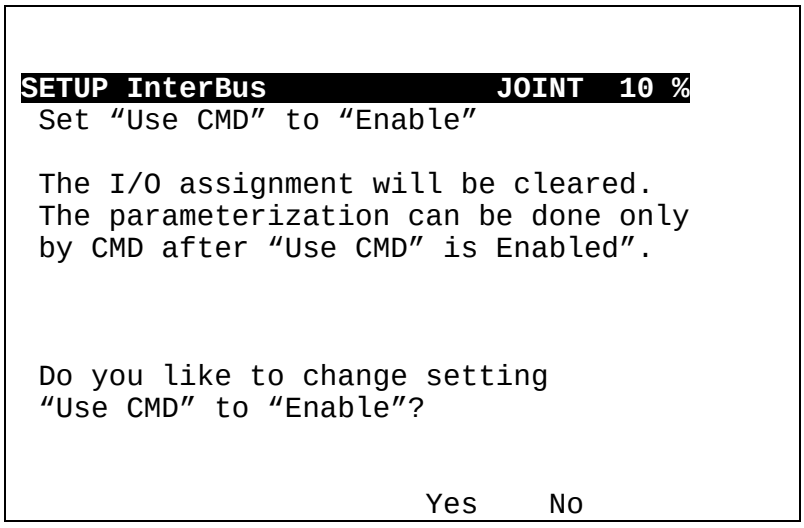


Fig 5.2.1.1 (a) Changing the setting: Use CMD (1)

A second confirmation message will be displayed in the TP prompt line:

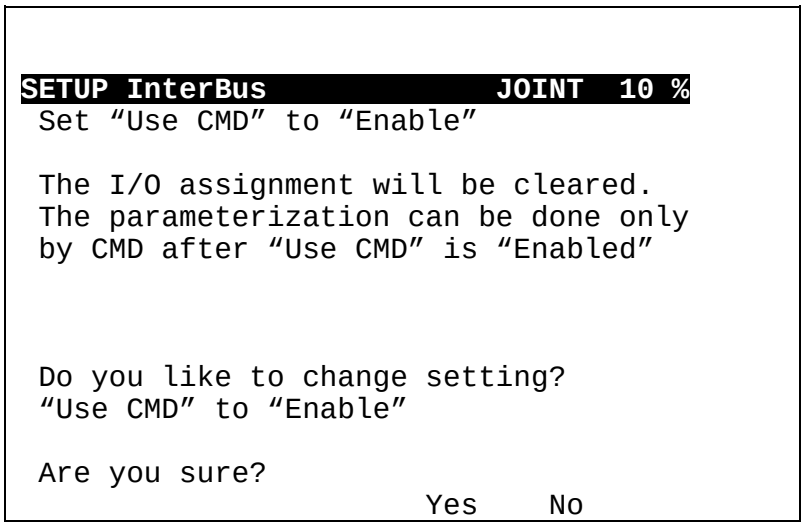


Fig 5.2.1.1 (b) Changing the setting: Use CMD (3)

Refer also to 6.2.1 “CMD: General setting screen”

5.2.2 Slave Setup Screen

On this screen, parameters of the system coupler's slave part can be modified.

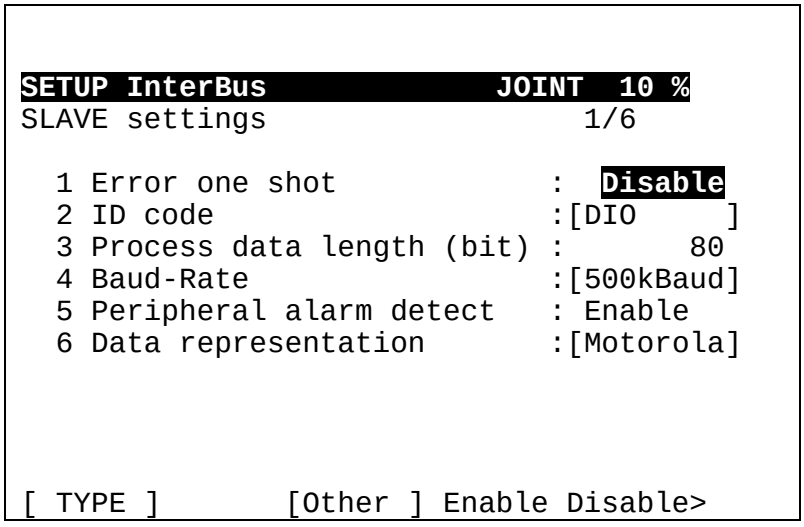


Fig 5.2.2 (a) SLAVE settings

Table 5.2.2 (a) SLAVE settings

#	TP Words	Adjustable values (1)	Description
1	Error one shot	Disable Enable	If this setting is enabled, the error message “IB-S-452 Slave no data exchange” will only be displayed once. It will be automatically set to Disable, when the communication from the higher master starts.
2 (b)	ID code	DIO PCP/1W PCP/2W PCP/4W	ID-Code 3 (0x03): DIO ID-Code 235 (0xEB): DIO + 1 word PCP ID-Code 232 (0xE8): DIO + 2 words PCP ID-Code 233 (0xE9): DIO + 4 words PCP
3 (b)	Process data length (bit)	80 0 – 256	Refer to table 5.6
4 (c)	Baud-Rate	500KBaud 2MBaud	Baud-Rate is set to 500Kbaud Baud-Rate is set to 2Mbaud
5 (b)	Peripheral alarm detect	Enable Disable	To enable or disable the peripheral alarm to the higher master when the robot controller is off.
6 (a)	Data representation	Motorola Intel	Representation in data word: HB/LB Representation in data word: LB/HB (HB: Higher Byte, LB: Lower Byte) Refer to 5.4.5 for more details.

(1) The respective upper entry in column ”Adjustable values“ shows the default setting.
  (a) Power off/on is required to enable the change of this setting.
  (b) Power off/on or “Execute Parameterization” is required to enable the change of this setting.
  (c) The external power of the system coupler's slave part must be disconnected and power off/on is required to enable the change of the Baud-Rate.

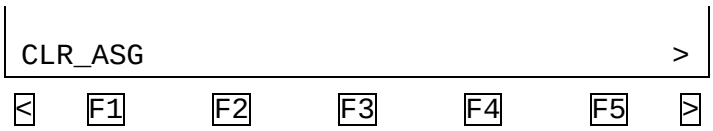


Fig 5.2.2 (b) Function keys ”SLAVE settings“

Table 5.2.2 (b) Function keys ”SLAVE settings“

Function key	Words	Description of function keys
F1	CLR_ASG	Clear I/O assignments *Clear ALL I/O assignments?*
Next	>	

“X” in the table 5.2.2(c) shows whether the combination of the ID code and the process data length is possible.

Table 5.2.2 (c) Possible combination of ID code and process data length

ID code	Process Data Length(in Words)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16
3 (DIO)		X	X	X	X	X	X	X	X	X	X		X		X	X
235(PCP/1W)	X	X	X	X	X	X	X	X	X	X		X		X		
232(PCP/2W)	X	X	X	X	X	X	X	X	X		X		X		X	
233(PCP/4W)	X	X	X	X	X	X	X		X		X		X			

5.2.3 Master Setup Screen

On this screen, the parameters of the system coupler's master part can be modified.

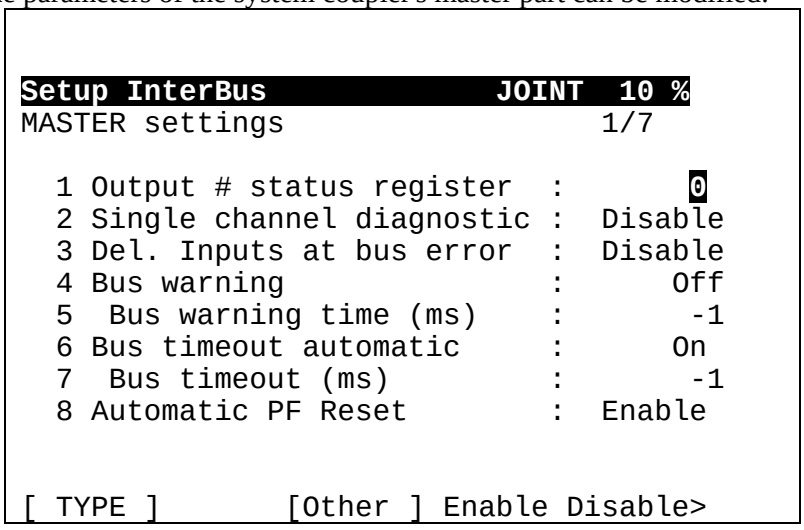


Fig 5.2.3 (a) MASTER settings

Table 5.2.3 (a) MASTER settings

#	TP Words	Adjustable values (1)	Description
1 (a)	Output # status register	0 0 - 2033	Set the signal number of the digital output to 1-2033, where the diagnostic status register of MASTER is copied when the slave part is running. Consecutive 16 bits are occupied for this purpose. Set 0 to disable this function. It is recommended to set these 16 points within the I/O of rack 94 and slot 1.
2 (b)	Single channel diagnostic	 Disable Enable	Single channel diagnosis (Var ID A255h) Disable single channel diagnosis (AF10h) Enable single channel diagnosis (047Ch)
3 (b)	Del. Inputs at bus error	 Enable Disable	Deleting inputs at bus error. (Var ID 2204h) Inputs are cleared at bus error. Inputs are held at bus error.
4 (b)	Bus warning	Off On	Enable / Disable the settings of a “Bus warning time” (Var ID 2212h)
5 (b)	Bus warning time (ms)	 -1 180 0 - 4294967	Bus warning time (Var ID 2212h) -1 will be displayed when the Bus warning is set to Off. 180 will be displayed as default setting when the Bus warning is set to On.
6 (b)	Bus timeout automatic	On Off	Enable / Disable “Bus timeout automatic” (Var ID 2211h)

#	TP Words	Adjustable values (1)	Description
7 (b)	Bus timeout (ms)	-1 200 0 - 4294967	Reaction time for “bus timeout” (Var ID 211h) -1 will be displayed when Bus timeout automatic is set to On. 200 will be displayed as default setting when Bus timeout automatic is set to Off.
8 (a)	Automatic PF Reset	Enable Disable	Enables / disables the automatic reset function of peripheral alarms. Set to enable if the robot should reset peripheral faults automatically. Set to disable if peripheral faults should be reset by pressing the reset button by the operator.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
  (a) Power off/on is required to enable the change of this setting.
  (b) Power off/on or “Execute Parameterization” is required to enable the change of this setting.

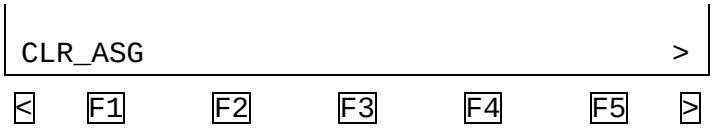


Fig 5.2.3 (b) Function keys “MASTER settings“

Table 5.2.3 (b) Function keys “MASTER settings“

Function key	Words	Description of function keys
F1	CLR_ASG	Clearing of I/O assignment *Clear ALL I/O assignments?*
Next	>	

5.2.4 Control Setup Screen

This screen is used to manage and monitor the InterBus status of the system coupler's master part. Move the cursor to one of the commands (item 1-4 and 9) and press “Enter” to execute the command. A corresponding firmware service is requested for the system coupler.
“Parameterization Execute” is a very important command as this command parameterizes the system coupler's master part based on the latest configuration and parameters held in the robot controller.

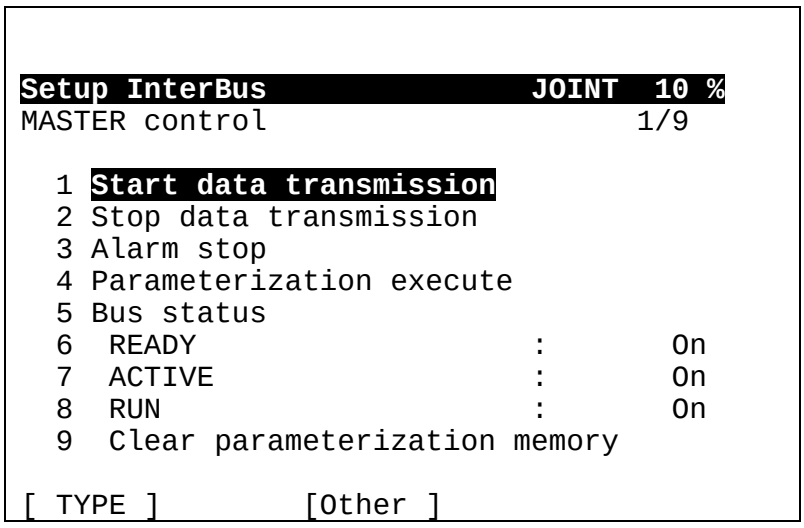


Fig 5.2.4 MASTER Control

Table 5.2.4 MASTER control

#	TP Words	Description
1	Start data transmission	Starts data transmission when the button ENTER is pressed *Start data transfer?*
2	Stop data transmission	Stops data transmission when the button ENTER is pressed *Stop data transfer?*
3	Alarm Stop	Alarm stop when the button ENTER is pressed *Stop data transfer?*
4	Parameterization execute	Executes parameterization when the button ENTER is pressed *Execute Parameterization?*
5	Bus status	
6	READY	System coupler is ready to operate Diagnostic status register bit 7
7	ACTIVE	InterBus configuration is active Diagnostic status register bit 6
8	RUN	Data transmission is running Diagnostic status register bit 5
9	Clear parameterization memory	Clears (formats) the parameterization memory. *Clear Parameterization memory?*

5.2.5 Configured Device List Setup Screen

This screen shows the list of configured devices with the respective segment number, position number, ID-code and device name. To view the configuration of each device, move the cursor to the line of the respective devices and press the “detail” function key.
By pressing the “SET CFG” function key, parameterization will be executed. It has the same function as “Parameterization Execute” in the Master Control setup screen.
By pressing the “READ IN” function key, the current network configuration will be automatically created and loaded to the robot. It is useful for default configurations and subsequent user modifications. This operation will overwrite the current setting of configured devices and the I/O assignment of each device.

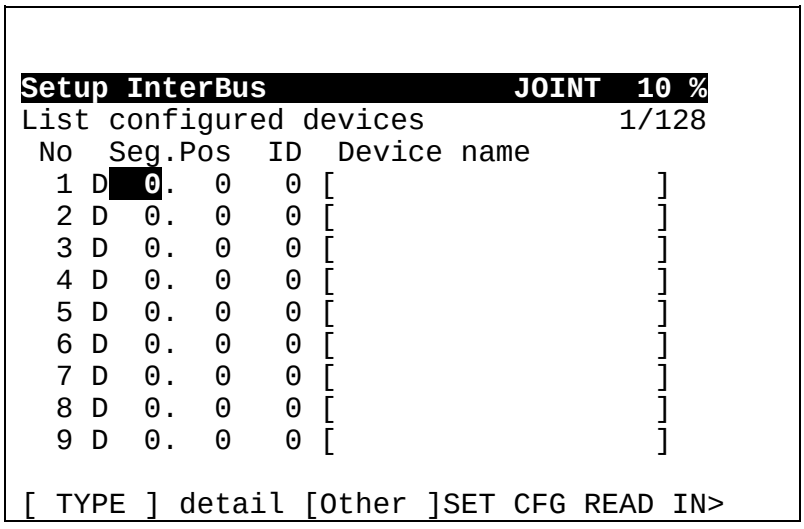


Fig 5.2.5 (a) List configured devices

Table 5.2.5 (a) List configured devices

Column	Adjustable values (1)	Description
No	1 – 128	Device number (used as slot number for I/O assignment)
	D E	D displays that this device is not enabled E displays that this device is enabled
SEG (b)	0 1 – 255	Segment number
POS (b)	0 1 – 63	Position number
ID (b)	0 1 – 255	ID-Code
Device name	Empty Alpha-Num	Device name with max. 24 characters (only 21 characters are displayed)

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
(b) Power off/on or “Execute Parameterization”is required to enable the change of this setting.

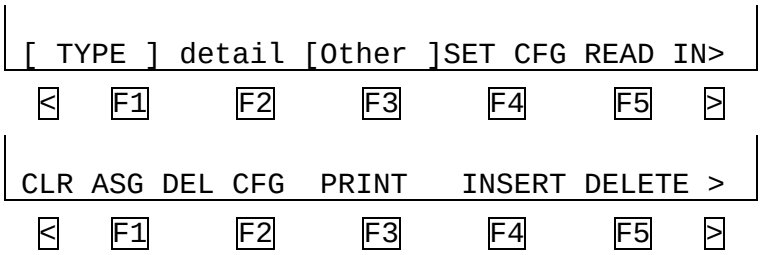


Fig 5.2.5 (b) Function keys “List configured devices“

Table 5.2.5 (b) Function keys “List configured device“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	detail	Detailed information of the configured devices
F3	[Other]	
F4	SET_CFG	Actual configuration will be transferred to the system coupler according to the setting and parameters held in the robot *Execute Parameterization?*
F5	READ_IN	Reads in the network configuration *Read in?*
Next	>	
F1	CLR_ASG	Deletes the I/O assignment *Clear ALL I/O assignments?*
F2	DEL_CFG	Clears the list of configured devices *Delete configuration?*
F3	PRINT	Prints out the configured devices as IB_CONF.TXT in form of a table according to the selected device (MC:, FLPY:). *Print configuration List?*
F4	INSERT	Inserts a new device previous to a selected device. Last device of the list will be deleted if the last configured device has the device number 128 (max.) *Insert new device?* Delete last device? *(When some entries are set for last device)*
F5	DELETE	Deletes the selected device *Delete device?*
Next	>	

5.2.6 Configured Device Detail Setup Screen

On this screen, the configuration of each device can be modified. There are three sub-screens for the process data of the device which is mapped to the I/O of the robot controller. To move the sub-screens for the I/O, move the cursor to <DETAIL> and press the Enter key.

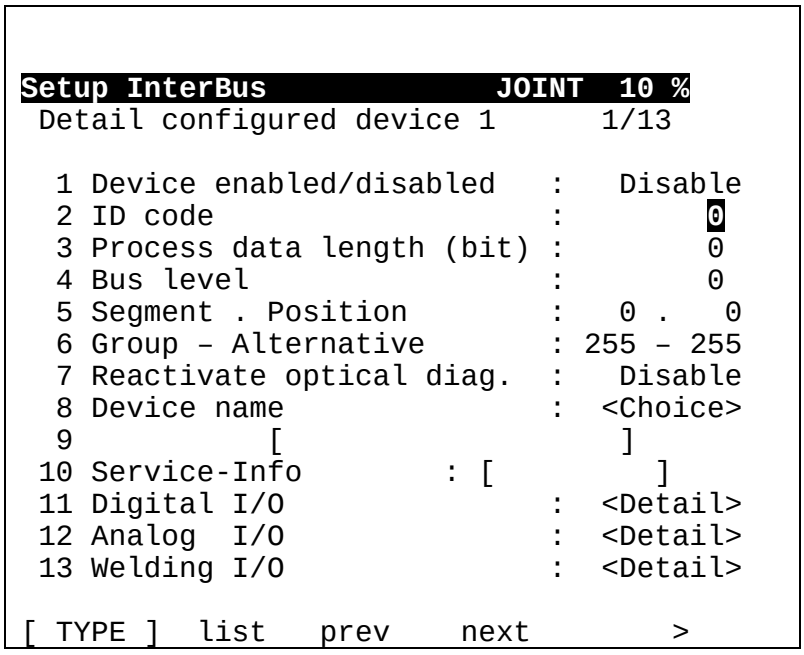


Fig 5.2.6 (a) Detail configured device

Table 5.2.6 (a) Detail configured device

#	TP Words	Adjustable values (1)	Description
1	Device Enable / Disable	None	Shows whether the device is enabled or disabled in the actual configuration frame
2 (b)	ID-Code	0 0 – 255	Ident-Code (decimal value)
3 (b)	Process data length (bit)	0 0 – 512	Length of process data in bit
4 (b)	Bus level	0 0 – 16	Number of bus level
5 (b)	Position	0 1 – 255	Position number
(b)	Segment	0 0 – 63	Segment number
6 (2) (b)	Group	255 1 – 255	Group number (no group = 255)
(2) (b)	Alternative	255 1 – 255	Alternative number (no alternative = 255)
7 (b)	Reactivate optical diag.	Disable Enable	Enables/Disables the reactivation of optical diagnostic to this device
8	Device name	<Choice>	To select a predefined device name, service information and I/O assignments, please refer to 5.2.7
9	[ ]	Empty String[24]	Device name

#	TP Words	Adjustable values (1)	Description
10 (b)	Service-Info	Empty String[12]	Service-Info When the device name is selected from the device name list, Service-Info will be displayed.
11	Digital I/O	<Detail>	Go to the next screen for setting assignments of the digital I/Os; press Enter; refer to 5.2.9.1 for more details.
12	Analog I/O	<Detail>	Go to the next screen for setting assignments and general settings of analog I/Os, press Enter; refer to 5.2.9.2 for more details.
13	Welding I/O	<Detail>	Go to the next screen to set assignments of welding I/Os, press Enter; refer to 5.2.9.3 for more details.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
(2) Change of group numbers and alternative numbers is applied to all devices in the same segment.
(b) Power off/on or “Execute Parameterization” is required to enable the change of this setting.

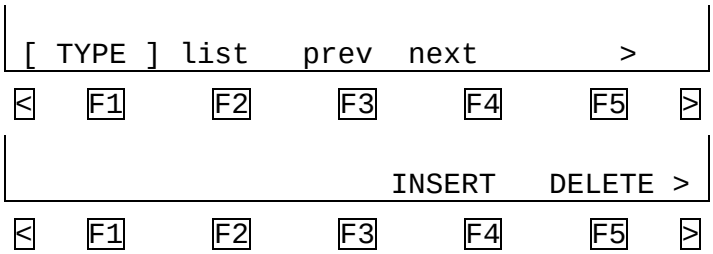


Fig 5.2.6 (b) Function keys “Detail configured device“

Table 5.2.6 (b) Function keys “Detail configured device“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Back to list
F3	prev	Goes to the previous device
F4	next	Goes to the next device
Next	>	
F4	INSERT	Inserts a new device previous to a selected device. Last device of the list will be deleted. *Insert new device?* *Delete last device? (When some entries is set for last device)*
F5	DELETE	Deletes the selected device New device will be added at the end of the list. *Delete device?*
Next	>	

5.2.7 Device Name List Screen

This screen can be called from the <Choice> in “Configured Device Detail” setup screen. The device, from which this screen is called, is the selected device.
This screen is useful to save time during the installation, when a couple of robots should get the same device name, Service-Info and I/O assignment, especially when the end customer defines a standard.
For example: The digital inputs and outputs for “Gripper 1” should be set to DI[129-144] and DO[129-144], equally as if the device was located in the network (different device numbers).
In total, 48 predefined settings are available.
With the function key “Detail”, a detail screen will be displayed on which it is possible to enter the device name, Service-Info and the start number for DI/DO, AI/AO, WI/WO, WSTK IN/OUT (refer to 5.2.8)
By choosing “Select”, the settings will be applied to the selected device (from where this screen was called).
The complete list can be loaded or saved with the function keys “LOAD” and “SAVE”, for transferring the list from one controller to another.

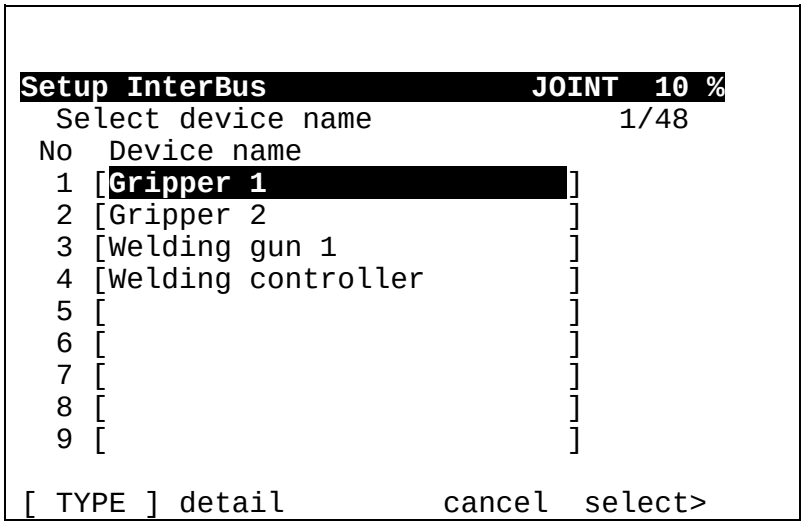


Fig 5.2.7 (a) Select device names (with example entries)

Table 5.2.7 (a) Select device name

Column	Adjustable values (1)	Description
No		
Device name	None	Predefined device name

(1) The respective upper entry in column “Adjustable values“ shows the default setting.

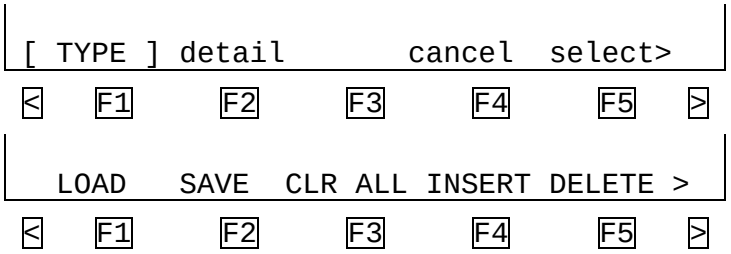


Fig 5.2.7 (b) Function keys “Select device name“

Table 5.2.7 (b) Function keys "Select device name"

Function key	Words	Description of function keys
F2	detail	Goes to the screen 5.2.8 "Detail device name"
F4	cancel	Goes back to the screen "Detail configured device"
F5	select	Sets the presetting text for the device name and Service-Info and the I/O assignment to/of the selected device and returns to the screen "Detail configured device"
Next	>	
F1	LOAD	Loads a text file with the device name from the selected port *Load list with device name?*
F2	SAVE	Saves a text file with the device name from the selected port *Save list with device names?*
F3	CLR_ALL	Clears all entries in the list *Clear all list entries?*
F4	INSERT	Inserts a new entry previous to the selected one. The last entry in the list will be deleted. *Insert new entry?* *Delete last entry?* (If a value is set for last entry)
F5	DELETE	Deletes the selected entry. A new entry will be created at the end of the list *Delete selected entry ?*
Next	>	

5.2.8 Device Name Detail Screen

This screen will display the predefined settings. Also the entries can be set or changed.

```
Setup InterBus                    JOINT  10 %
   Detail device name 1                1/10

  1 Device name                    :
        [                                 ]
  2 Service-Info          : [             ]
  3 DI start number                :      0
  4 DO start number                :      0
  5 AI start number                :      0
  6 AO start number                :      0
  7 WI start number                :      0
  8 WO start number                :      0
  9 WSTK I start number            :      0
 10 WSTK O start number            :      0

[ TYPE ]  list   prev    next            >
```

Fig 5.2.8 (a) Detail device name

Table 5.2.8 (a) Detail device name

#	TP Words	Adjustable values (1)	Description
1	Device name	Empty String[24]	Device name with max. 24 characters
2	Service-Info	Empty String[12]	Service Info, the same as used in CMD
3	DI start number	0 0 - 2048	Predefines start number for digital inputs of this device
5	DO start number	0 0 - 2048	Predefines start number of digital outputs for the selected device
7	AI start number	0 0 - 2048	Predefines start number of analog inputs for the selected device
9	AO start number	0 0 - 2048	Predefines start number of analog outputs for the selected device
11	WI start number	0 0 - 2048	Predefines start number of welding inputs for the selected device
12	WO start number	0 0 - 2048	Predefines start number of welding outputs for the selected device
13	WSTK I start number	0 0 - 2048	Predefines start number of WSTK inputs for the selected device
14	WSTK O start number	0 0 - 2048	Predefines start number of WSTK outputs for the selected device

(1) The respective upper entry in column “Adjustable values“ shows the default setting.

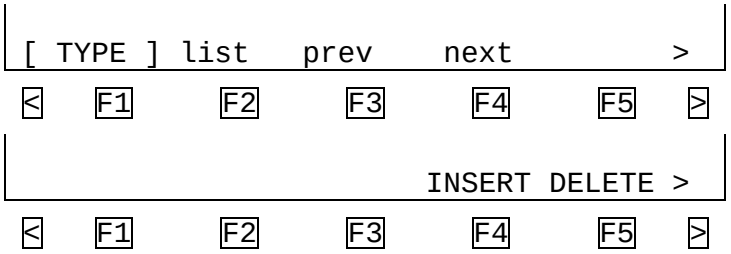


Fig 5.2.8 (b) Function keys “Detail device name“

Table 5.2.8 (b) Function keys “Detail device name“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	
F3	prev	Goes to the previous entry
F4	next	Goes to the next entry
Next	>	
F4	INSERT	Inserts a new entry previous to the selected one. The last entry in the list will be deleted. *Insert new entry?* *Delete last entry?* (If a value is set for last entry)
F5	DELETE	Deletes the selected entry. A new entry will be created at the end of the list *Delete selected entry?*
Next	>	

5.2.9 Sub Menu for Digital, Analog and Welding I/O

With the function key F5 [Other], it can be switched between three different screens: “Digital I/O”, “Analog I/O” and “Welding I/O”

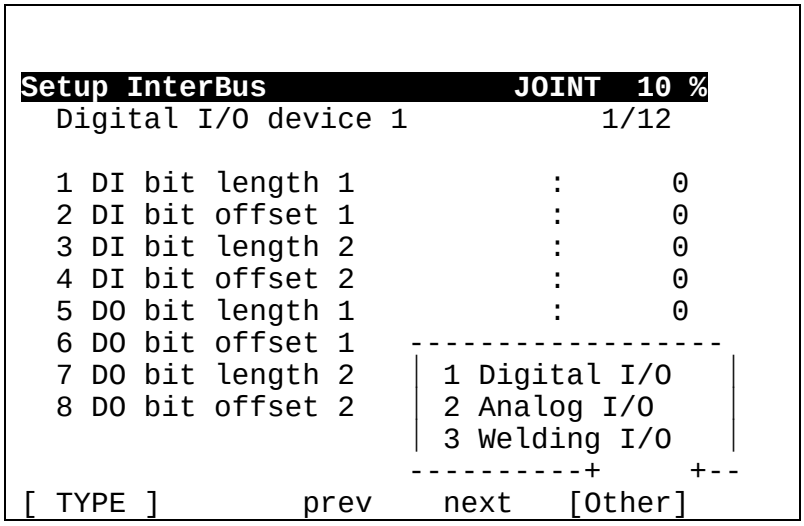


Fig 5.2.9 Sub menu “I/O settings device“

This submenu leads directly to another setup screen of this device.

Table 5.2.9 Sub menu “I/O settings device“

#	Menu item	Description	Chapter
1	Digital I/O	Setup of digital I/O to this device	5.2.9.1
2	Analog I/O	Setup of analog I/O to this device	5.2.9.2
3	Welding I/O	Setup of welding I/O to this device	5.2.9.3

5.2.9.1 Digital I/O device screen

On this screen, the bit length of the robot's digital I/O, which is mapped to the process data of the device, can be modified. Also the bit offset, which corresponds to the mapping from the lowest bit of the process data, can be specified.
The duplication of mappings is not allowed. Refer to 5.4.2 for more details.
Press PREV key to return to the “Configured Device Detail” screen.

Note: The I/O assignment is not made in this screen. To assign the logical I/O of robot controller to the physical I/O of each device, it is necessary to make the settings under “MENU -> IO -> F1 [TYPE] -> Digital -> F2 CONFIG”.

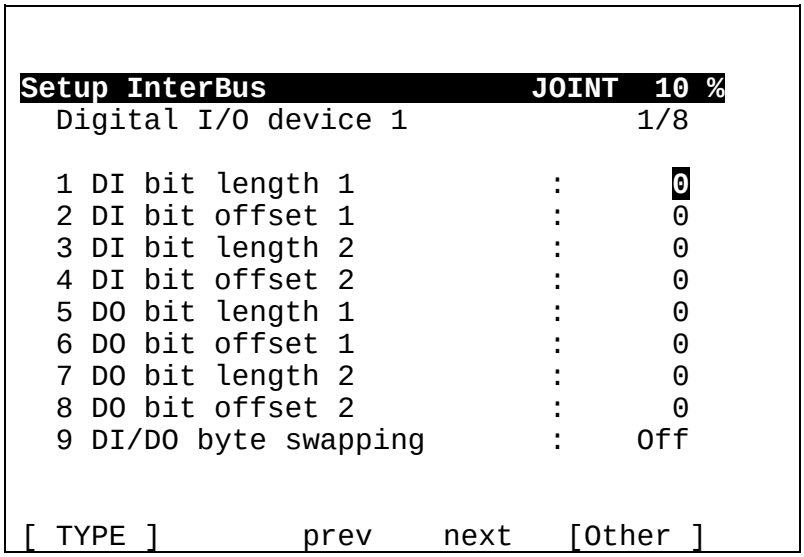


Fig 5.2.9.1 (a) Digital I/O device

Table 5.2.9.1 (a) Digital I/O device

#	TP Words	Adjustable values (1)	Description
1 (a)	DI Bit Length 1	0 max. PD length	The number of bits for the input assignment of this device
2 (a)	DI Bit Offset 1	0 max. offset	The number of offset bits for this device
3 (a)	DI Bit Length 2	0 max. PD length	The number of bits for the input assignment of this device
4 (a)	DI Bit Offset 2	0 max. offset	The number of offset bits for this device
5 (a)	DO Bit length 1	0 max. PD length	The number of bits for the output assignment of this device
6 (a)	DO Bit Offset 1	0 max. offset	The number of offset bits for this device
7 (a)	DO Bit length 2	0 max. PD length	The number of bits for the output assignment of this device
8 (a)	DO Bit Offset 2	0 max. offset	The number of offset bits for this device
9 (a)	DI/DO Byte swapping	Off On	This setting is only for the device whose process data size is a multiple of 2 bytes. If the setting is set to On and the bit length and bit offset are multiples of 16, the location of the bytes in the device is swapped. Otherwise the setting is not utilized.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
For “max. PD length” and “max. offset” please refer to 5.4.2
(a) Power off/on is required to enable the change of this setting.

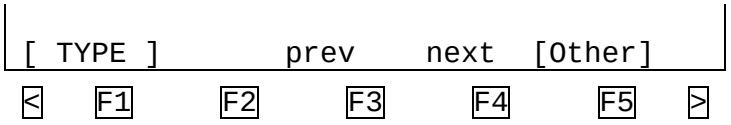


Fig 5.2.9.1 (b) Function keys “Digital I/O device“

Table 5.2.9.1 (b) Function keys "Digital I/O device"

Function key	Words	Description of function keys
F1	[TYPE]	
F3	prev	Goes to the previous device
F4	next	Goes to the next device
F5	[Other]	Goes to the submenu: - Digital I/O device (refer to 5.2.9.1) - Analog I/O device (refer to 5.2.9.2) - Welding I/O device (refer to 5.2.9.3) See also Figure 5.20

5.2.9.2 Analog I/O device screen

On this screen, the bit length of analog I/O of the robot controller, which is mapped to the process data of the device, can be modified. Also the bit offset, which corresponds to the mapping from the lowest bit of the process data, can be specified. And a setting of the valid bits can be made.
The duplication of mapping is not allowed. Please refer to 5.4.2 for details. Press the PREV key to return to the configured device detail screen.

Note: The I/O assignment is not made in this screen. To assign the logical I/O of robot controller to the physical I/O of each device, it is necessary to make the settings under "MENU -> IO -> F1 [TYPE] -> Analog -> F2 CONFIG".

```
Setup InterBus                  JOINT  10 %
  Analog I/O device 1                1/15

  1 AI bit length 1             :      0
  2 AI bit offset 1             :      0
  3 AI bit length 2             :      0
  4 AI bit offset 2             :      0
  5 AI right shift count        :      0
  6 AI valid bits               :     16
  7 AI unit word                :    On
  8 AO bit length 1             :      0
  9 AO bit offset 1             :      0
 10 AO bit length 2             :      0
 11 AO bit offset 2             :      0
 12 AO left shift count         :      0
 13 AO valid bits               :     16
 14 AO unit word                :    On
 15 AI/AO bit order reverse     :    Off

[ TYPE ]          prev    next  [Other]
```

Fig 5.2.9.2 (a) Analog I/O device

Table 5.2.9.2 (a) Analog I/O device

#	TP Words	Adjustable values (1)	Description
1 (a)	AI bit length 1	0 max. PD length	The number of bits for the input assignment of this device
2 (a)	AI bit offset 1	0 max. offset	The number of offset bits for this device
3 (a)	AI bit length 2	0 max. PD length	The number of bits for the input assignment of this device
4 (a)	AI bit offset 2	0 max. offset	The number of offset bits for this device
5 (a)	AI right shift count	0 1 – 16	The number of bits for the right shift count
6 (a)	AI valid bits	16 1 – 16	The number of valid bits
7 (a)	AI unit word	On Off	1 analog channel is assigned to 16bits of the process data 1 analog channel is assigned to 8bits of the process data
8 (a)	AO bit length 1	0 max. PD length	The number of bits for the output assignment of this device
9 (a)	AO bit offset 1	0 max. offset	The number of offset bits for this device
10 (a)	AO bit length 2	0 max. PD length	The number of bits for the output assignment of this device
11 (a)	AO bit offset 2	0 max. offset	The number of offset bits for this device
12 (a)	AO left shift count	0 1 – 16	The number of bits for the left shift count
13 (a)	AO valid bits	16 1 – 16	The number of valid bits
14 (a)	AO unit word	On Off	1 analog channel is assigned to 16bits of the process data 1 analog channel is assigned to 8bits of the process process data
15 (a)	AI/AO bit order reverse	Off On	Normal bit order Reversed bit order

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
For “max. PD length” and “max. offset” please refer to 5.4.2
(a) Power off/on is required to enable the change of this setting.

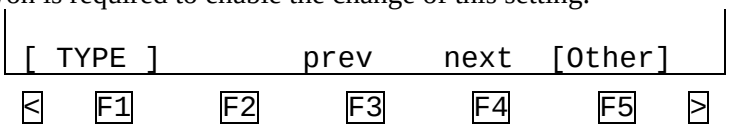


Fig 5.2.9.2 (b) Function keys “Analog I/O device“

Table 5.2.9.2 (b) Function keys “Analog I/O device“

Function key	Words	Description of function keys
F1	[TYPE]	
F3	prev	Goes to the previous device
F4	next	Goes to the next device
F5	[Other]	Goes to the submenu - Digital I/O device (refer to 5.2.9.1) - Analog I/O device (refer to 5.2.9.2) - Welding I/O device (refer to 5.2.9.3) See also Figure 5.20

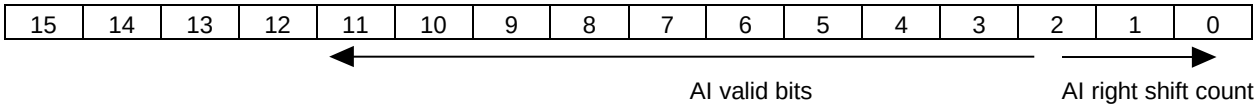
The following are the specified items for AI/AO.

AI/AO unit word:
These items specify the unit of an analog channel. If AI/AO unit word is set to ON, 16 bits of process data will be mapped to one analog channel. In this case, the length and offset must be multiples of 16. If AI/AO unit word is set to OFF, 8 bits of process data will be mapped to one analog channel. In this case, the length and offset must be multiples of 8.

AI right shift count, AI valid bits, AI/AO bit order reverse:
Sometimes a bit operation is required to take out significant parts from raw analog values according to the specification of analog devices. These three items provide the setting for the bit operation. The bit operation for AI is performed by means of the following procedure. Specific bit operations are not performed by the default setting.

1) Reads analog input data from the MPM of the system coupler.
2) Reverses the order of bits if “AI/AO bit order reverse” is on.
3) Shifts the value to the right according to “AI right shift count”.
4) Takes valid bits from the lowest bit according to “AI valid bits”.
5) Copies the value to the AI of the robot controller.

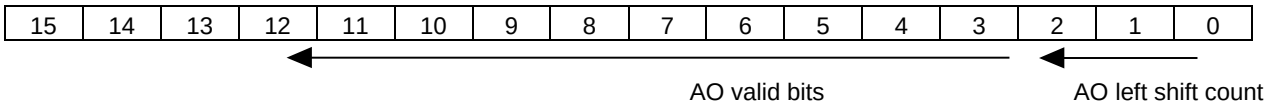
Example:
- “AI right shift count” is 3.
- “AI valid bits” is 12.
- “AI unit word” is ON.
- “AI/AO bit order reverse” is OFF.



AO left shift count, AO valid bits, AI/AO bit order reverse:
The bit operation for AO is performed by means of the following procedure. Specific bit operations are not performed by the default setting.

1) Reads analog output data from AO of the robot controller.
2) Takes valid bits from the lowest bit according to “AO valid bits”.
3) Shifts the value to the left according to “AO left shift count”.
4) Reverses the order of bits if “AI/AO bit order reverse” is on.
5) Writes the value as the analog output data to the MPM of the system coupler.

Example:
- “AO left shift count” is 3.
- “AO valid bits” is 12.
- “AO unit word” is ON.
- “AI/AO bit order reverse” is OFF.



5.2.9.3 Welding I/O device screen

On this screen, the bit length of welding I/O or WSTK I/O of the robot controller, which is mapped to the process data, can be modified. Also the bit offset, which corresponds to the mapping from the lowest bit of the process data, can be specified. The duplication of mapping is not allowed. Refer to 5.4.2 for more details. Press the PREV key to return to the configured device detail screen.

ArcTool is required to use WI/WO or WSTK IN/OUT. If the length of WI/O or WSTK IN/OUT is set, but the ArcTool is not installed, the error message “IB-S-503 Welding I/O needs ArcTool” will be posted.

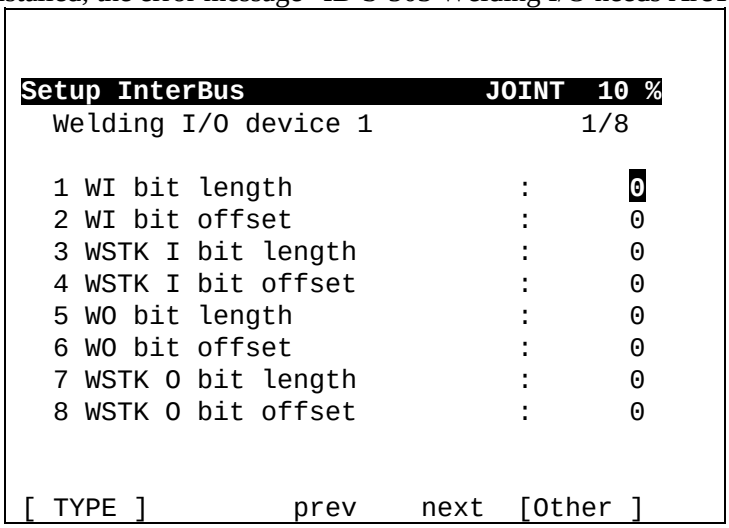


Fig 5.2.9.3 (a) Welding I/O device

Table 5.2.9.3 (a) Welding I/O device

#	TP Words	Adjustable values (1)	Description
1 (a)	WI bit length	0 max. PD length	The number of bits for the input assignment of this device
2 (a)	WI bit offset	0 max. offset	The number of offset bits for this device
3 (a)	WSTK I bit length	0 max. PD length	The number of bits for the input assignment of this device
4 (a)	WSTK I bit offset	0 max. offset	The number of offset bits for this device
5 (a)	WO bit length	0 max. PD length	The number of bits for the output assignment of this device
6 (a)	WO bit offset	0 max. offset	The number of offset bits for this device
7 (a)	WSTK O bit length	0 max. PD length	The number of bits for the output assignment of this device
8 (a)	WSTK O bit offset	0 max. offset	The number of offset bits for this device

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
For “max. PD length” and “max. offset” please refer to 5.4.2
(a) Power off/on is required to enable the change of this setting.

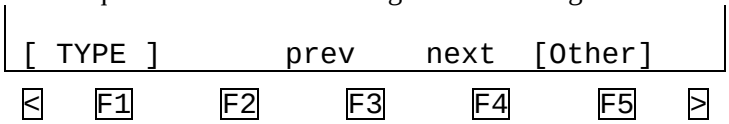


Fig 5.2.9.3 (b) Function keys “Welding I/O device“

Table 5.2.9.3 (b) Function keys "Welding I/O device"

Function key	Words	Description of function keys
F1	[TYPE]	
F3	prev	Goes to the previous device
F4	next	Goes to the next device
F5	[Other]	Sub menu to: - Digital I/O device (refer to 5.2.9.1) - Analog I/O device (refer to 5.2.9.2) - Welding I/O device (refer to 5.2.9.3) See also Figure 5.20

WSTK (Welding stick detection signal) is BIT7.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
WSTK							

5.2.10 Alternative Groups List / Detail Screen

These screens are identical for TP mode and CMD mode and are explained in the InterBus switching instructions. Please refer to section 7.2, 7.3.

5.3 SETUP OPERATIONS IN TP MODE

5.3.1 Reading in the Current Network Configuration

To save time and effort on the InterBus configuration, the robot controller can request the system coupler to create a default configuration according to the physical connection of the devices. The robot then can load the network configuration. The operator can use the configuration as a basis of his own setting.
This operation will clear the existing configuration. All I/O settings, such as bit offset etc., are set back to the default value.

Procedure Reading in the Current Network Configuration

Steps

1. Connect all slave devices to the system coupler's master part.
2. Clear all I/O assignments that will be no longer used after the "Read in" operation.
3. Press [MENU] key.
4. Select "SETUP".
5. Press F1, [TYPE].
6. Select "InterBus".
7. Go to the "Configured Device List" screen according to the tree diagram (Figure 5.1).
8. Press F4, "READ_IN" .A confirmation message at the bottom of the screen will be displayed. "Read in ?".
9. Press F4, "YES".
10. The message "Read In ended" will be displayed when the operation was successful.

When "Read in" is performed, the InterBus configuration will be automatically created and the robot controller will read out the configuration from the system coupler.

At the same time, the ID code and process data length of each device are examined. If the device has the ID code of a digital device, the process data length of the device will be automatically set to the DI/DO bit length 1. If the device has the ID code of an analog device, the process data length of the device will be automatically set to the AI/AO bit length 1.

In some devices, such as the PCP device, the I/O length will not be automatically set. For such devices it is necessary to set the I/O length on the TP screen. Refer to 5.2.9.1 and the following sections.

11. Power off/on the robot controller to start the InterBus with a new configuration.

NOTE
The configuration can be modified previous to step 11, such as alternative group. It is possible to send new settings back to the system coupler by means of “Execute Parameterization”, which is useful for error checks in new settings.
Data transfer is not possible until the power is turned off and on again.

5.3.2 Inserting or Deleting a Device to/from the Configured Device List.

Procedure 1 Inserting a device to configured device list

Steps

1. Press [MENU] key.
2. Select “SETUP”.
3. Press F1, [TYPE].
4. Select “InterBus”.
5. Go to the “Configured Device List” screen according to the tree diagram (Figure 5.1).
6. Move the cursor to the line where the new device will be inserted.
7. Press >, then press F4, “Insert”. A confirmation message will be displayed at the bottom of the screen, “Insert new device ?”.
8. Press F4, “Yes. The new configuration with the default values will be inserted into the cursor position.

Procedure 2 Deleting a device from the configured device list

Steps

1. Press [MENU] key.
2. Select “SETUP”.
3. Press F1 [TYPE].
4. Select “InterBus”.
5. Go to the “Configured Device List” screen according to the tree diagram (Figure 5.1).
6. Move the cursor to the line where the device will be deleted.
7. Press >, then press F5, “Delete”. A confirmation message will be displayed at the bottom of screen, “Delete device ?”.
8. Press F4, “Yes. The configuration of the device at the cursor line will be deleted. The following configurations will move upwards.

5.3.3 Deleting the Configuration List

This operation will delete all configurations held by the robot controller. The setting “Slave Error one shot” will be automatically disabled for safety reasons. This operation will not clear the I/O assignments. Unnecessary assignments should be cleared on the I/O screen either manually or by using the CLR_ASG key.

Procedure 1 Deleting a device from the configured device list

Steps

1. Press [MENU] key.
2. Select “SETUP”.

3. Press F1, [TYPE].
4. Select “InterBus”.
5. Go to the “Configured Device List” screen according to the tree diagram (Figure 5.1).
6. Press >, then press F2 “DEL_CFG”. A confirmation message will be displayed at the bottom of the screen, “Delete configuration ?”.
7. Press F4, “Yes”. All configurations held by the robot controller will be cleared.

5.3.4 Defining an Alternative Group

To make a device belong to an alternative group, change the group number and the alternative number on the “Configured Device” setup screen. The group number and the alternative number should be other than 255 and the alternative group should not be zero. If both the group number and the alternative number are 255, the device does not belong to any alternative groups. The group number and the alternative number of devices in the same segment are changed together.

Procedure Defining an alternative group

Steps

1. Press [MENU] key.
2. Select “SETUP”.
3. Press F1, [TYPE].
4. Select “InterBus”.
5. Go to the “Configured Device List” screen according to the tree diagram (Figure 5.1).
6. Move the cursor to the device which will be configured to belong to an alternative group.
7. Press F2, “Detail” to open the “Configured Device Detail” screen.
8. Move the cursor to the group number and enter a value other than 255.
9. Move the cursor to the alternative number and enter a value other than 0 or 255.
10. Repeat step 5-9 for all devices that belong to the alternative group.
11. Go to the “Control” screen according to the tree diagram (Figure 5.1).
12. Move the cursor to “Parameterization execute” and press enter. A confirmation message will be displayed at the bottom of the screen, “Execute Parameterization?”.
13. Press F4, “Yes” to send the new configuration to the system coupler.
14. If parameterization completes without an error, check on the “Alternative group List” setup screen whether the alternative groups are defined correctly .
    If an error occurs, check the device settings according to the reported firmware error code.

5.3.5 Executing the Parameterization of the System Coupler Based on the Latest Configuration

This procedure explains how to perform “Parameterization execute”.

Procedure Executing the parameterization

Steps

1. Press [MENU] key.
2. Select “SETUP”.
3. Press F1, [TYPE].
4. Select “InterBus”.
5. Go to the “Control” screen according to the tree diagram (Figure 5.1).
6. Move the cursor to “Parameterization execute” and press enter. A confirmation message will be displayed at the bottom of the screen, “Execute Parameterization?”.
7. Press F4, “Yes” to send the new configuration to the system coupler.
8. If the parameterization completes without an error, the new configuration is activated.

If an error occurs, check the settings according to the reported firmware error code.

NOTE
Use the status screens to confirm the parameterization of the system coupler.
The “Slave” status screen shows the current slave parameters.
The “Device Diagnostic List/Detail” status screens show the activated configuration.

5.3.6 Storing the InterBus Configuration to IBPXC.SV

Procedure Storing the InterBus configuration to IBPXC.SV

Steps

1. Press [MENU] key.
2. Select “FILE”.
3. Press F5, [UTIL].
4. Select “Set Device” and select the device.
5. Press F4, [Backup].
6. Select “System file” or “All of above”.
7. Follow the dialog on the TP screen.

NOTE
When correct storage device is selected, open one of the InterBus setup screens and press FCTN, then press 0 for NEXT and press 2 for SAVE. IBPXC. SV will be saved to the selected device, but IBBDFIL.IBA is not created.

5.4 INTERBUS I/O ASSIGNMENT IN TP MODE

5.4.1 Rack Number and Slot Number of I/O Used in TP Mode

For the identification of the I/O mapping, the rack and slot number are provided.
The I/O, mapped to the InterBus, has the following rack and slot number.

Table 5.4.1 Rack and slot number of the InterBus I/O in TP mode

Item	Value
Rack number	Master : 93 Slave : 94
Slot number	Master : The device number in the configured device list (1-128) Slave : 1

5.4.2 I/O Mapping to the Process Data Area of Each Device

TP mode uses the automatic assignment of generation 4 firmware. The robot controller reads in the assignment from the firmware. For details on the automatic assignment of generation 4 firmware, refer to IBS SYS ADDRESS, a manual provided by Phoenix Contact.

DI/DO, AI/AO (requires the analog option), WI/WO and WSTK IN/OUT (both requires ArcTool) can be used in TP mode. The I/O of the robot controller can be mapped to the whole or only a part of the process data area of each device. The mapped area is referred to as sub area of the whole process data area. The following settings define a sub area mapped to each I/O type.

Table 5.4.2 (a) Setting used to define the I/O mapping to the process data area

Item	Meaning	Value
bit offset	Offset from the first bit of process data.	0- process data size
bit length	The number of bits that are assigned to the specified I/O type.	0- process data size

Bit offset and bit length of the analog I/O must be multiples of 8 or 16 according to the setting “AI/AO Unit Word”.

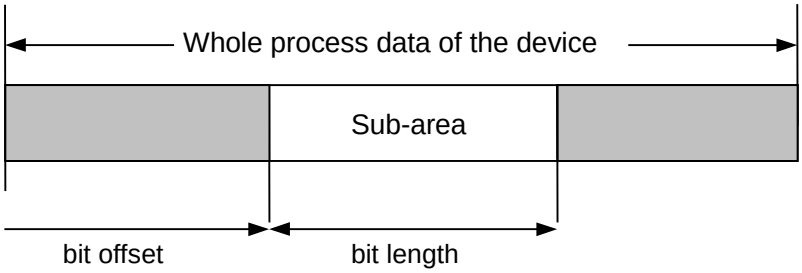


Fig 5.4.2 (a) Defining a sub-area of device for each I/O type

There are two settings for each DI/DO/AI/AO. Therefore up to two sub areas for DI/DO/AI/AO can be mapped to the process data area of a device . There is one setting for each WI/WO/WSTK(IN)/WSTK(OUT) available. Only one sub area for these I/O types can be mapped. Bit offset and bit length of each sub area can be changed independently, whereas combinations, overlapping two or more sub areas, are not allowed.

The following setting, for example, maps two DI areas and one AI area to a 4 byte (64bit) process data area(IN) of a device. The indexes of DI and AI are assumed to start on 1 in the following example.

Table 5.4.2 (b) Example of I/O area definitions

Type	bit offset	bit length
DI area 1	0	16
DI area 2	48	16
AI area 1	16	32

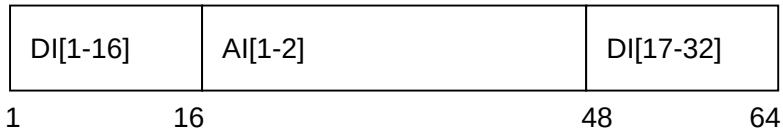


Fig 5.4.2 (b) Example of an I/O mapping to a 4 byte process data area

There are three sub areas, DI[1-16], AI[1-2] and DI[17-32] in figure 5.28. The start location in the process data area is specified by the bit offset. The size is specified by the bit length. It is not allowed for any sub area to share the same bit.

5.4.3 Mapping I/O to the Process Data of the System Coupler Slave Part

The process data of the system coupler's slave part is referred to as digital area and assigned to the digital I/O or peripheral I/O (UI/UO). The default setting tries to assign the first 18 bits of the input to UI and the first 20 bits of the output to UO. The remaining bits are assigned to DI/DO. If UI/UO needs not to be assigned to the system coupler's slave part, set $IBPX_SL.$ASG_UOP = 0 (default is 1) or $IO_AUTO_UOP = FALSE (default is TRUE).

Table 5.4.3 Assignment of the process data of the slave part in TP mode

$IBPX_SL.$ASG_UOP	Assignment of the process data
0	All process data are assigned to DI/DO
1 (default)	The first 18 bits of the input are assigned to UI, and the first 20 bits of the output are assigned to UO. The remaining bits are assigned to DI/DO.

5.4.4 Assignment to the InterBus Reference of Each Device

As default, all digital I/O data will be copied from the MPM to logical ports byte-by-byte.
If, for any reasons, a word orientated assignment for certain devices is necessary, set the "DI/DO byte swapping" for this device to ON. Refer to 5.2.9.1.

Table 5.4.4 (a) Assignment of digital inputs to the InterBus reference

FANUC	ex. DI no	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DI no	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 5.4.4(b) Assignment of digital outputs to the InterBus reference

FANUC	ex. DO no	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DO no	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

5.4.5 Assignment to the InterBus Reference of the Slave Part

The digital I/O assignment of the slave from the MPM to the logical ports can be set with "Data representation" to Motorola or Intel. Refer to 5.2.2

Table 5.4.5 (a) Assignment of digital inputs to the InterBus reference (Motorola)

FANUC	ex. DI no	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DI no	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 5.4.5 (b) Assignment of digital outputs to the InterBus reference (Motorola)

FANUC	ex. DO no	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
INTERBUS Reference	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DO no	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
INTERBUS Reference	Byte	Byte 2								Byte 3							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 5.4.5 (c) Assignment of digital inputs to the InterBus reference (Intel)

FANUC	ex. DI no	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
INTERBUS Reference	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DI no	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
INTERBUS Reference	Byte	Byte 2								Byte 3							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 5.4.5 (d) Assignment of digital outputs to the InterBus reference (Intel)

FANUC	ex. DO no	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
INTERBUS Reference	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DO no	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
INTERBUS Reference	Byte	Byte 2								Byte 3							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

6 SETUP SCREENS IN CMD MODE

6.1 SETUP SCREENS IN CMD MODE

The following figure shows a tree diagram of the sub screens that belong to the InterBus setup in CMD mode. The operator can switch between the screens in a column of the [Other] function key menu. The operator can move to and from the branched screen.

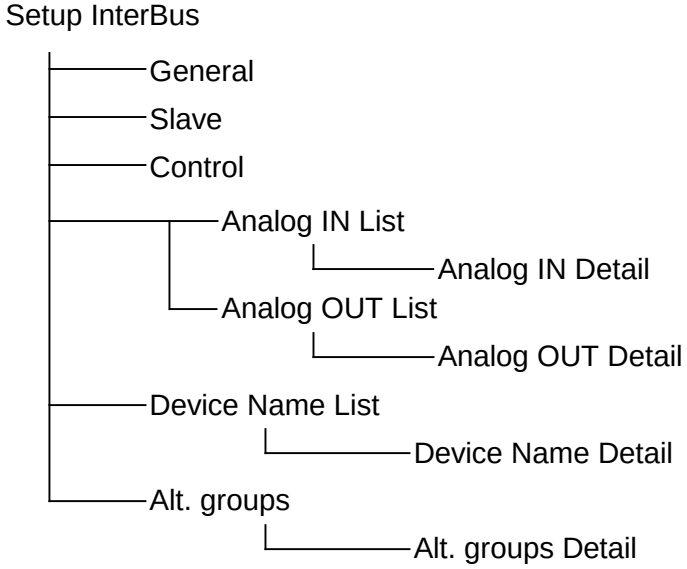


Fig 6.1 Tree diagram of sub screens under setup InterBus with CMD

The following sections describe the setting items of each setting screen. When settings are changed, the new values will be held by the controller but will not be enabled until power off/on or "Execute Parameterization" (refer to 6.2.3 for more details) is performed. In such cases, an alarm message will be displayed at the top of the screen to inform the operator on how to enable the changes. Please follow the procedure for activating changes.

6.2 SUB MENU UNDER SETUP INTERBUS

The first level of the tree diagram consists of six main InterBus setup screens. To switch between these screens, press F3, [Other] and select one of the screens from the pop-up menu.

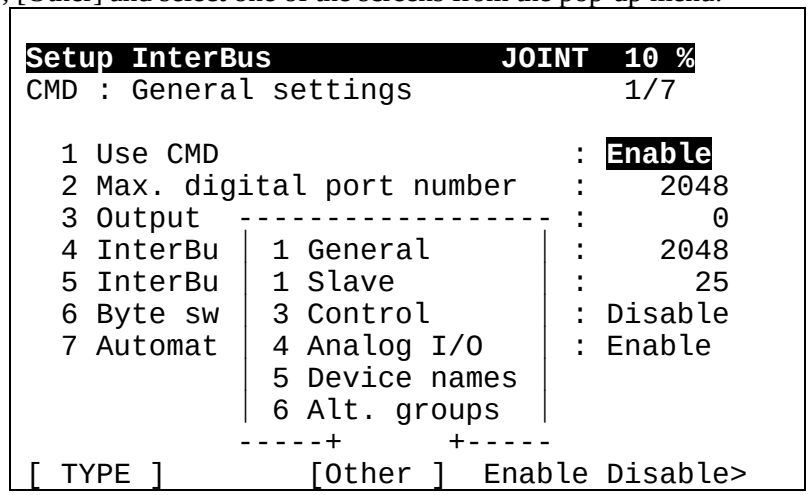


Fig 6.2 Submenu under setup InterBus with CMD

Table 6.2 Submenu under setup InterBus with CMD

#	Menu item	Description	Refer to
1	General	General settings	6.2.1
2	Slave	Slave settings	6.2.2
2	Control	Master control	6.2.3
3	Analog I/O	Analog I/O settings	6.2.4
4	Device names	List of device names	6.2.5
5	Alt. groups	Connection of alternative groups	6.2.7, 7.2

6.2.1 CMD: General Setup Screen

In the general setup screen, TP mode and CMD mode can be selected by changing the setting “Use CMD”. This operation will display a confirmation message. Refer to 5.2.1.1 for more details.
There are settings related to the InterBus I/O in CMD mode. The number of the InterBus digital and analog I/Os can be changed on this screen.
On the next screen of the function key menu, the function key “LOAD_SV” can be found. Pressing the “LOAD_SV“ key results in loading the InterBus configuration data from the backup file (IBPXC.SV).

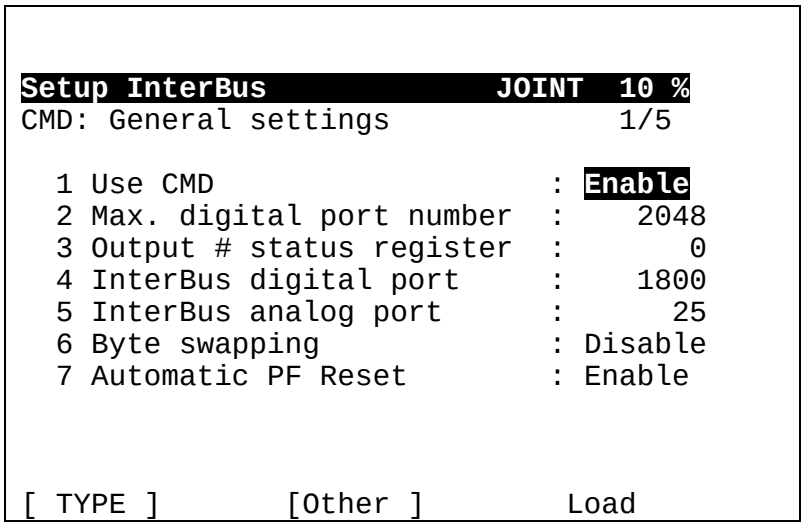


Fig 6.2.1 (a) CMD: General settings

Table 6.2.1 (a) CMD: General settings

#	TP Words	Adjustable values (1)	Description
1 (a)	Use CMD	Disable Enable	-The parameterization of the system coupler can only be done via the TP at the robot controller. -The parameterization of the system coupler can only be done via CMD. Refer to chapter 6. Setup in CMD mode After a change, a prompt message will be displayed which has to be confirmed before the setting will be activated (refer to 5.2.1.1)
2	Max. digital port number	2048	Maximal number of digital ports (Read Only)

#	TP Words	Adjustable values (1)	Description
3 (a)	Output # status register	0 0 – 2033	Set the signal number of the digital output to 1-2033, where the diagnostic status register of MASTER is copied when the slave part is running. Consecutive 16 bits are occupied for this purpose. Set 0 to disable this function. It is recommended to set these 16 bits within the I/O of rack 95 and slot 1, the location in which the process data of the system coupler's slave part are mapped.
4 (a)	InterBus of digital port	1800 0-1800	The number of digital port used by the InterBus in CMD mode. Refer to 6.4.2 for more details.
5 (a)	InterBus of analog port	25 0-25	The number of analog port used by the InterBus in CMD mode. Refer to 6.4.2 for more details.
6 (a)	Byte swapping	 Disable Enable	Selects the byte order in the process data word. Motolora format (HB/LB) Intel format (LB/HB) (HB: Higher Byte, LB: Lower Byte) Refer to 6.4.3 for more details.
7 (a)	Automatic PF Reset	 Enable Disable	Enables / Disables the automatic reset function of peripheral alarms. Set to Enable if the robot should reset peripheral faults automatically. Set to Disable if peripheral faults should be reset by pressing the reset button by the operator.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
(a) Power off/on is required to enable change of this setting.

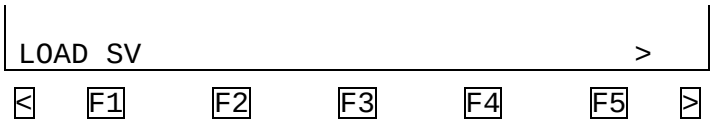


Fig 6.2.1 (b) Function keys “CMD: General settings”

Table 6.2.1 (b) Functions keys “CMD: General settings”

Function key	Words	Description of function keys
Next	>	
F1	LOAD_SV	Loading of system file (IBPXC.SV) *Load IBPXC.SV?*
Next	>	

6.2.1.1 Changing the setting “Use CMD” from ENABLE to DISABLE

After the change, the following message will be displayed on a separate screen:

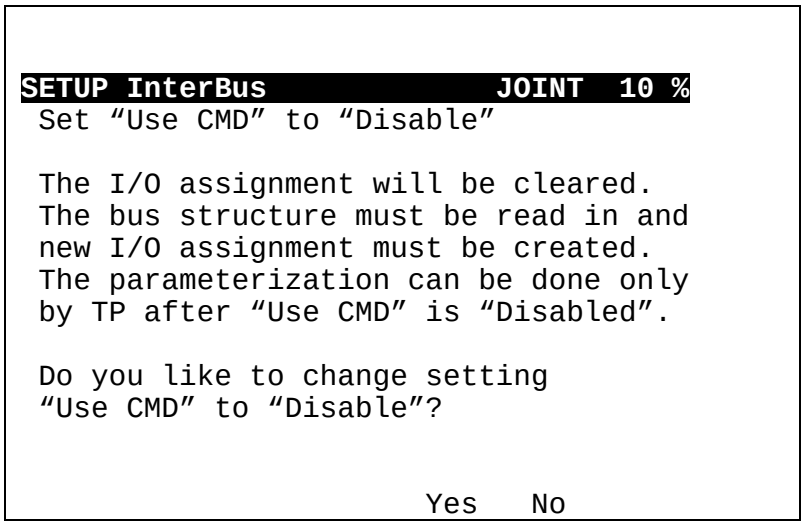


Fig 6.2.1.1 (a) Changing the setting: Use CMD (2)

After choosing “Yes”, a second confirmation message will be displayed in the TP prompt line:

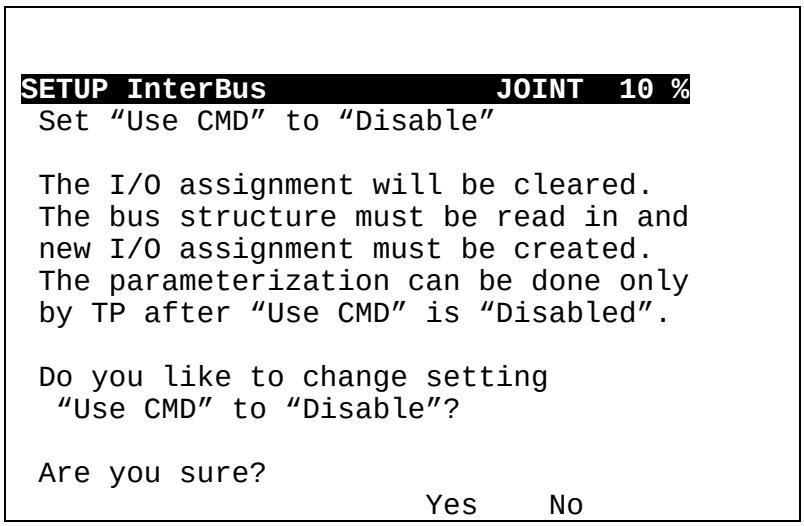


Fig 6.2.1.1 (b) Change setting: Use CMD (3)

6.2.2 CMD: Slave Setup Screen

On this screen only one item is displayed, “Error one shot” in CMD mode. Other slave parameters should be configured with CMD Tool.

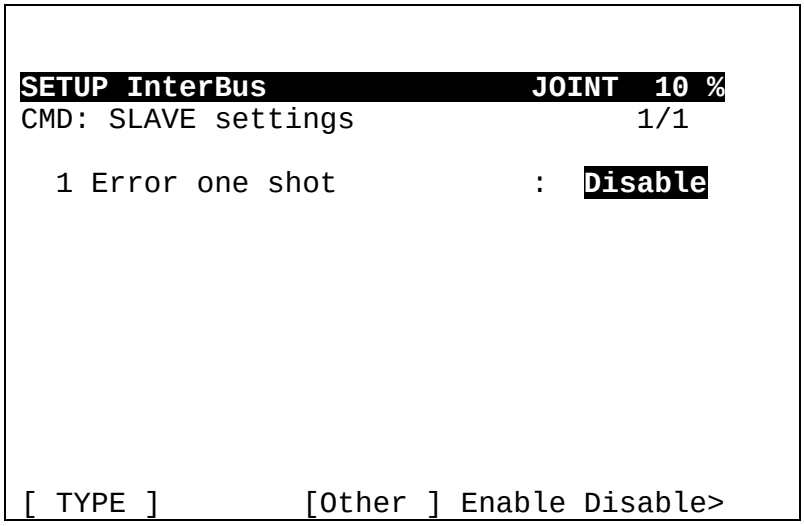


Fig 6.2.2 (a) CMD: SLAVE settings

Table 6.2.2 (a) SLAVE settings

#	TP Words	Adjustable values (1)	Description
1	Error one shot	Disable Enable	If this setting is enabled, the error message “IB-S-452 Slave no data exchange” will only be displayed once. It will be set automatically to Disable, when the communication from the higher master starts.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.

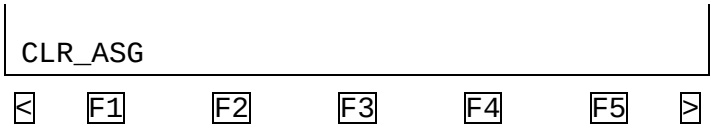


Fig 6.2.2 (b) Function keys „CMD: SLAVE settings“

Table 6.2.2 (b) Function keys „CMD: SLAVE settings“

Function key	Words	Description of function keys
F1	CLR_ASG	Clears I/O assignments *Clear ALL I/O assignments?*
Next	>	

6.2.3 CMD: Control Setup Screen

This screen provides an interface to the system coupler. It can manage and monitor the InterBus status of the system coupler's master part. This screen also provides an interface for loading SVC files specified in the line, “Name SVC file”. The files in the parameterization memory of the system coupler can be backed up by choosing the item, “BackUp board files”.
“Parameterization Execute” is a very important command as it is required to parameterize the system coupler by means of the SVC file, loaded in the robot controller.

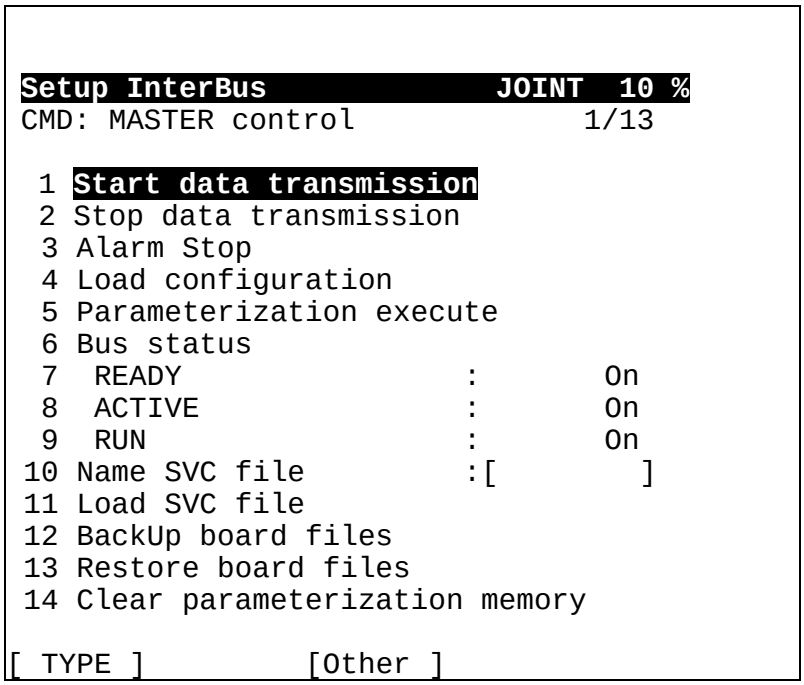


Fig 6.2.3 CMD: MASTER control

Table 6.2.3 MASTER control

#	TP Words	Description
1	Start data transmission	Starts data transmission when the button ENTER is pressed *Start data transfer ?*
2	Stop data transmission	Stops data transmission when the button ENTER is pressed *Stop data transfer ?*
3	Alarm Stop	Alarm stop when the button ENTER is pressed *Stop data transfer ?*
4 (2)	Load configuration	Loads the actual configuration and service info from SC when the button ENTER is pressed. *Load configuration from board ?*
5	Parameterization execute	Interprets PXC_SVC.DT that is loaded to the robot and sends firmware services to the system coupler. *Execute parameterization ?*
6	Bus status	Only header
7	READY	The system coupler is ready to operate Diagnostic status register bit 7
8	ACTIVE	InterBus configuration is active Diagnostic status register bit 6
9	RUN	Data transmission is running Diagnostic status register bit 5
10	Name SVC file	Specifies the name of the SVC file in the parameterization memory of system coupler before loading the SVC file. When the SVC file has already been loaded to the robot, this item shows the name of the SVC file when the controller is powered up. The name of the SVC file is written in the header of PXC_SVC.DT which is stored in the FROM of the robot.
11 (3)	Load SVC file	Loads the SVC file from the parameterization memory of the system coupler into the FROM of the robot when the button ENTER is pressed. *Load SVC file?* Note: Use only upper characters.

#	TP Words	Description
12	BackUp board files	Saves all files from the parameterization memory to the selected device as IBBDFIL.IBA. *BackUp files from Parameterization memory?* Note: Please verify message like, IB-S-559 “%d files saved as ibbdfil.iba” shows up to confirm backup is completed successfully.
13	Restore board files	Restores files to the parameterization memory from IBBDFIL.IBA in the selected device. The parameterization memory of InterBus system coupler is cleared during this process, and files are recovered from IBBDFIL.IBA. *Write files in Parameterization memory?* *Clear Param. Mem before restore?* Note: Please verify message like, IB-S-560 “%d files loaded as ibbdfil.iba” shows up to confirm restore is completed successfully.
14	Clear parameterization memory	Clears (formats) the parameterization memory. *Clear Parameterization memory?* Note: This command is required to solve the fragmentation of the parameterization memory.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.
(2) Load configuration is required especially for reading out the service info of each devices when the device name is set by TP of the robot controller.
(3) Perform “Parameterization Execute” to parameterize the system coupler by means of the loaded SVC file.

6.2.4 Analog I/O Setup Screen

When selecting "Analog I/O" in the pop-up menu of one of the InterBus setup screens, either the setup screen for AI or AO will be displayed. It depends on which screen has been displayed last. By pressing the F5 I/O key, it can be switched between the AI and AO screen.

6.2.4.1 CMD. AI list setup screen

Each AI, mapped to the InterBus, is configured on this screen.

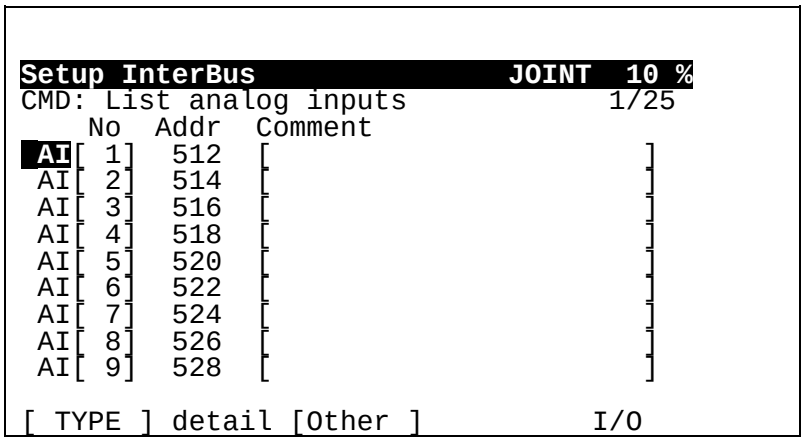


Fig 6.2.4.1 (a) CMD: List analog inputs

Table 6.2.4.1 (a) CMD: List analog inputs

Column	Adjustable values (1)	Description
No		Analog output number
Addr	None	MPM Address in bytes, where values for this inputs are located (The address is the same as CMD)
Comment	None	Comment for this analog input (Sets comment in I/O screen)

(1) The respective upper entry in column "Adjustable values" shows the default setting.

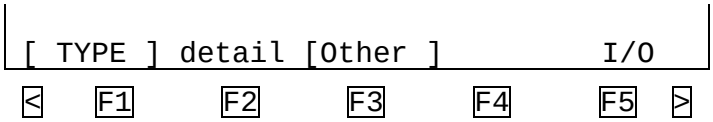


Fig 6.2.4.1 (b) Function keys „CMD: List analog inputs"

Table 6.2.4.1 (b) Function keys „CMD: List analog inputs"

Function key	Words	Description of function keys
F1	[TYPE]	
F2	detail	Goes to the detail screen
F3	[Other]	
F5	I/O	Changes to the "Setup AO List" screen

6.2.4.2 CMD: AI detail setup screen

Special settings for AI can be set on this screen.

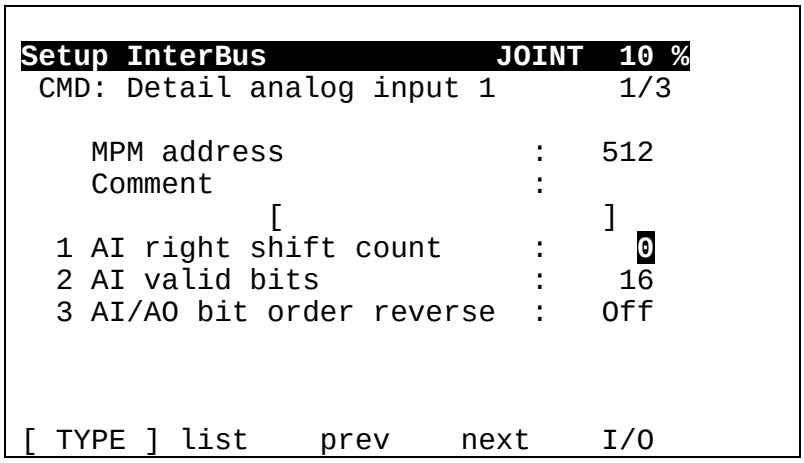


Fig 6.2.4.2 (a) CMD: Detail analog input

Table 6.2.4.2 (a) CMD: Detail analog input

#	TP Words	Adjustable values (1)	Description
	MPM address		Address in the MPM where values for this inputs are located. The address is the same as CMD.
	Comment	Empty String[24]	Description of this analog input (Sets comment in I/O screen)
1	AI right shift count	0 0 – 16	The number of bits for right shift count
2	AI valid bits	16 0 – 16	The number of valid bits

#	TP Words	Adjustable values (1)	Description
3	AI/AO bit order reverse	Off On	Normal bit order Reversed bit order Note: This setting has also an influence to the analog output with the same port number.

(1) The respective upper entry in column “Adjustable values“ shows the default setting.

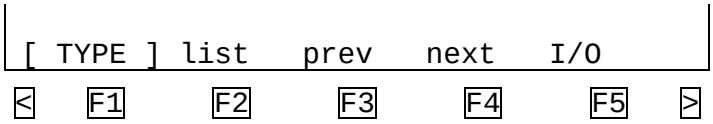


Fig 6.2.4.2 (b) Function keys „CMD: Detail analog input“

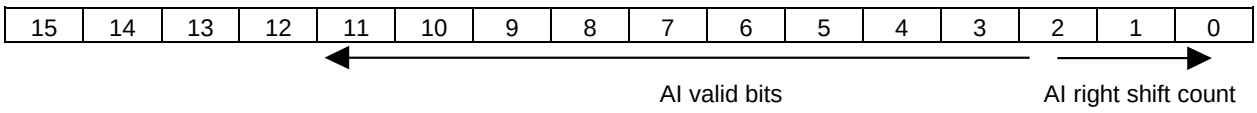
Table 6.2.4.2 (b) Function keys „CMD: Detail analog input“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Goes to the list screen
F3	prev	Goes to the previous analog input
F4	next	Goes to the next analog input
F5	I/O	Changes to the “Setup AO Detail” screen

AI right shift count, AI valid bits, AI/AO bit order reverse:
Sometimes a bit operation is required to take out significant parts from the raw analog value according to the specification of analog devices. These three items provide the settings for such bit operations. The bit operation for AI is performed by means of the the following procedure. Specific bit operations are not performed by the default setting.

1) Reads the analog input data from the MPM of the system coupler.
2) Reverses the order of bits, if “AI/AO bit order reverse” is set to On.
3) Shifts the value to the right according to “AI right shift count”.
4) Takes valid bits from the lowest bit according to “AI valid bits”.
5) Copies the value to the AI of the robot controller.

Example:
- “AI right shift count” is 3.
- “AI valid bits” is 12.
- “AI unit word” is ON.
- “AI/AO bit order reverse” is OFF.



NOTE
The setting "AI/AO bit order reverse" has an influence to the AO setting with the same number.

6.2.4.3 CMD: AO list setup screen

Each AO, mapped to InterBus, is configured on this screen.

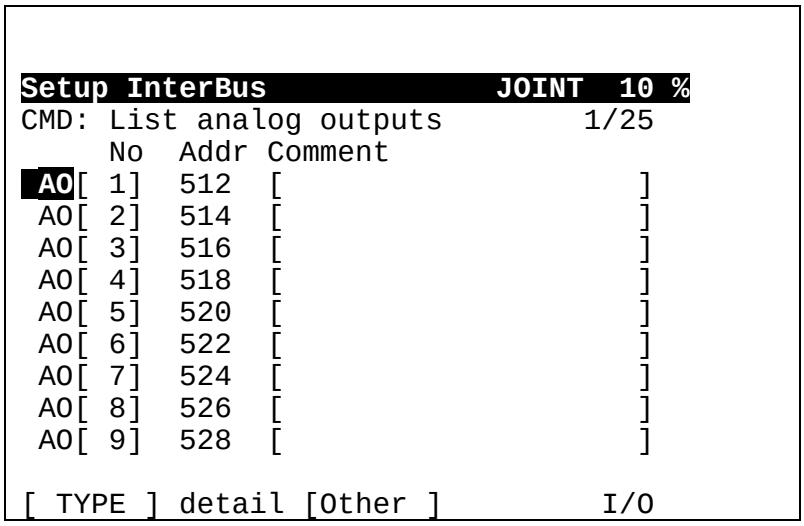


Fig 6.2.4.3 (a) CMD: List analog outputs

Table 6.2.4.3 (a) CMD: List analog outputs

Column	Adjustable values (1)	Description
NO		Analog output number
Addr	None	MPM Address in bytes, where values for this outputs are located (The value is the same as CMD)
Comment	None	Comment for this analog output (Sets comment in I/O screen)

(1) The respective upper entry in column “Adjustable values“ shows the default setting.

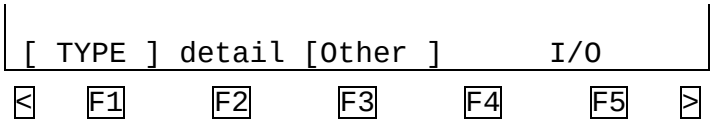


Fig 6.2.4.3 (b) Function keys „CMD: List analog outputs

Table 6.2.4.3 (b) Function keys „CMD: List analog outputs“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	detail	Goes to the detail screen
F3	[Other]	
F5	I/O	Changes to the “Setup AI List” screen

6.2.4.4 CMD. AO detail setup screen

Special settings for a bit mask of AO can be set on this screen.

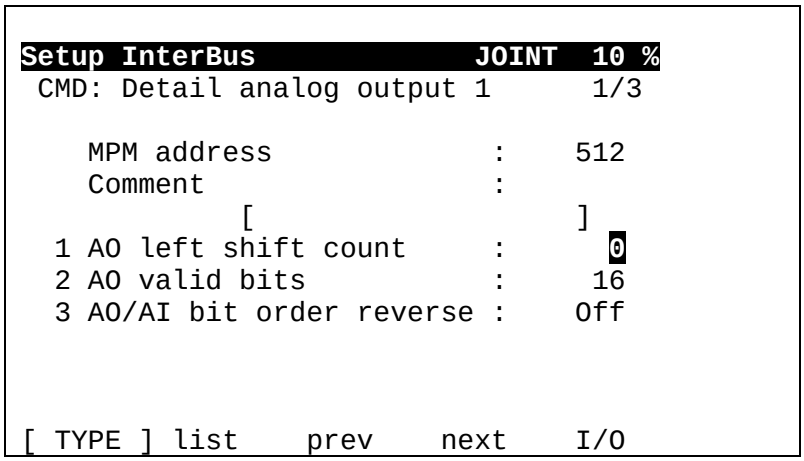


Fig 6.2.4.4 (a) CMD: Detail analog output

Table 6.2.4.4 (a) CMD: Detail analog output

#	TP Words	Adjustable values (1)	Description
	MPM address		Address in the MPM where values for this outputs are located (The value is the same as CMD)
	Comment	Empty String[24]	Description of this analog output (Sets comment in I/O screen)
1	AO left shift count	0 0 – 16	The number of bits for left shift count
2	AO valid bits	16 0 – 16	The number of valid bits
3	AO/AI bit order reverse	Off On	Normal bit order Reversed bit order Note: This setting has also a influence to analog input with the same port number

(1) The respective upper entry in column “Adjustable values“ shows the default setting.

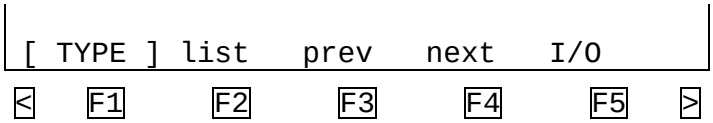


Fig 6.2.4.4 (b) Function keys „CMD: Detail analog output“

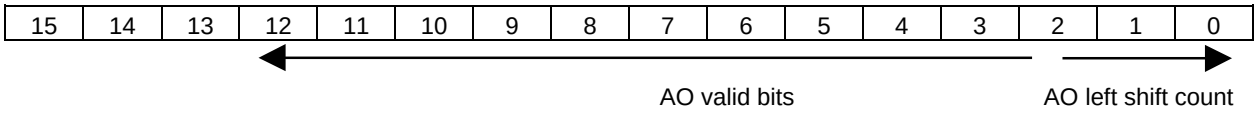
Table 6.2.4.4 (b) Function keys „CMD: Detail analog output“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Goes to the list screen
F3	Prev	Goes to the previous analog output
F4	Next	Goes to the next analog output
F5	I/O	Changes to the “Setup AI Detail” screen.

AO left shift count, AO valid bits, AI/AO bit order reverse:
The bit operation for AO is performed by means of the following procedure. Specific bit operations are not performed by the default setting.

1) Reads the analog output data from AO of the robot controller.
2) Takes valid bits from the lowest bit according to “AO valid bits”.
3) Shifts the value to the left according to “AO left shift count”.
4) Reverses the order of bits if “AI/AO bit order reverse” is set to On.
5) Writes the value as analog output data to the MPM of the system coupler.

Example:
- “AO left shift count” is 3.
- “AO valid bits” is 12.
- “AO unit word” is ON.
- “AI/AO bit order reverse” is OFF.



NOTE
The setting "AI/AO bit order reverse" has an influence to the AI setting with the same number.

6.2.5 CMD: Device Name List Screen

This screen is used to establish a relationship between the Service-Info (which can be set via CMD) and a device name. If the device name is set, the robot controller will display the device name with an error message instead of the Service-Info.

```
Setup InterBus              JOINT  10 %
CMD: List device names           1/48
 No Service-Info   Device name
  1[Gripper 1    ] [Gripper 1          ]
  2[WeldGun1     ] [Welding Gun 1      ]
  3[WeldContr1   ] [Weld Controller 1  ]
  4[             ] [                   ]
  5[             ] [                   ]
  6[             ] [                   ]
  7[             ] [                   ]
  8[             ] [                   ]
  9[             ] [                   ]

[ TYPE ] detail [Other ]                >
```

Fig 6.2.5 (a) CMD: List device names (with example entries)

Table 6.2.5 (a) CMD: List device names

Columnx	Adjustable values (1)	Description
Service-Info	Empty String[12]	Should be the same text as for the Service-Info which can be set via CMD
Device name	Empty String[24]	Only 19 characters will be shown. To view device names longer than 19 characters, go to the detail screen.

(2) The respective upper entry in column “Adjustable values“ shows the default setting.

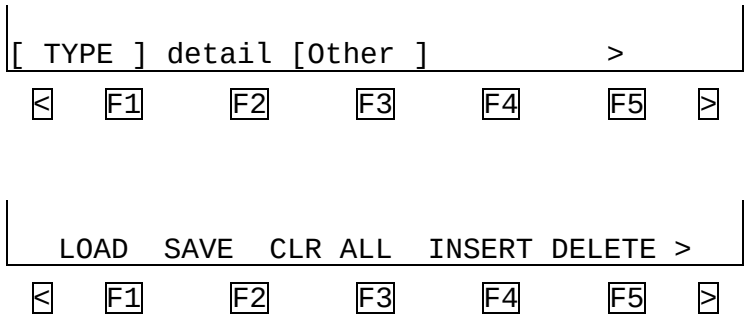


Fig 6.2.5 (b) Function keys “CMD: List device names“

Table 6.2.5 (b) Function keys “CMD: List device names“

Function key	Words	Description of function keys
F2	Detail	Goes to the next screen (Refer to 6.2.6)
Next	>	
F1	LOAD	Loads a text file with the device name from the selected port *Load list with device name?*
F2	SAVE	Saves a text file with the device name from the selected port *Save list with device name?*
F3	CLR_ALL	Clears all entries in the list *Clear all?*
F4	INSERT	Inserts a new line previous to the selected line. The last line of the list will be deleted. Insert new line? *Delete last line?* (If entries are set for the last line)
F5	DELETE	Deletes the selected line A new line will be added at the end of the list *Delete line?*

6.2.6 CMD: Device Name Detail Screen

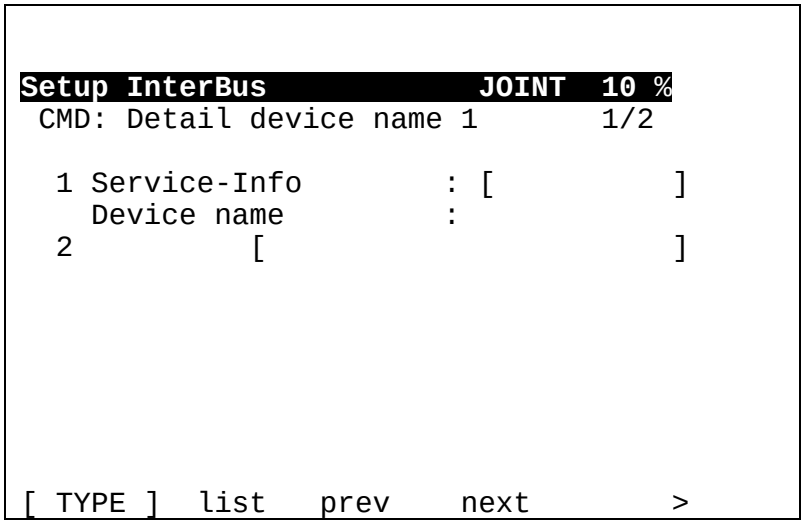


Fig 6.2.6 CMD: Detail device name

Table 6.2.6 CMD: Detail device name

#	TP Words	Adjustable values (1)	Description
1	Service-Info	Empty String[12]	Service Info (same as in CMD)
2	Device name	Empty Alpha-Num	Device name with max. 24 characters

(3) The respective upper entry in column “Adjustable values“ shows the default setting.

6.2.7 Alternative Groups List/Detail Screen

These screens are identical in TP and CMD mode and are explained by means of InterBus switching instruction. Please refer to section 7.2, 7.3.

6.3 OPERATIONS FOR SETUP IN CMD MODE

6.3.1 Loading the SVC File from the Parameterization Memory of the System Coupler.

Procedure Loading the SVC file from the parameterization memory of the system coupler

Steps

1. Create the SVC file with CMD Tool and save it to the parameterization memory of the system coupler.
2. Press [MENU] key.
3. Select “SETUP”.
4. Press F1, [TYPE].
5. Select “InterBus”.
6. Go to the “Setup Control” screen according to the tree diagram (Figure 6.1).
7. Move the cursor to “Name SVC file” and press Enter.
8. Enter the name of the SVC file without “.SVC” and press Enter again.
9. Confirm the name.
10. Move the cursor to “Load SVC file” and press Enter. A confirmation message will be displayed at the bottom of the screen, “Load SVC file ?”.
11. Press F4, Yes.
12. The message “SVC file is loaded from Board” will be displayed if the operation was successful. If the name is incorrect or the SVC file has not been stored to the parameterization memory, the message “SVC file is not found” will be displayed.

NOTE
When the SVC file has been loaded to the robot controller, the filename of the SVC file will be displayed in “Name SVC” in “Setup Control” screen at next power up.

6.3.2 Management of Exclusive Rights

Exclusive rights are required to perform several commands with TP or CMD Tool These rights have to be managed in CMD mode. When started up, the exclusive right is held by the robot and should be released when the parameterization is done via CMD Tool. Follow procedure 6-2 to release the exclusive right in the robot.

Procedure Releasing the Exclusive Rights with the Alarm Stop command

Steps

1. Press [MENU] key.
2. Select “SETUP”.
3. Press F1, [TYPE]
4. Select “InterBus”.
5. Go to the“Control” setup screen according to the tree diagram (Figure 6.1).
6. Move thecursor to “Alarm Stop” and press Enter. A confirmation message, “Stop data transfer ?” will be displayed.
7. Press F4, “Yes”.
8. The data transfer will be stopped and the exclusive rights will be released.

As mentioned before, the exclusive rights are required to perform certain commands, such as "Start Data Transfer" and "Parameterization execute". In such cases, the robot requests the exclusive rights automatically. The robot will hold the exclusive rights until the Alarm Stop command will be executed on the “Control” setup screen of the TP.

6.3.3 Executing the Parameterization of the System Coupler with the SVC File

This procedure explains how to perform “Parameterization execute”.

Procedure Executing the parameterization with the SVC file

Steps

1. Press [MENU] key.
2. Select “SETUP”.
3. Press F1, [TYPE].
4. Select “InterBus”.
5. Go to the “Control” screen according to the tree diagram (Figure 6.1).
6. Move the cursor to “Parameterization execute” and press enter. A confirmation message will be displayed at the bottom of the screen, “Execute Parameterization?”
7. Press F4, “Yes” to send the new configuration to the system coupler.
8. If the parameterization completes without an error, the new configuration will be activated.
   If an error occurs, check the settings according to the reported firmware error code.

NOTE

Use the status screens to confirm the parameterization of the system coupler.
“Slave” status screen shows the current slave parameters.
“Device Diagnostic List/Detail” status screens show the activated configuration.

6.3.4 Storing the InterBus Setting to IBPXC.SV and Storing the SVC File to PXC_SVC.DT

The current setting of the CMD mode will be stored to IBPXC.SV. The SVC file, loaded to the robot controller, will be stored to PXC_SVC.DT by means of the following procedure.

Procedure Storing IBPXC.SV and PXC_SVC.DT

Steps

1. Press [MENU] key.
2. Select “FILE”.
3. Press F5 [UTIL].
4. Select “Set Device” and choose the respective device.
5. Press F4 [Backup].
6. Select “System file” or “All of above”.
7. Follow the dialog on the TP screen.

6.3.5 Storing the Files in the Parameterization Memory of InterBus System Coupler as IBBDFIL.IBA

InterBus system coupler has the parameterization memory where setting files, like SVC file, created by CMD tool are stored. The files will be stored to IBBDFIL.IBA as an archive by the following procedure. In addition, IBBDFIL.IBA is also stored during the procedure described in 6.3.4. The system coupler must be installed to the controller, otherwise no file is stored to IBBDFIL.IBA. When FTP is used for backup, please verify the file size of IBBDFIL.IBA to know if the files are actually stored to it.

Procedure Storing IBBDFIL.IBA

Steps

1 Press [MENU] key.
2 Select “SETUP”.
3 Press F1, [TYPE].
4 Select “InterBus”.
5 Go to the “Control” screen according to the tree diagram (Figure 6.1).
6 Move the cursor to “BackUp board files” and press enter. A confirmation message will be displayed at the bottom of the screen, “BackUp files from Parameterization memory?”.
7 Press F4, “Yes” to create IBBDFIL.IBA in the selected device.
8 Verify message like, IB-S-559 “%d files saved as ibbdfil.iba” shows up to confirm backup is completed successfully.

6.3.6 Restoring Files to the Parameterization Memory of InterBus System Coupler by IBBDFIL.IBA

IBBDFIL.IBA can be loaded to the controller to recover the files in the parameterization memory of the system coupler by the following procedure. The parameterization memory of InterBus system coupler is cleared during this process, and files are recovered from IBBDFIL.IBA. The system coupler must be installed to the controller before loading IBBDFIL.IBA. This operation is useful after the system coupler is replaced. In addition, IBBDFIL.IBA is also loaded when restore of “System files” or “All of above” is done at control start.

Procedure Loading IBBDFIL.IBA

Steps

1 Press [MENU] key.
2 Select “SETUP”.
3 Press F1, [TYPE].
4 Select “InterBus”.
5 Go to the “Control” screen according to the tree diagram (Figure 6.1).
6 Move the cursor to “Restore board files” and press enter. A confirmation message will be displayed at the bottom of the screen, “Write files in Parameterization memory?”.
7 Press F4, “Yes” to continue.
8 Next confirmation message will be displayed at the bottom of the screen, “Clear Param. Mem before restore?”.
9 Press F4, “Yes” to clear the parameterization memory and restore files from IBBDFIL.IBA in the selected device.
10 Verify message like, IB-S-560 “%d files loaded as ibbdfil.iba” shows up to confirm restore is completed successfully.

6.4 INTERBUS I/O ASSIGNMENT IN CMD MODE

6.4.1 Rack Number and Slot Number of I/O Used in CMD Mode

The rack and slot number are provided to identify the device the I/O is mapped to.
The I/O, mapped to the InterBus, has the following rack and slot number.

Table 6.4.1 Rack and slot number of InterBus I/O in CMD mode

Rack number	95 (Master and slave are not distinguished)
Slot number	1

6.4.2 I/O Mapping to the MPM of the System Coupler

Users can define the MPM addressing of the process data of devices independently with CMD Tool.
The MPM addressing is reflected to the SVC file, which must be loaded to the robot controller every time the SVC file is being changed. The robot controller parameterizes the controller board by means of the SVC file every time the system is started up or when “Parameterization execute” is performed via the Teach Pendant.

At the same time, the robot controller regards the process data area of the MPM as four continuous areas : a digital input area, a digital output area, an analog input area and an analog output area. Each area is mapped by 1:1 to the I/O of the robot. To map the process data of each device to the specific I/O, the process data should be mapped to the specific I/O area.

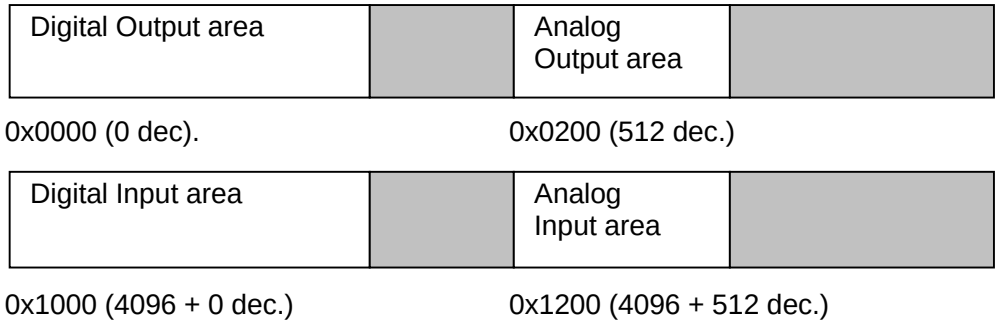
For example, the digital input area is mapped to DI. The first bit in the first byte of the digital input area is mapped to DI[1] and the second bit is mapped to DI[2] and so forth.

The byte order of the digital input/output area can be selected as Intel or Motorola format.

Table 6.4.2 Start MPM address and size of digital and analog areas in CMD mode

Area	Start MPM address	Size (bit)
Digital input area	0x1000 (input base + 0x0000) 4096 dec. + 0 dec.	number of digital ports
Digital output area	0x0000 (output base + 0x0000) 0 dec. + 0 dec.	number of digital ports
Analog input area	0x1200 (input base + 0x0200) 4096 dec. + 512 dec.	number of analog ports * 16
Analog output area	0x0200 (output base + 0x0200) 0 dec. + 512 dec.	number of analog ports * 16

Figure 6.4.2 The address map of digital and analog areas in CMD mode



6.4.3 Assignment to the InterBus Reference of I/O in CMD Mode

Table 6.4.3 (a) Assignment of digital inputs to the InterBus reference (Byte swapping = Disable)

FANUC	ex. DI no	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DI no	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 6.4.3 (b) Assignment of digital outputs to the InterBus reference (Byte swapping = Disable)

FANUC	ex. DO no	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DO no	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 6.4.3 (c) Assignment of digital inputs to the InterBus reference (Byte swapping = Enable)

FANUC	ex. DI no	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DI no	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 6.4.3 (d) Assignment of digital outputs to the InterBus reference (Byte swapping = Enable)

FANUC	ex. DO no	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9
INTERBUS Reference	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

FANUC	ex. DO no	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25
INTERBUS Reference	Byte	Byte 2								Byte 3							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

7 ALTERNATIVE GROUP SWITCHING

Alternative groups can be defined in the InterBus network configuration by specifying the group number and the alternative number, both a number other than 255. The alternative number should not be zero. The devices, belonging to an alternative group, should have the same group and alternative number. An alternative group consists of one or more segments.

An alternative group is usually defined for removable robot hands with InterBus slave devices. The alternative group can be enabled or disabled by means of TP program instructions or on the “Alternative groups list / detail” setup screen. When the alternative group is disabled, all devices in the alternative group will stop the data transfer and can be removed from the InterBus. Removed devices must be connected again before the alternative group will be enabled.

7.1 INTERBUS SWITCHING INSTRUCTIONS

There are two InterBus instructions to switch alternative groups in the TP program:

IB attach (seg).(pos) (device name) : Enables the alternative group
IB detach (seg).(pos) (device name) : Disables the alternative group

These instructions are usually used with robots that change robot hands during operation.

NOTE
No alternative group number will be displayed. Instead the “Segment. Position” number of the first device in an alternative group will be displayed. The device name of the device will be displayed as an additional information to the operator.

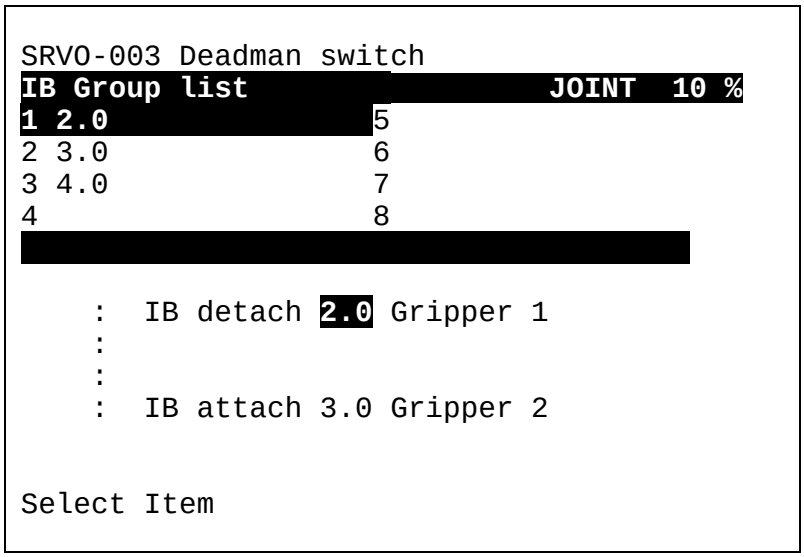


Fig 7.1 InterBus switching instruction (with example device)

Table 7.1 Select device

Column	Display	Description
	1, 2, 3, 4, …	When more then 8 alternative groups exist, then the text “8 next page” will be displayed.
Seg.Pos	Seg.Pos number	Device number (segment position number)

7.2 ALTERNATIVE GROUPS LIST SETUP SCREEN

This screen shows the list of alternative groups defined in the current configuration. The list will be updated when parameterization is executed (refer to 5.2.4 for TP mode, refer to 6.2.3 for CMD mode). This screen does not display groups whose alternative group number is zero. The segment number, position number and device name of the first device in the alternative group are displayed.

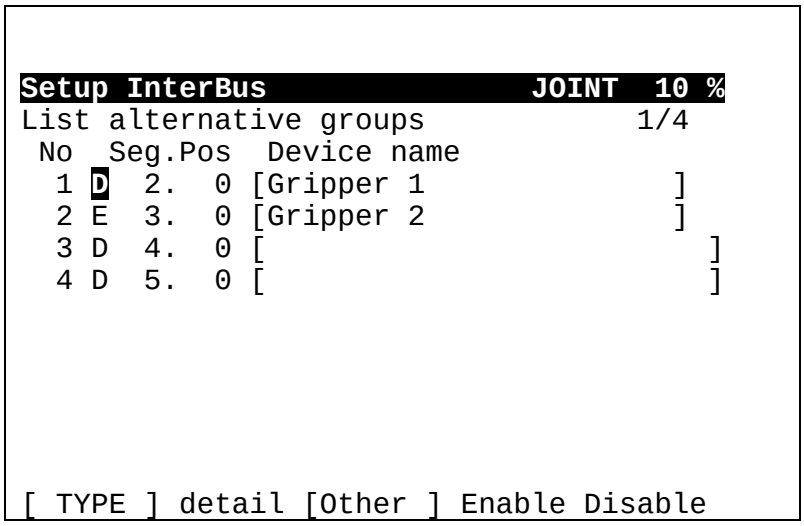


Fig 7.2 (a) List alternative groups (with example)

Table 7.2 (a) List alternative groups

Column	Adjustable values	Description
No		Device number
None	D E	Display status and switch of the alternative group D stands for Disable and E for Enable Press F4 Enable to enable the alternative group. Press F5 Disable to disable the alternative group.
Seg.Pos		Shows the segment and position number
Device name		Shows the device name (24 characters)

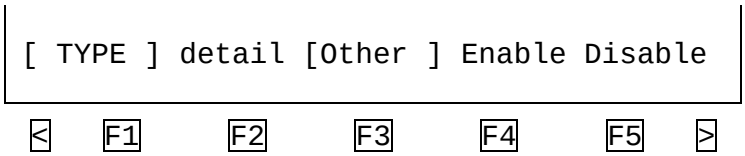


Fig 7.2 (b) Function keys „List alternative groups“

Table 7.2 (b) Function keys „List alternative groups“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	detail	Goes to the “Alternative groups Detail” setup screen (refer to section 7.3)
F3	[Other]	

7.3 ALTERNATIVE GROUPS DETAIL SETUP SCREEN

The segment number, position number and device name of the first device in alternative group are displayed.

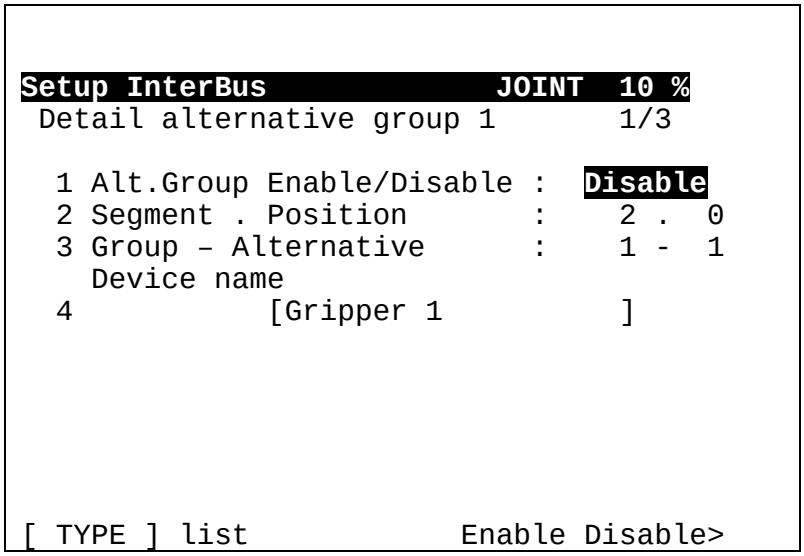


Fig 7.3 (a) Detail alternative group (with example)

Table 7.3 (a) Detail alternative group

#	TP Words	Adjustable values	Description
1	Group Enable/Disable	Disable Enable	Enables or disables thealternative group D stands for Disable and E for Enable. Press F4 Enable to enable the alternative group. Press F5 Disable to disable the alternative group.
2	Segment.Position		Display of the segment and position number
3	Alternative group number		Display of the alternative group number
4	Device name		Display of the device name with the lowest segment and position number in the group.

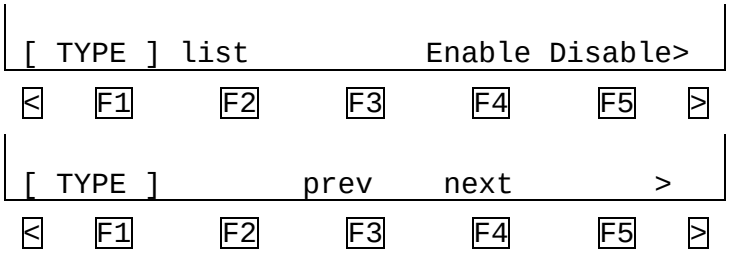


Fig 7.3 (b) Function keys „Detail alternative group"

Table 7.3 (b) Function keys „Detail alternative group

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Goes to the "Alternative groups List" setup screen.
Next	>	
F3	prev	Goes to the previous group
F4	next	Goes to the next group
Next	>	

8 OPERATIONS FOR CMD TOOL

This chapter introduces the operations of CMD Tool, the PC software product by Phoenix Contact.
Because this chapter cannot describe all possible functions and operations of CMD Tool, for more information, refer to the on-line help of CMD Tool or to the manuals of Phoenix Contact (see also “1.3 More information about InterBus, the system coupler and its firmware).

NOTE
CMD Tool is a software product of Phoenix Contact. FANUC does not have any responsibility for CMD Tool and result of its operations. The release number of CMD Tool is 4.61(2) at the momemt of creating this chapter.

All following procedures implicitly assume that the communication between CMD and the system coupler has been established. The operation state must be “Online”. For more information, please see “8.1 CONNECTION AND OPERATION STATE".
For creating or reading in the configuration frame, refer to “8.2 OPERATIONS TO CREATE AND ACTIVATE A CONFIGURATION FRAME”.
The procedures in “8.3 SPECIAL SETTINGS” will explain how to setup the process data, Service-Info and alternative group number.
“8.4 OPERATIONS FOR THE SVC FILE” will explain how to handle the SVC file.
The handling of the CMD project will be described in “8.5 CMD PROJECT HANDLING”.

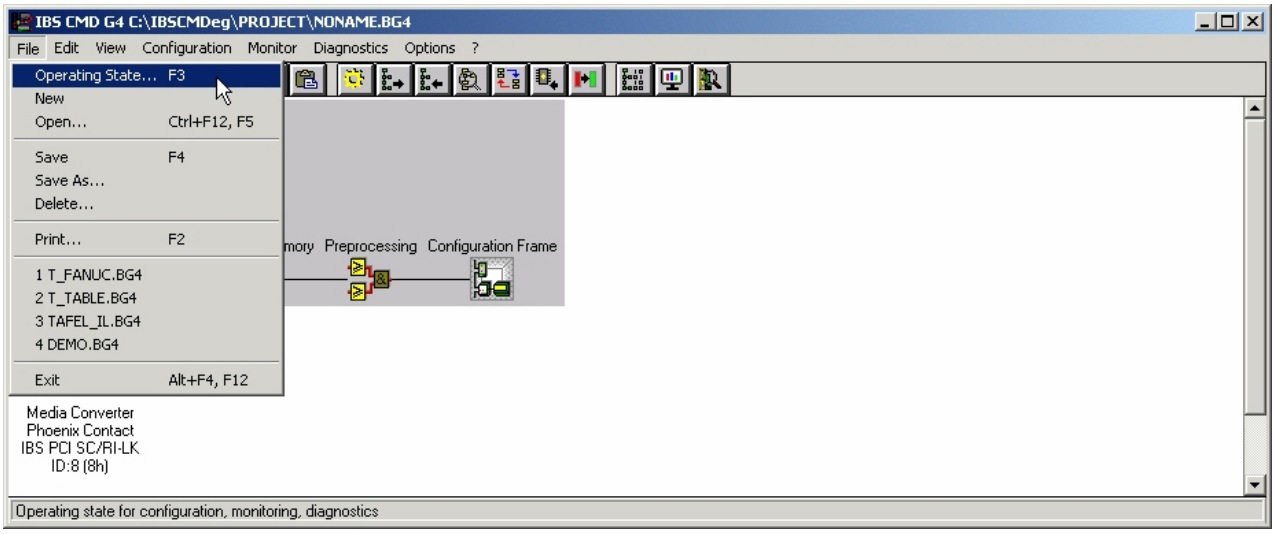
8.1 CONNECTION AND OPERATION STATE

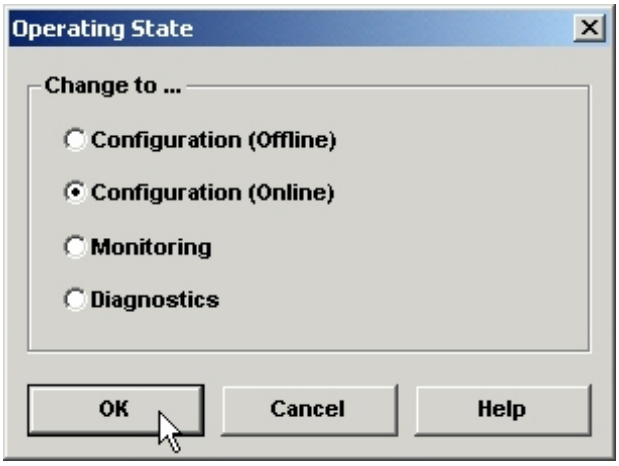
8.1.1 Setting the Operation State for CMD Tool to “Online”

Connect the serial port of the PC to the serial port at the system coupler. For this connection, use the cable “PRG CAB MINI DIN”.

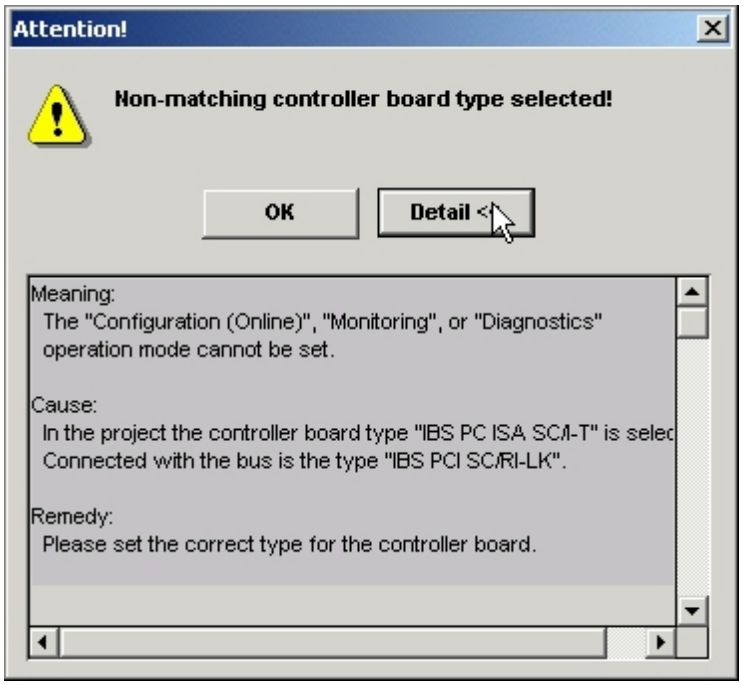
Procedure Setting the operation state for CMD Tool to “Online”

1. Start CMD at the PC.
2. Select the item “File” from the main menu.
3. Select “Operating State …” from the pull down menu.
   ➔ the dialog box “Operating State” will be displayed.
4. Enable the item “Configuration (Online)” by click on the text.
5. Click on the “OK” button to change the operating state to online.
6. Check the operation state at the status bar, this should show the word “Online”.





If an “Attention!” window will open, click on the “Detail” button to get a description for the cause. Follow the instructions in this window to solve the problem.



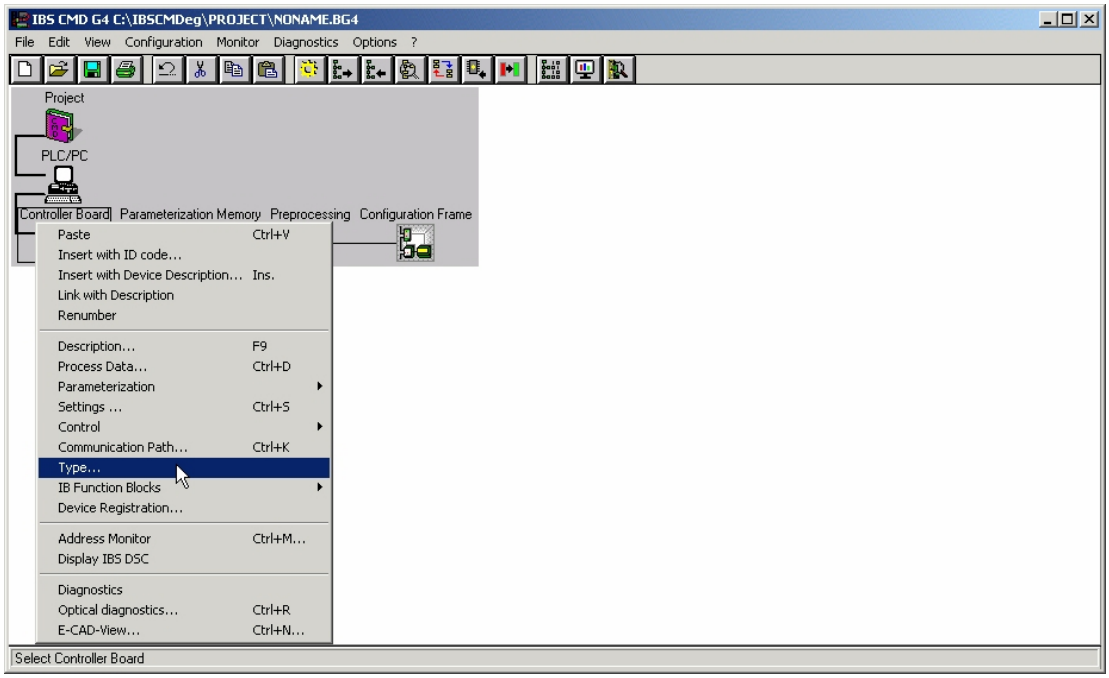
8.1.2 Setting the Correct Controller Board Type

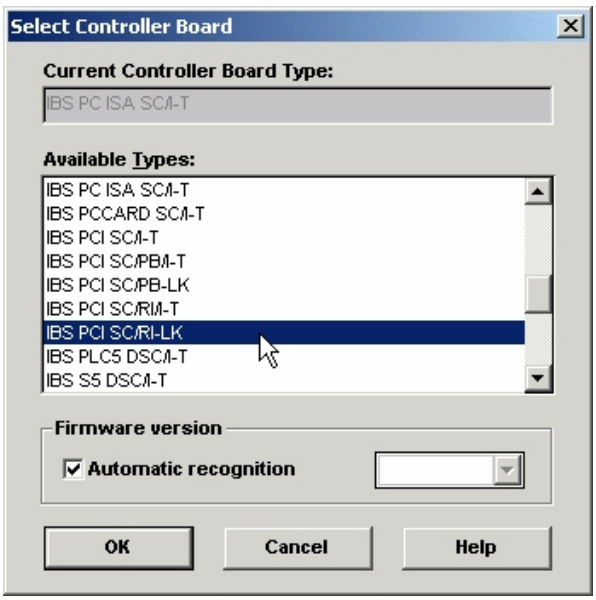
If the wrong controller board is selected, follow the procedure below to set the correct controller board.

Procedure Selecting the controller board type

1. Click on the icon “Controller Board” with the right mouse button to open a context menu.
2. Select “Type…” from this context menu
   ➔ the dialog box “Select Controller Board” will be displayed.
3. Select the correct controller board from the list box “Available Types”:
   - IBS PCI SC/RI-LK (optical) or
   - IBS PCI SC/RI/I-T (copper)

   This depends on which system coupler is installed in the robot controller.
4. Click on the “OK” button to confirm the selection.
5. Go to Procedure Setting the operation state for CMD Tool to “Online” to change the operation state again.



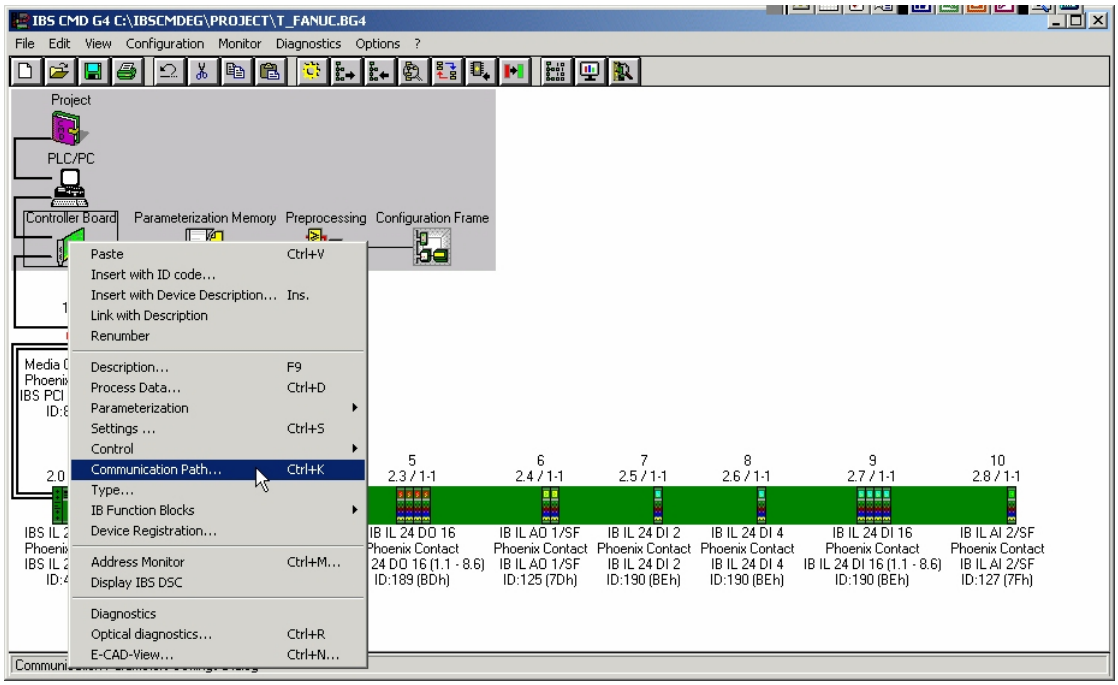


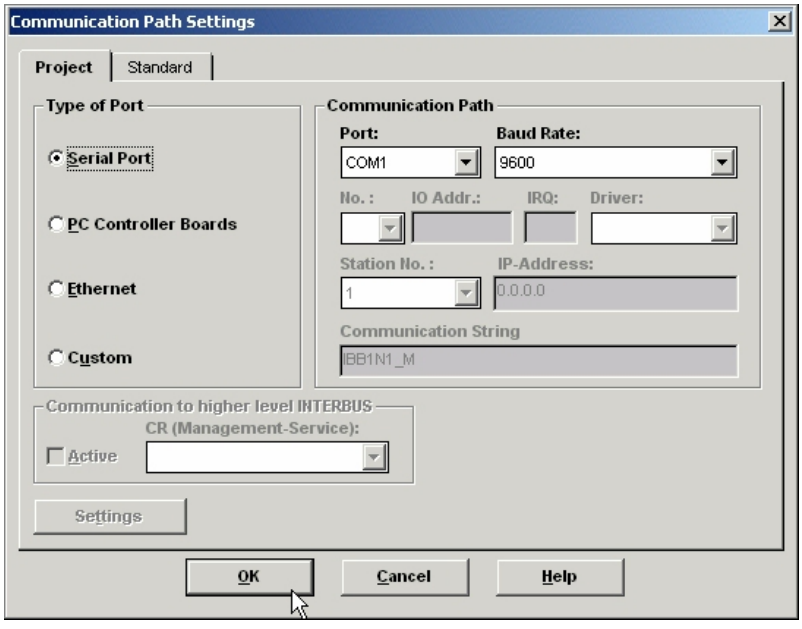
8.1.3 Selecting the Communication Path

If the wrong communication path is selected, follow the procedure below to set the correct communication path.

Procedure Selecting the communication path

1. Click on the icon “Controller Board” with the right mouse button to open a context menu.
2. Select line “Communication Path…” from this context menu
   ➔ the dialog box “Communication Path Settings” will be displayed.
3. Enable the button “Serial Port” for the port type.
4. Select in the drop box “Port” the used serial port (“COM1” is the most common serial port).
5. Change the “Baud Rate” if necessary.
6. Click on the “OK” button to confirm the settings.





8.2 OPERATIONS TO CREATE AND ACTIVATE A CONFIGURATION FRAME

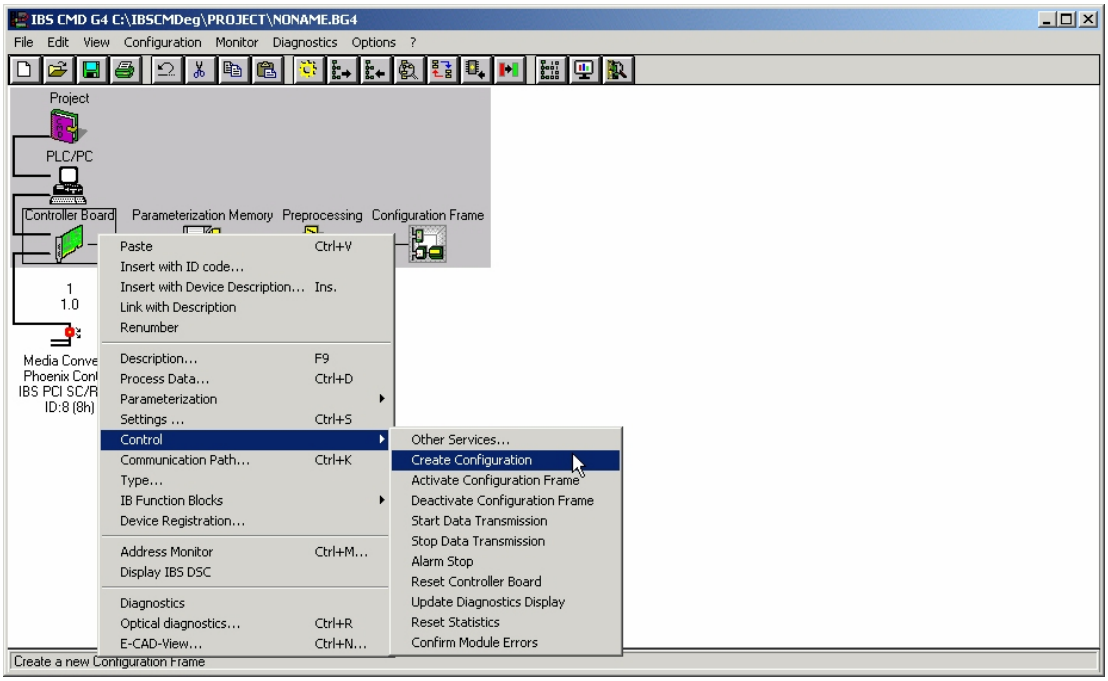
8.2.1 Creating a Configuration Frame

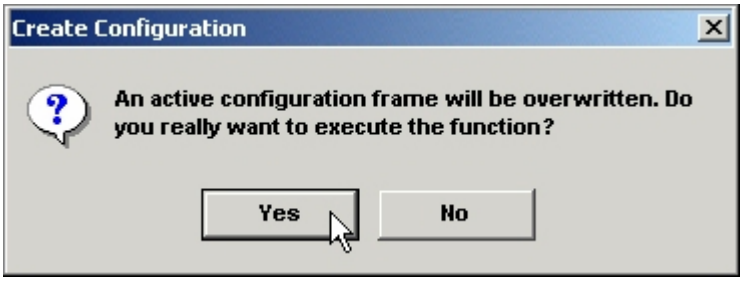
Before the configuration is read in, the configuration frame should be created.

Procedure Creating a configuration frame

Steps

1. Click on the icon “Controller Board” with the right mouse button to open a context menu.
2. Select “Control ►” from this context menu and select “Create Configuration” from the sub menu
   ➔ the dialog box “Create Configuration” will be displayed.
3. To create a new configuration, click on the “OK” button in this dialog box.
4. If an attention window is displayed to inform that the operation has failed, go to step 5.
   If the operation is successful, the procedure ends here.
5. If the dialog box “Attention!” with the text “Service called without authorization” is displayed, refer to “6.3.2 Management of Exclusive Rights” to release the exclusive rights. Do not try to fetch the exclusive rights. This can cause problems.
6. Click on the “OK” button to close the dialog box.
7. Click on the “Cancel” button in the next attention window to cancel the current function.





NOTE
Do not fetch the exclusive rights. This can cause problems.

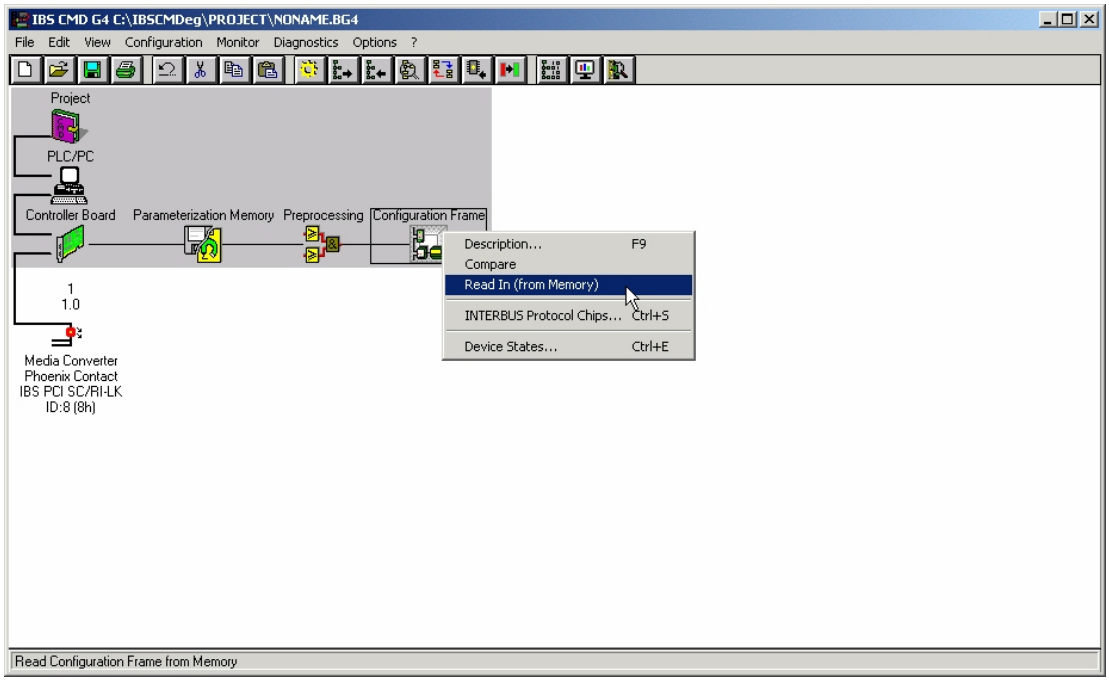
8.2.2 Reading in the Configuration Frame

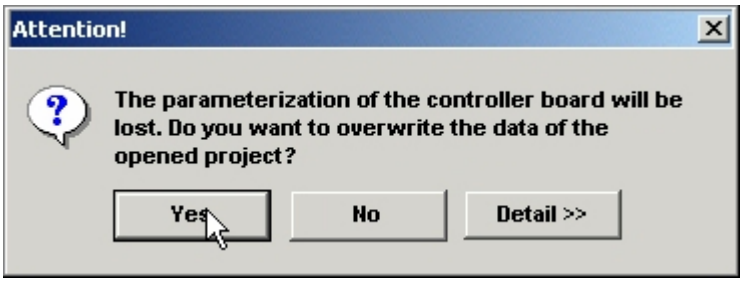
To read in the actual configuration from the memory of the system coupler, follow the procedure below. This procedure can be used without creating a configuration. This is helpful for diagnostic situations, when the actual configuration and all settings should only be read in from the system coupler.

Procedure Reading in the configuration frame

Steps

1. Click on the icon “Configuration Frame” with the right mouse button to open a context menu.
2. Select “Read In (from Memory)” from this context menu
   ➔ the dialog box “Attention!” will be displayed.
3. Click on the “Yes” button to start the read in function.
4. After the “Read In” function has been completed, the current configuration will be displayed.





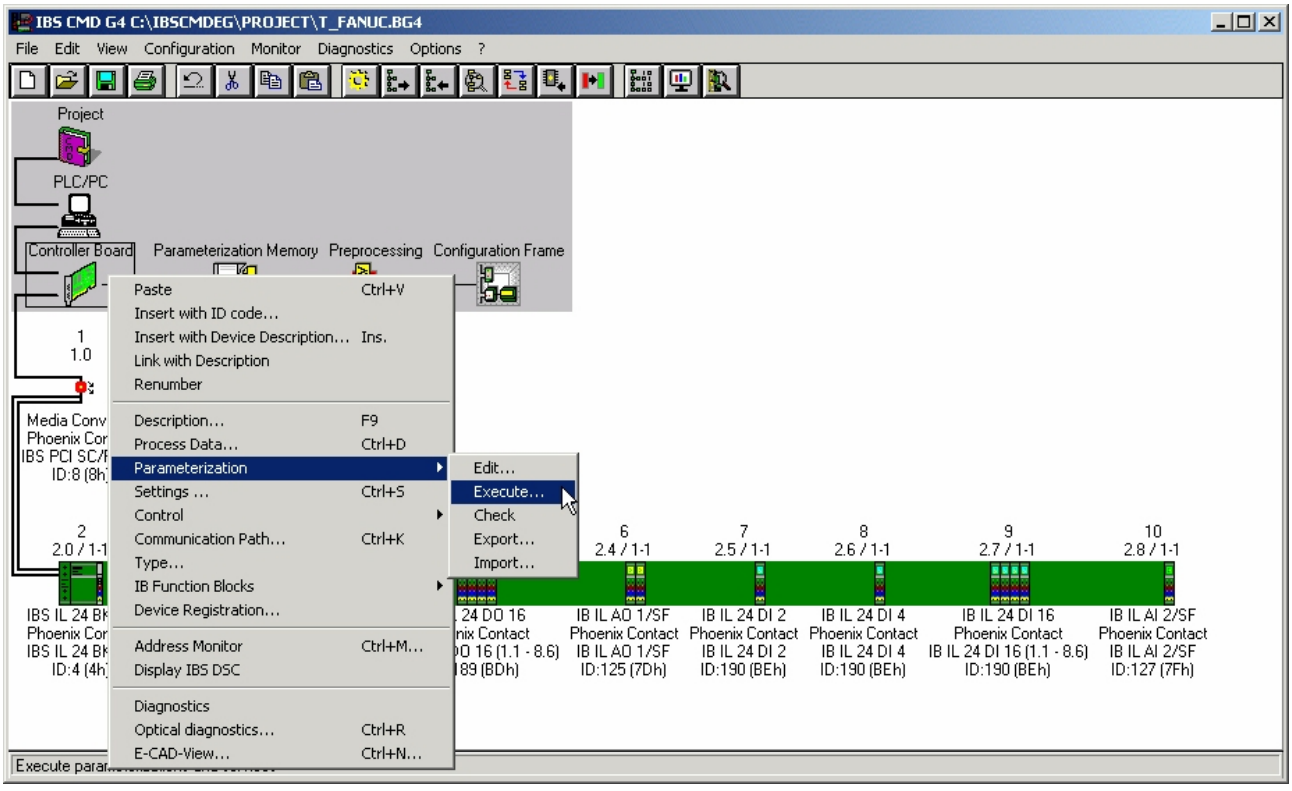
8.2.3 Executing the Parameterization

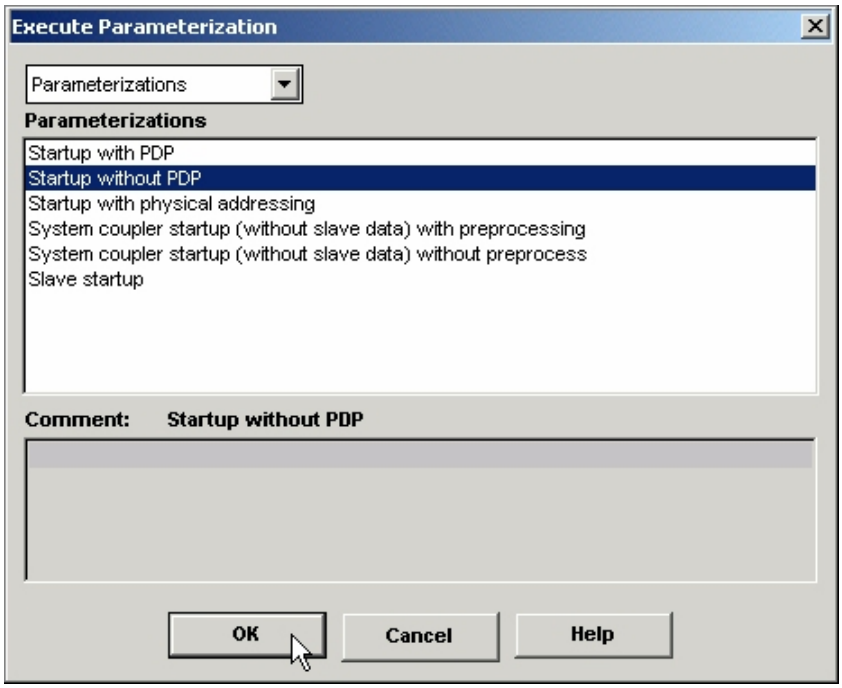
After all settings are made (e.g. configuration frame, process data, settings and so on), the parameterization of the system coupler must be done.

Procedure Executing the parameterization

Steps

1. Click on the icon “Controller Board” with the right mouse button to open a context menu.
2. Select “Parameterization ►” from this context menu and select “Execute…” from the sub menu
   ➔ the dialog box “Execute Parameterization” will be displayed.
3. Select the parameterization type in the list box “Parameterizations” .
   - It is recommended to select “Startup without PDP” for the operating mode w/o preprocessing.
   - In case that preprocessing is necessary, select “Startup with PDP”.
4. Click on the “Ok” button to start the execution.
5. A window will inform about the progress of this process.
6. If the process has finished without errors, a window will inform that the execution was successful.
   If any error has occurred, a window with the error cause will be displayed.





8.3 SPECIAL SETTINGS

NOTE
All settings in this chapter will only be set to the system coupler when “Execute Parameterization” is performed. Refer to “8.2.3 Executing the parameterization” for more information.

8.3.1 Process Data

The I/O assignment in the robot operation mode “CMD” must be done via CMD. This will be done with the “process data”. The process data will assign the I/Os of each device (including the I/Os from the slave board) to the MPM. The assignment of the MPM to the I/O ports at the robot controller is done by 1:1. Please see “6.4 InterBus I/O assignment in CMD mode” for more information.

Procedure Opening the process data window

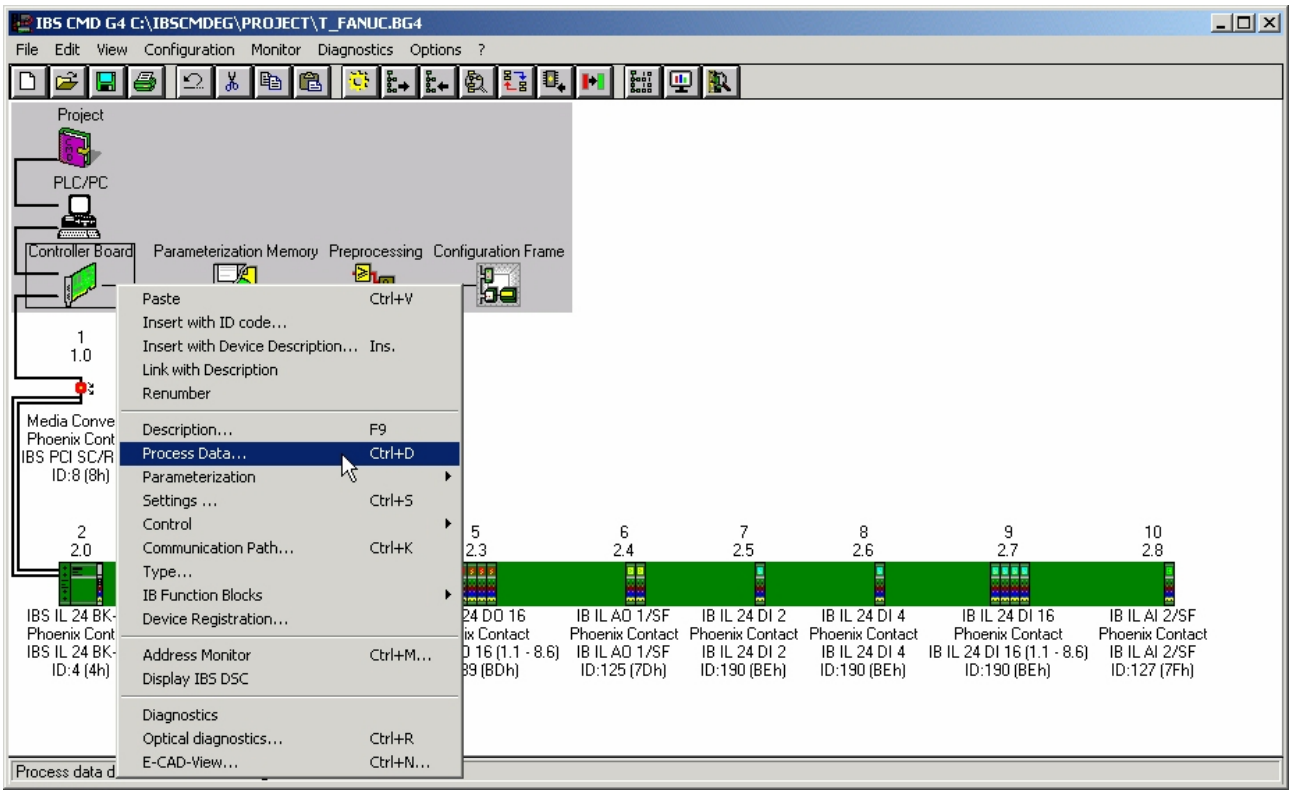
Steps

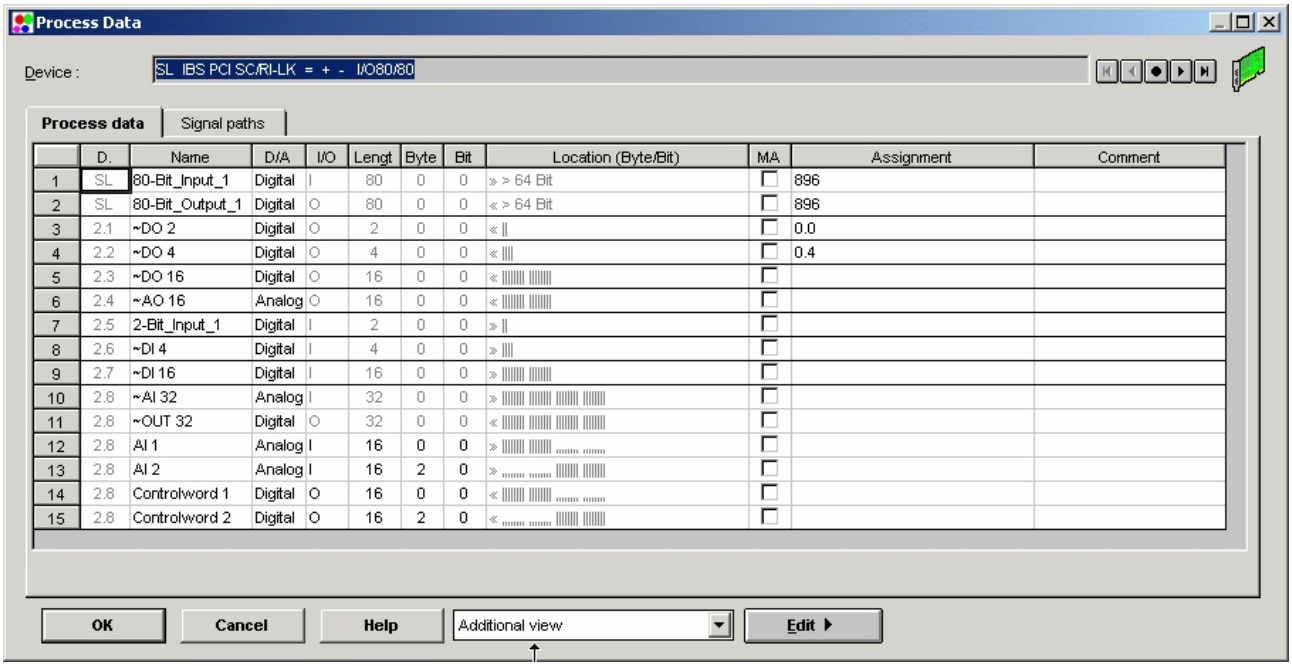
1. Click on the icon “Controller Board” with the right mouse button to open a context menu.
2. Select “Process Data…” from this context menu
   ➔ the window “Process Data” will be displayed.
3. In this window the assignment between each device and the MPM can be made.
4. After all assignments are made, click on the “OK” button.

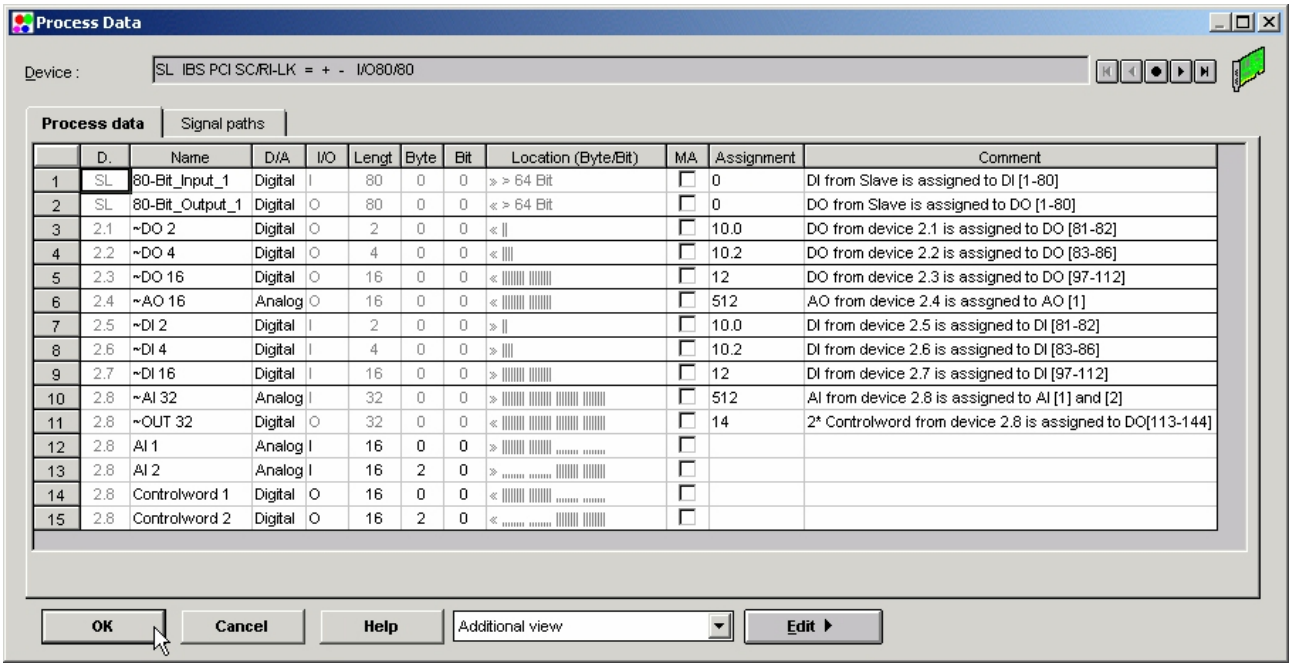
All configured devices and the slave board will be displayed in the window “Process Data”.
Set the MPM address in the column “Assignment” to the address to which this device should be mapped to. The address has 2 possible notifications. First is the byte address. This can be used for devices with a process data length of more than 1 byte. For devices with a process data length less than 1 byte, the notification is “Byte.Bit”.
When the configuration frame has been created automatically, a default assignment will be made by the system coupler. If this default assignment should be changed, please delete the assignment first.

NOTE

1. The default assignment of the slave board is in an area where robot does not update this I/O data. Change the assignment for the slave board (SL) in case that the robot controller should update the I/Os from the slave. Please refer to “6.4 InterBus I/O assignment in CMD mode” to get more information about the possible array of process data.
2. A separate window with possible and free MPM addresses can be displayed by selecting the field of the column “Assignment” and the row with the selected device. Press the right mouse button, a context menu will be displayed. Choose the item “Assignment…” to open a dialog box.
3. The digital I/O area is from byte address 0 to (“InterBus digital port” divided by 8) The analog I/O area is from byte address 512 to (512 + “InterBus analog port” * 2 - 1)







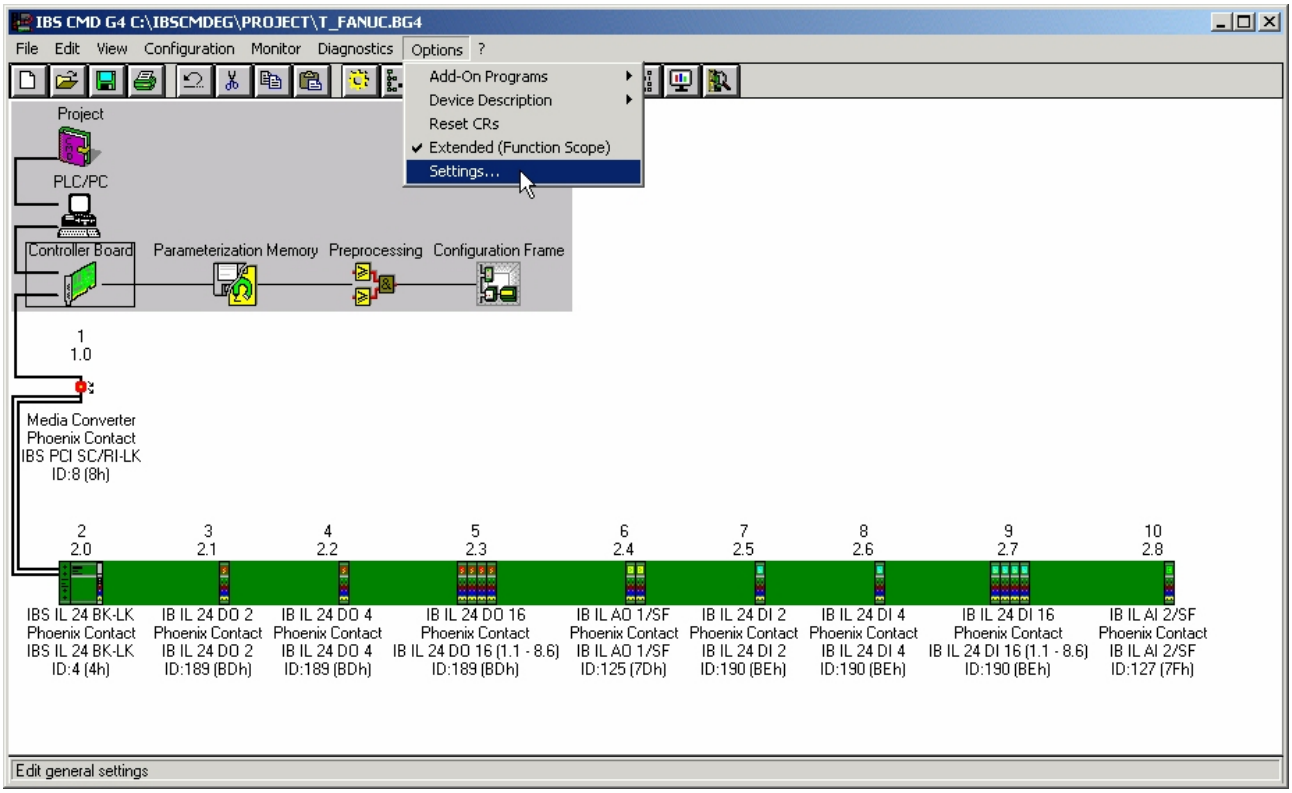
8.3.2 Service-Info

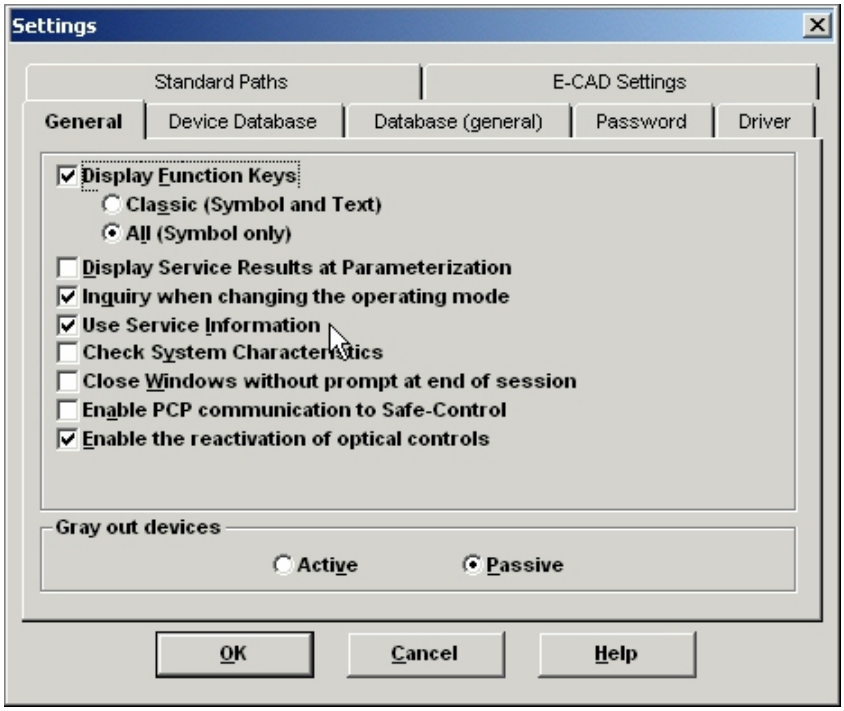
The Service-Info is used to create a relationship to a device name which is stored in the robot controller. Before the Service-Info is typed in, a setting in the options of CMD must be done.

Procedure 1 Setting to enable the field Service-Info

Steps

1. Select the item “Settings…” from the main menu
   ➔ the window “Settings” will be displayed.
2. Select the tab sheet “General” when another tab sheet is displayed.
3. Enable the click box “Use Service-Information”.
4. Close the window by click on the “OK” button.

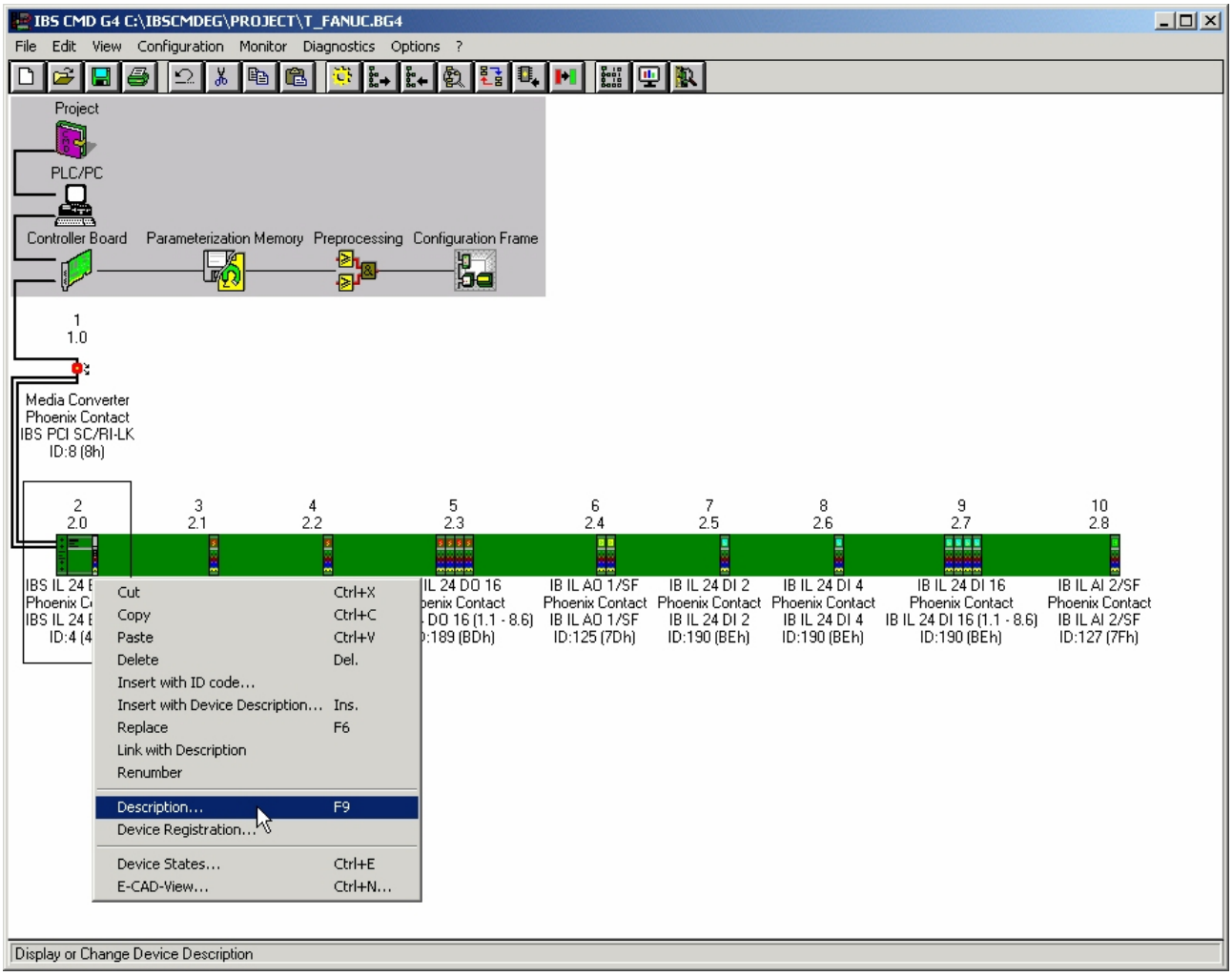


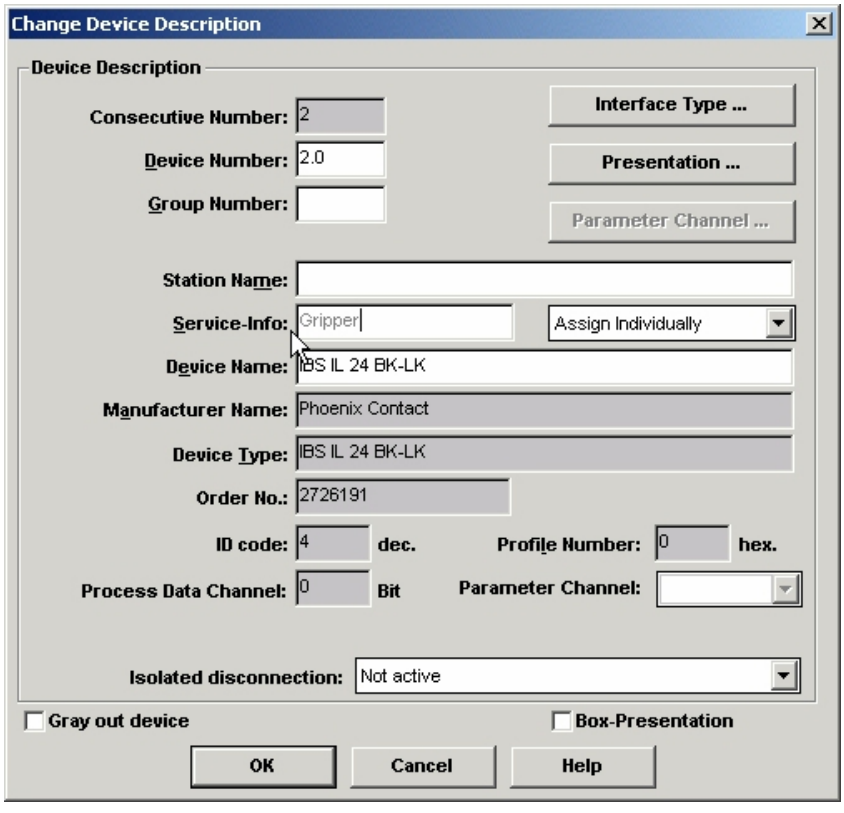


Procedure 2 Typing in the Service-Info

Steps

1. Click on the icon of the device where the Service-Info should be typed in with the right mouse button to open a context menu.
2. Select “Description…” from this context menu
   ➔ the window “Change Device Description” will be displayed.
3. Type in the service-info for this device in the edit box “Service-Info” .
4. Close the window by click on the “OK” button.


IBS CMD G4 C:\IBSCMDEG\PROJECT\T_FANUC.BG4
File Edit View Configuration Monitor Diagnostics Options ?
Project
PLC/PC
Controller Board
Parameterization Memory
Preprocessing
Configuration Frame
1
1.0
Media Converter
Phoenix Contact
IBS PCI SC/RI-LK
ID:8 (8h)
2 2.0
3 2.1
4 2.2
5 2.3
6 2.4
7 2.5
8 2.6
9 2.7
10 2.8
IB IL AO 1/SF
Phoenix Contact
IB IL AO 1/SF
ID:125 (7Dh)
IB IL 24 DI 2
Phoenix Contact
IB IL 24 DI 2
ID:190 (BEh)
IB IL 24 DI 4
Phoenix Contact
IB IL 24 DI 4
ID:190 (BEh)
IB IL 24 DI 16
Phoenix Contact
IB IL 24 DI 16 (1.1 - 8.6)
ID:190 (BEh)
IB IL AI 2/SF
Phoenix Contact
IB IL AI 2/SF
ID:127 (7Fh)
Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Delete Del.
Insert with ID code...
Insert with Device Description... Ins.
Replace F6
Link with Description
Renumber
Description... F9
Device Registration...
Device States... Ctrl+E
E-CAD-View... Ctrl+N...
Display or Change Device Description


Change Device Description
Device Description
Consecutive Number: 2
Device Number: 2.0
Group Number:
Interface Type ...
Presentation ...
Parameter Channel ...
Station Name:
Service-Info: Gripper
Assign Individually
Device Name: IBS IL 24 BK-LK
Manufacturer Name: Phoenix Contact
Device Type: IBS IL 24 BK-LK
Order No.: 2726191
ID code: 4 dec.
Profile Number: 0 hex.
Process Data Channel: 0 Bit
Parameter Channel:
Isolated disconnection: Not active
Gray out device
Box-Presentation
OK
Cancel
Help

8.3.3 Alternative Group Number

The alternative group number is used to connect and disconnect one or more devices. This function is usually used at robots with a tool changing system.

Procedure Setting the alternative group number

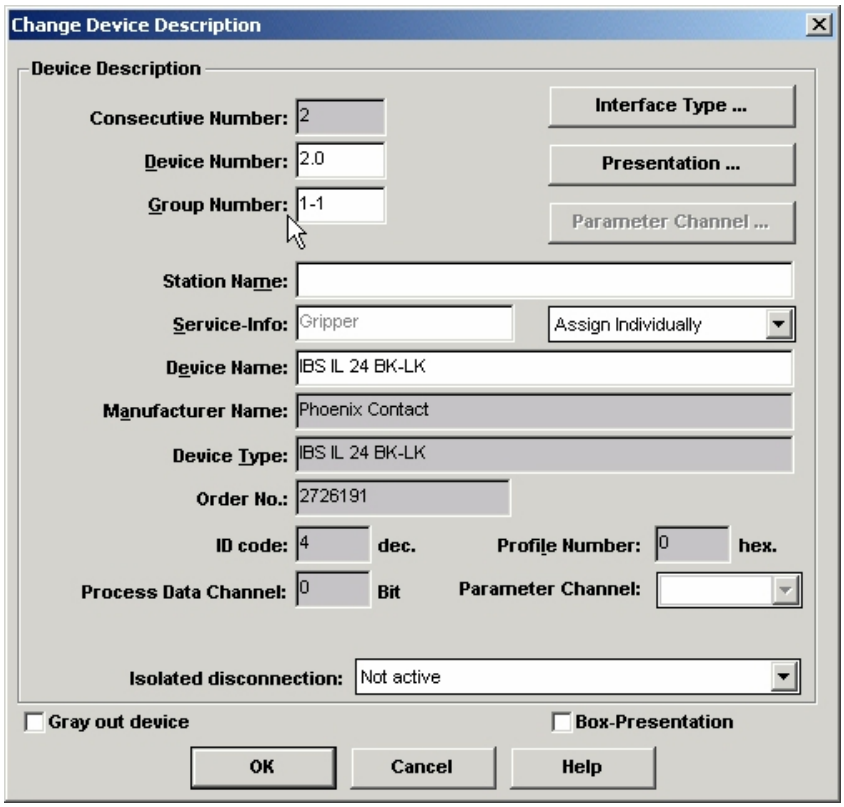
Steps

1. Click on the icon of the device where the alternative group number should be typed in with the right mouse button to open a context menu.
2. Select “Description…” from this context menu
   ➔ the window “Change Device Description” will be displayed.
3. Type in the alternative group number for this device in the edit box “Group Number” .
4. Close the window by click on the “OK” button.

The notation is “X-Y”; where as X is the group number and Y is the alternative number.
The group number has a range from 1 to 254. Do not use 0 for a group number.
The alternative number has a range from 1 to 254. Do not use 0 for an alternative number.

> ⚠ **WARNING**
> The alternative number 0 can cause problems and must not be used in robot applications.
> Never set the alternative number to 0.

A group-alternative number of X.0 means, that this device (or devices) has to be connected to the network when the data transfer starts.



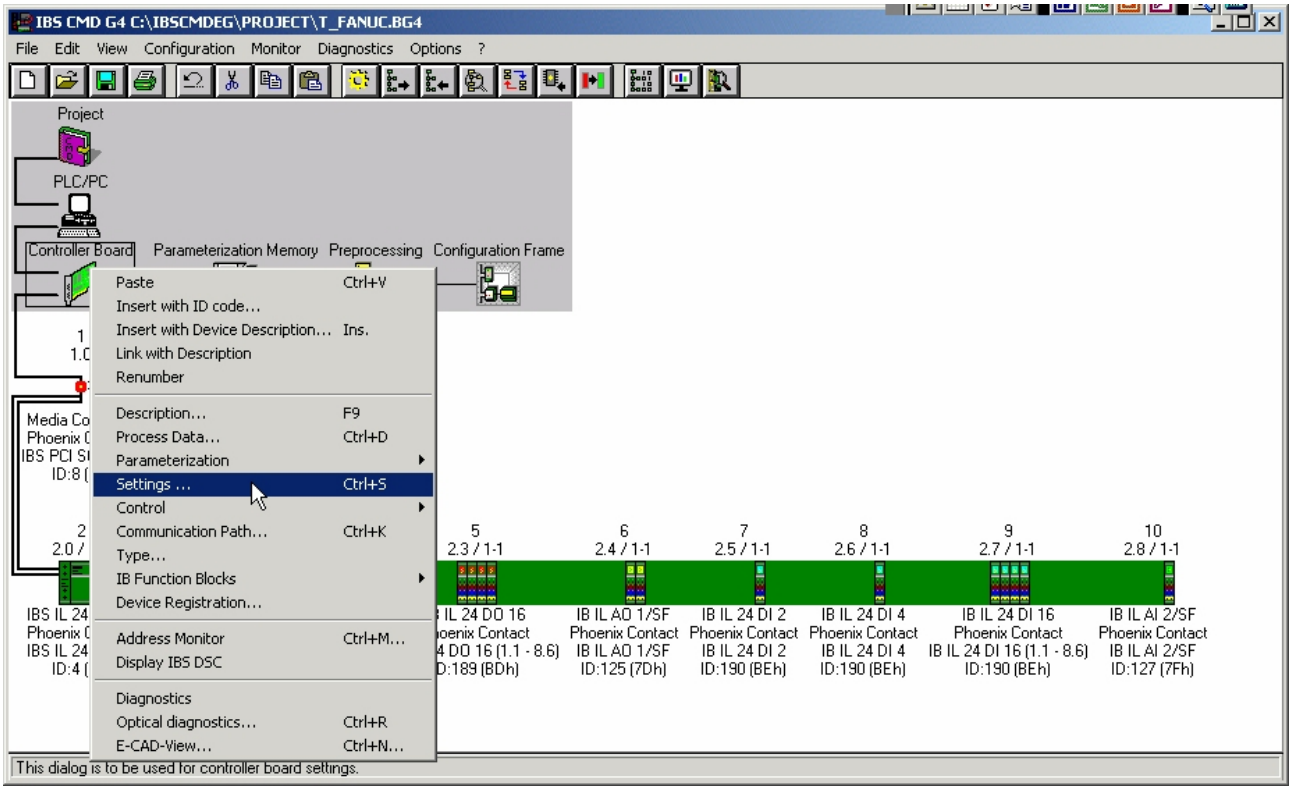
8.3.4 Settings of the Controller Board

Some controller board's settings can be made. Especially the slave board settings are important.

Procedure Opening the controller board setting window

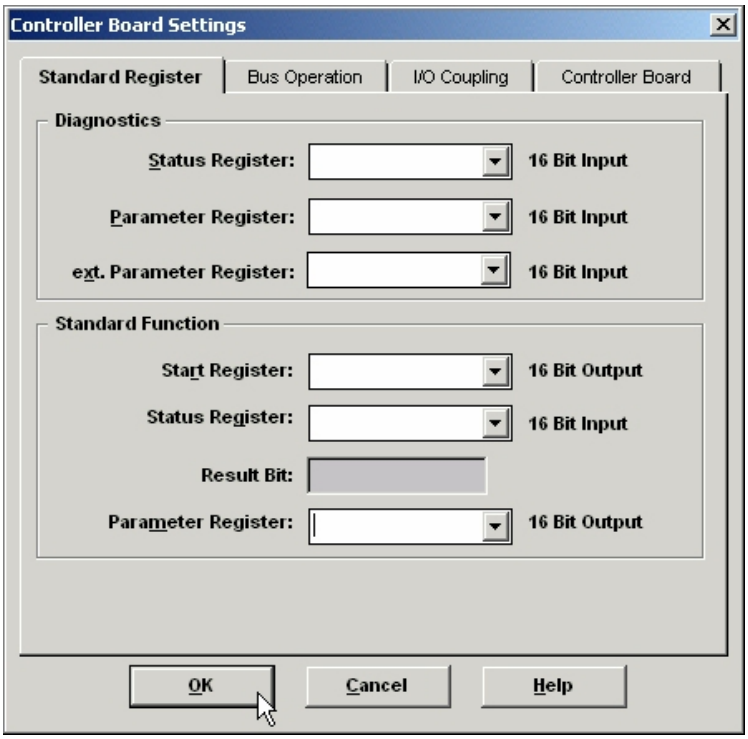
Steps

1. Click on the icon "Controller Board" with the right mouse button to open a context menu.
2. Select "Settings…" from this context menu
   ➔ the window "Controller Board Settings" will be displayed.
3. In this window, 4 tab sheets ("Standard Register", "Bus Operation", "I/O Coupling" and "Controller Board") give various possibilities for different settings.
4. After all settings are made, click on the "OK" button.



NOTE
All following pictures of the window "Controller Board Settings" shows example settings.

At the tab sheet "Standard Register", set the MPM address for the diagnostic register and standard functions. For more information about "Standard Register" settings, refer to the document of Phoenix Contact.

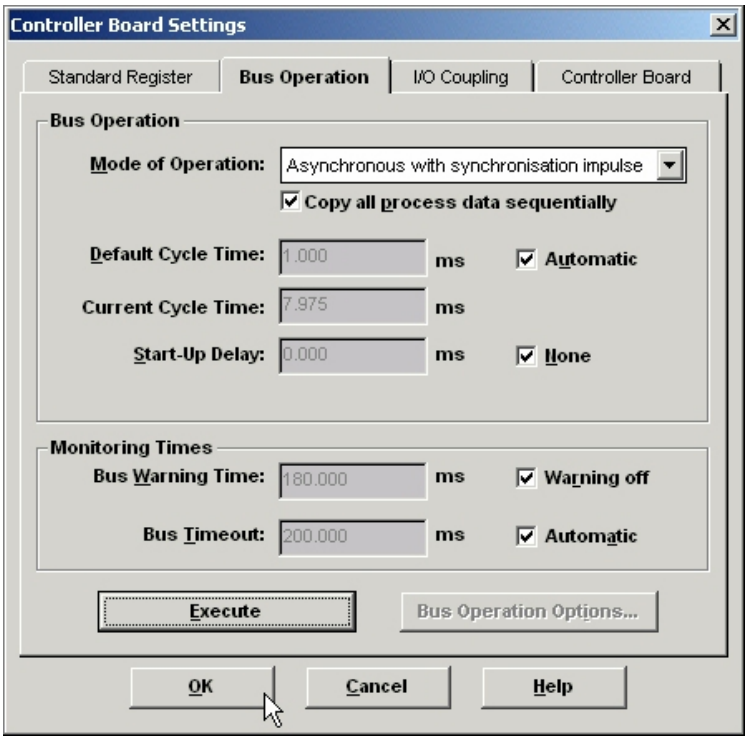


At tab sheet “Bus Operation”, set only in the group box “Monitoring Times” the requested settings.
For more information about “Bus Operation” settings, refer to the description of Phoenix Contact.

NOTE

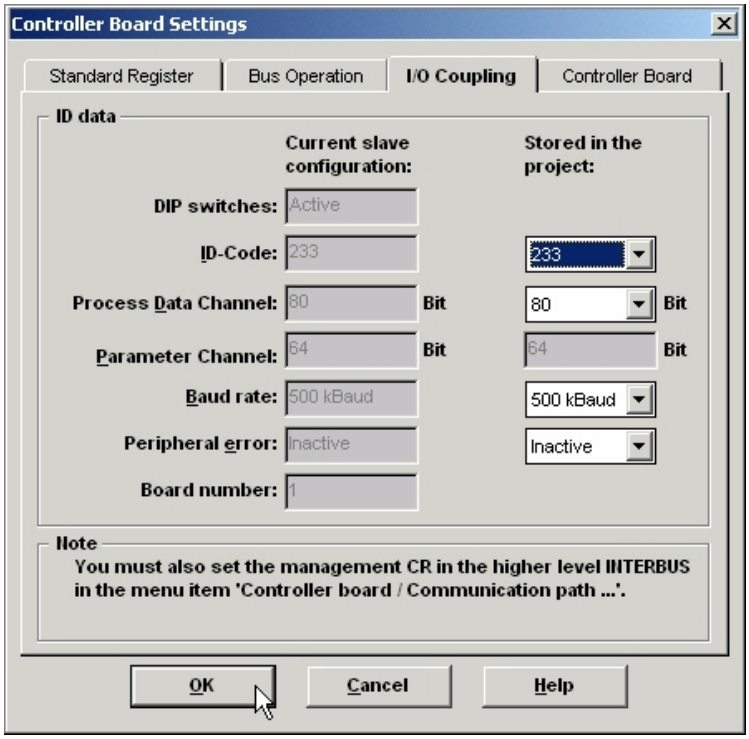
Set all entries in the group box “Bus Operations” to the settings which are shown in example picture.

Do not disturb when the value “1.000 ms” is displayed in “Default Cycle Time:”.

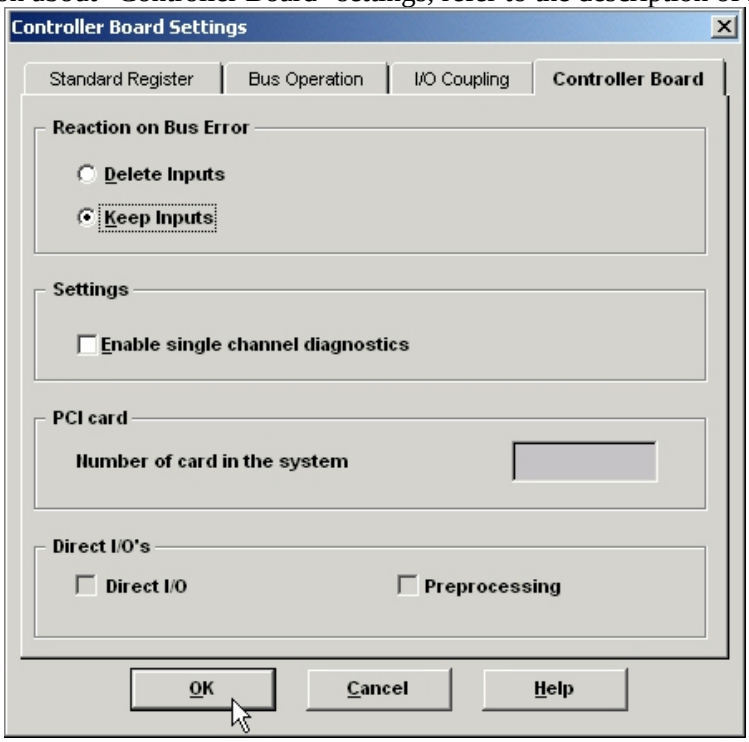


At the tab sheet “I/O Coupling”, set the settings for the slave board.
For more information about “I/O Coupling” settings, refer to the description of Phoenix Contact.

NOTE
When the word “Active” will be displayed for “DIP switches:”, the setting for the “Baud rate:” does not set the current baud rate. Refer to “4.4 Slave board DIP switch” for more information.



At the tab sheet “Controller Board”, set the requested settings.
For more information about “Controller Board” settings, refer to the description of Phoenix Contact.



8.4 OPERATIONS FOR THE SVC FILE

This section describes the operations for the SVC file. These operations assume that all necessary settings are made.

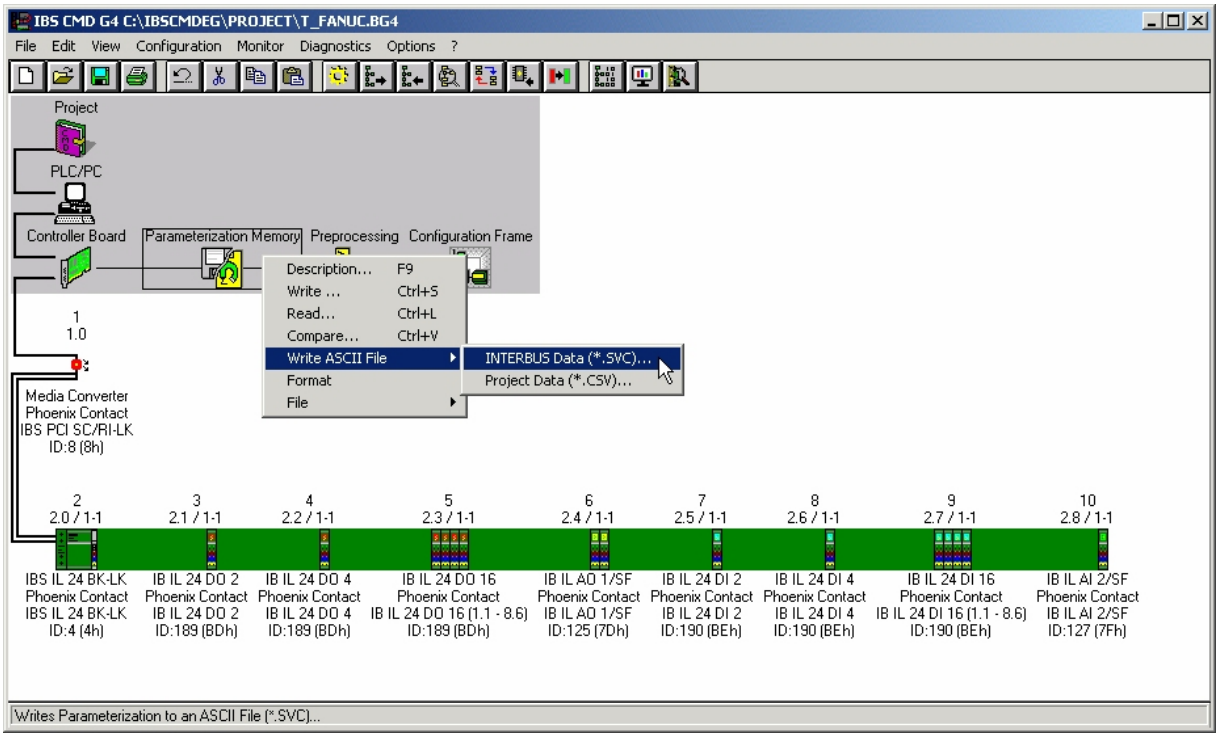
8.4.1 Creating the SVC File

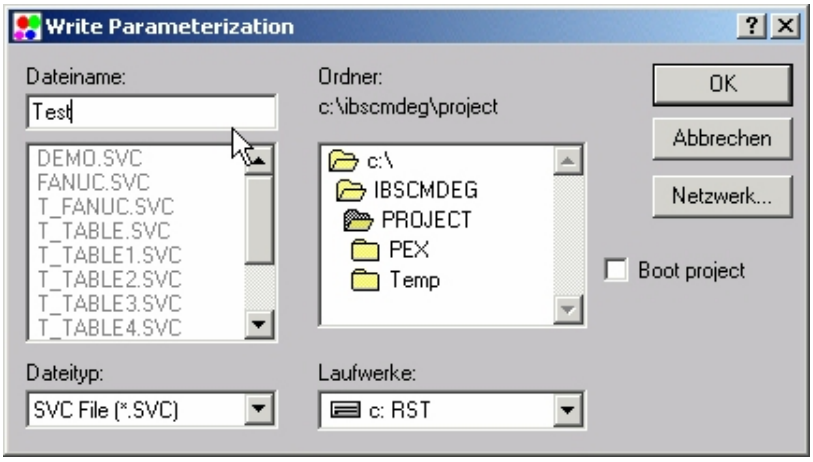
To create and save the SVC file at the PC, follow the procedure below.

Procedure Creating the SVC file

Steps

1. Click on the icon “Parameterization Memory” with the right mouse button to open a context menu.
2. Select “Write SVC File ►” from this context menu and select “INTERBUS Data (*.SVC)…” from the sub menu
   ➔ the dialog box “Write Parameterization” will be displayed.
3. Type in or choose the file name (maybe select a separate folder).
4. Click on the “OK” button to create and write the SVC file.
5. After the SVC has been created successfully, close the window “Write SVC File … successfully created.” By click on the “OK” button.





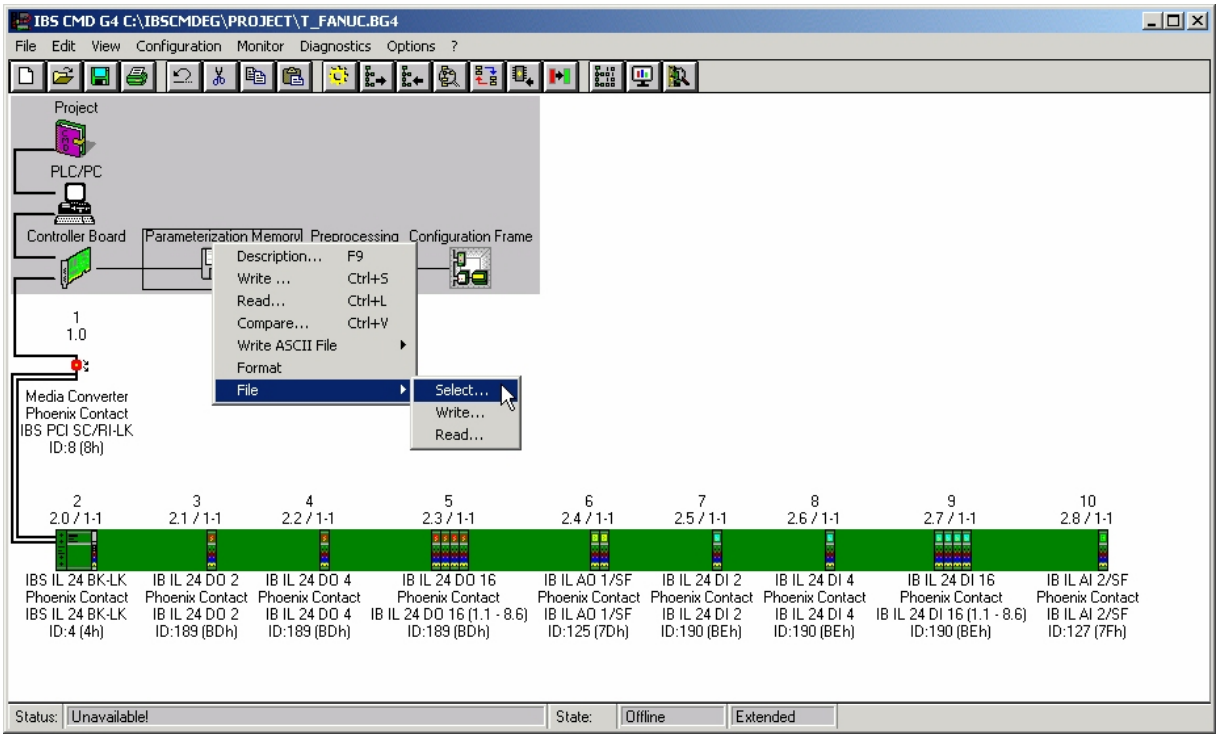
8.4.2 Selecting a File for Copy Operation to the Parameterization Memory

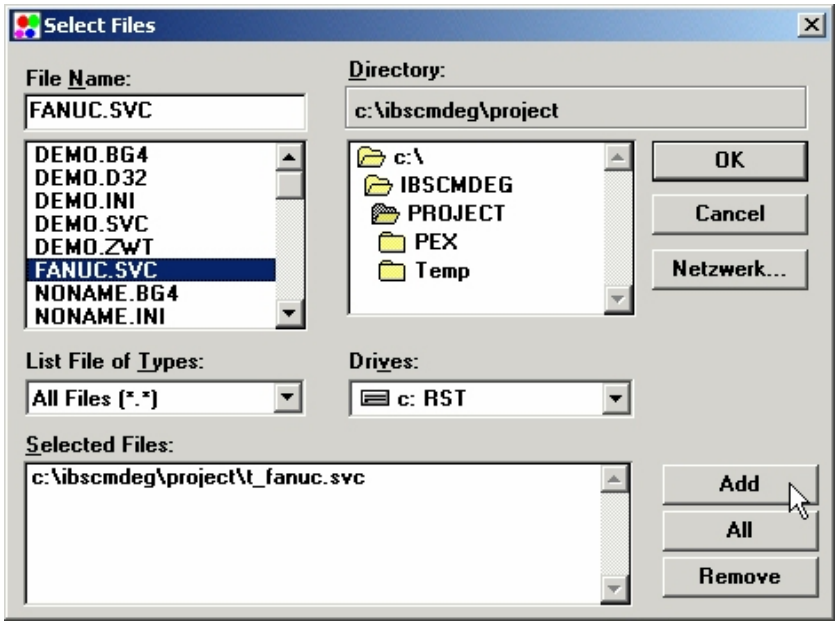
Select the SVC file which should be copied (written) to the parameterization memory.
It is also possible to copy more than the SVC file to the parameterization memory. Select all other files with this procedure as well.

Procedure Selecting a file for copy operation to the parameterization memory

Steps

1. Click on the icon “Parameterization Memory” with the right mouse button to open a context menu.
2. Select “File ►” from this context menu and select “Select…” from the sub menu
   ➔ the dialog box “Select Files” will be displayed.
3. Type in the file name or select the file from the list box, which should be copied to the parameterization memory.
4. Click on the “Add” button, the file name will be displayed in the list box “Selected files”.
5. Click on the “OK” button after the choice is made.





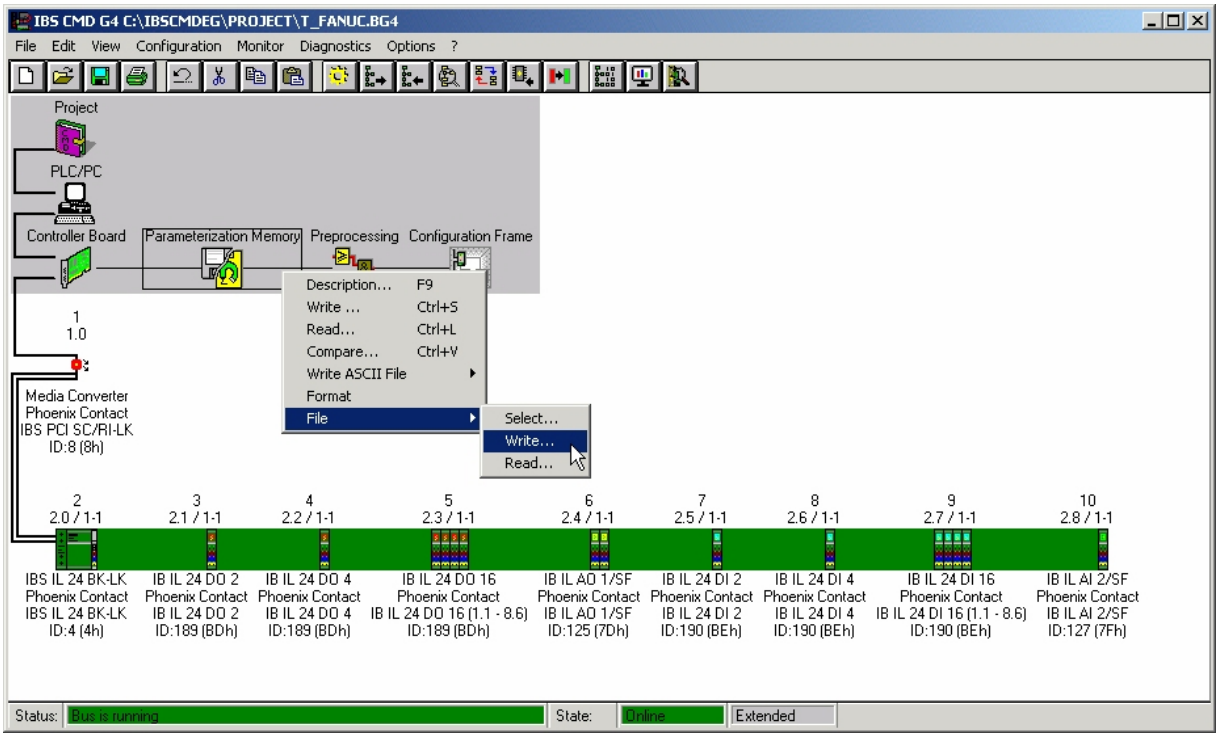
8.4.3 Copying the Selected File to the Parameterization Memory

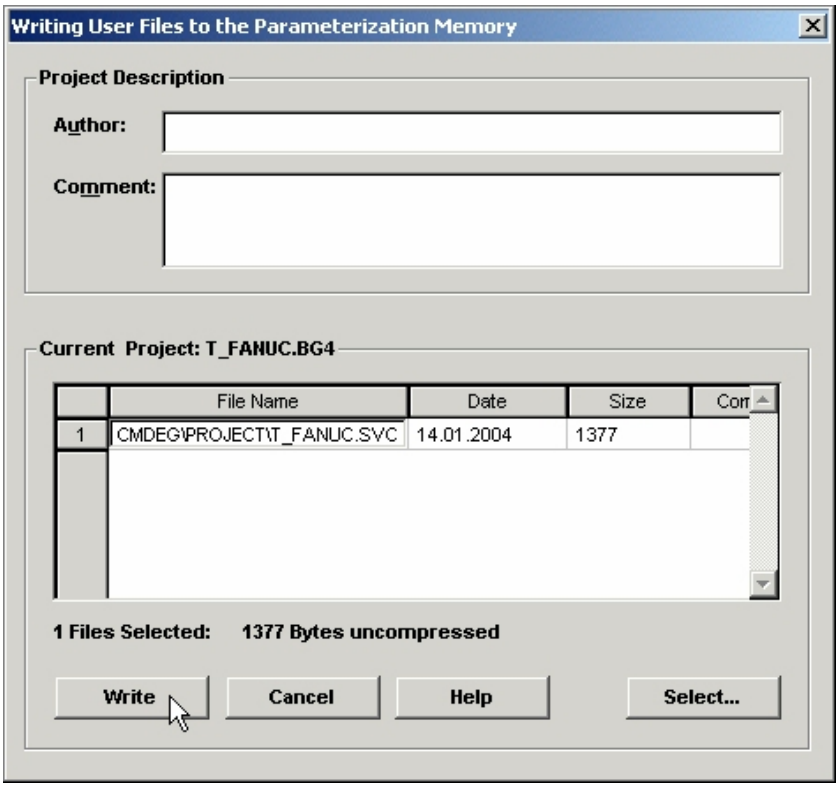
After a file (especially the SVC file) has been selected, follow the procedure below to copy this file to the parameterization memory.

Procedure Copying the selected files to the parameterization memory

Steps

1. Click on the icon “Parameterization Memory” with the right mouse button to open a context menu.
2. Select “File ►” from this context menu and select “Write…” from the sub menu
   ➔ the dialog box “Writing User Files to the Parameterization Memory” will be displayed.
3. Click on the “Write” button to start the write process.
4. A window will be opened and the current status during the copy process will be displayed.





8.5 CMD PROJECT HANDLING

The CMD project can also be stored to the parameterization memory. When the project is stored to the parameterization memory, it can be reloaded for modifications. This is especially useful for modifications of this project at a later time.

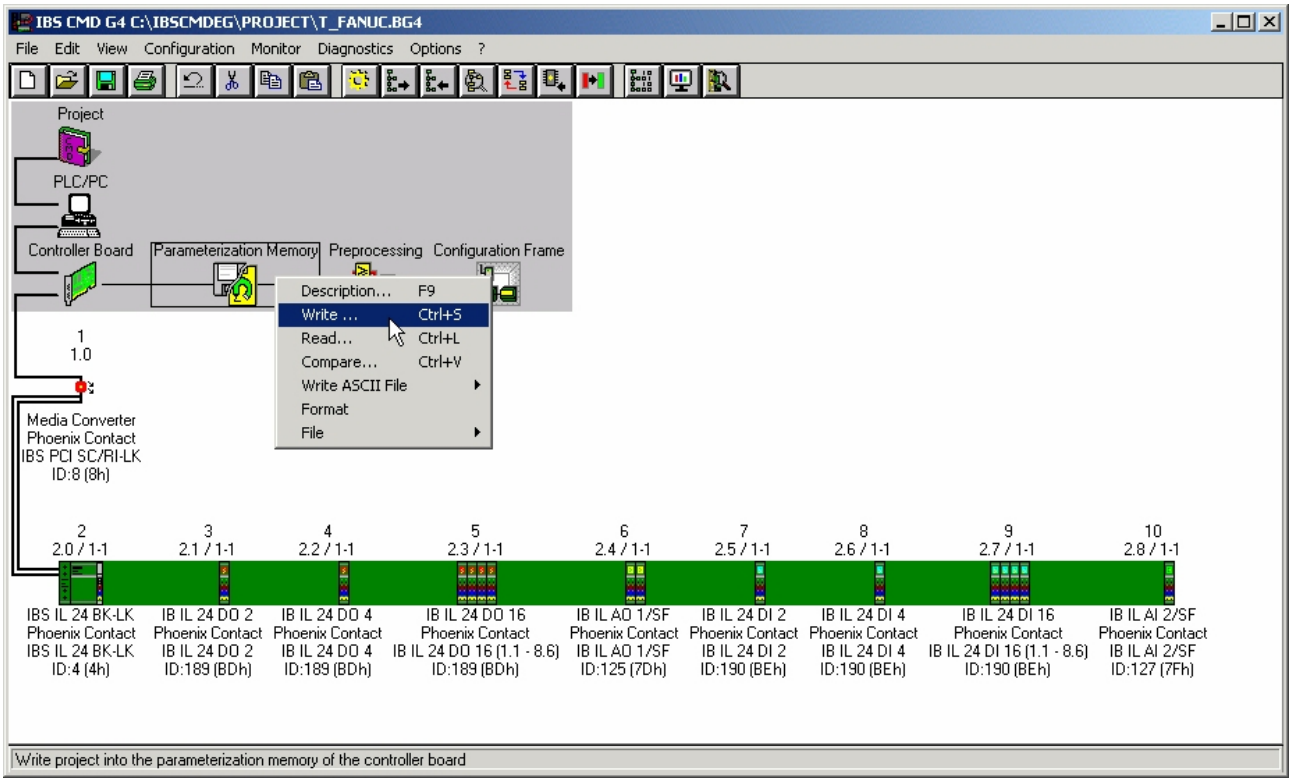
All files in the parameterization memory can be saved via the robot controller by choosing “BackUp Board Files” on the screen “CMD: Master control”.

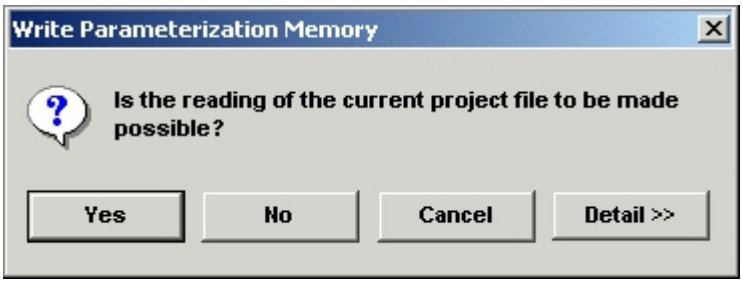
8.5.1 Storing the CMD Project Files to the Parameterization Memory

Procedure Storing the CMD project files to the parameterization memory

Steps

1. Click on the icon “Parameterization Memory” with pressing the right mouse button to open a context menu.
2. Select “Write…” from this context menu
   ➔ the dialog box “Write Parameterization Memory” will be displayed.
3. Click on the “YES” button to make it possible that the current project can be read.
4. A window will inform about the status during this process.
5. Close the confirmation windows for a successful process by click on the “OK” button.



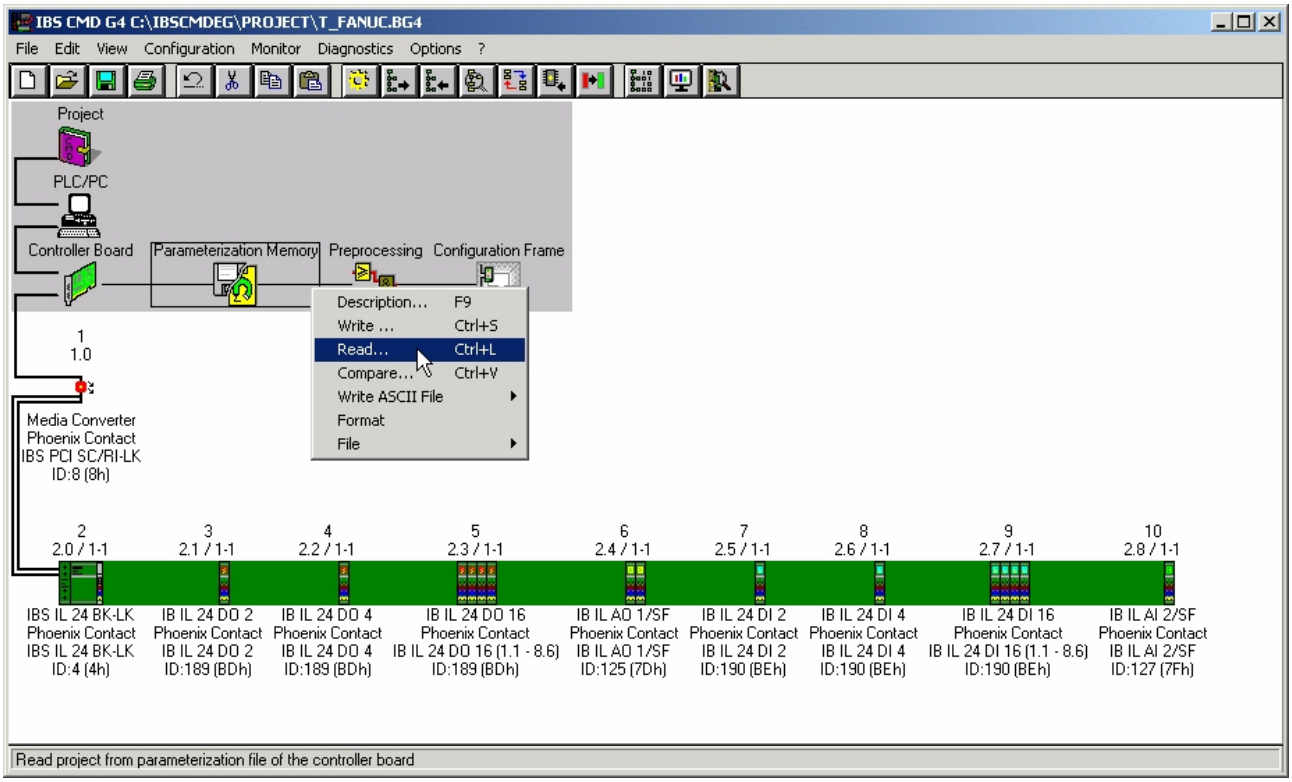


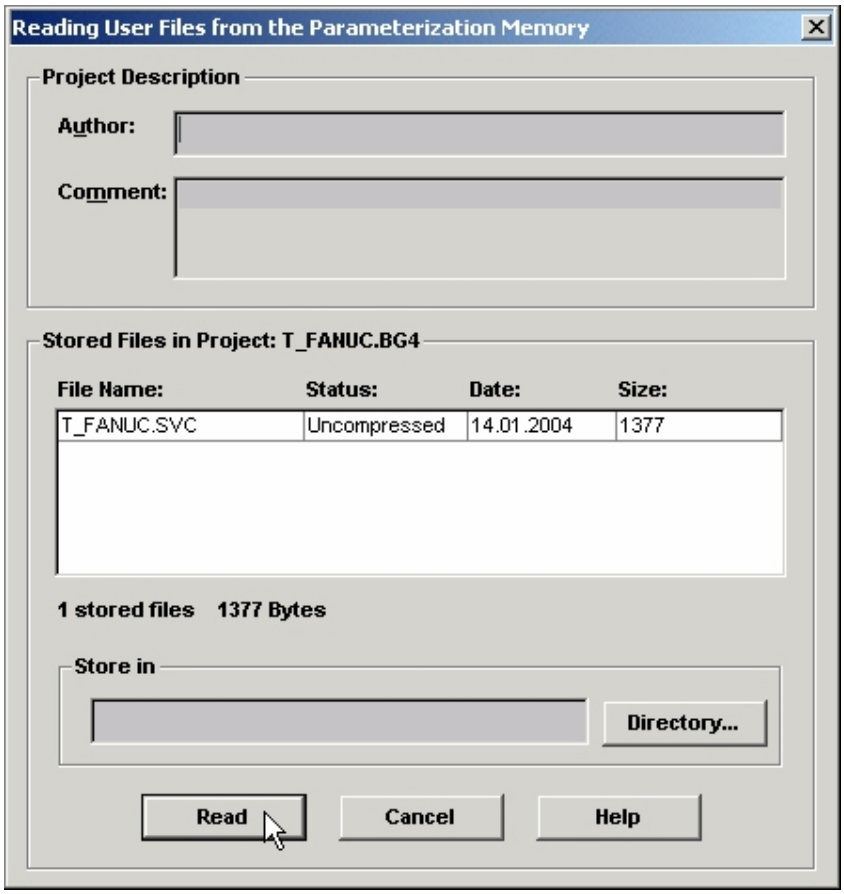
8.5.2 Reading the CMD Project Back from the Parameterization Memory

Procedure Reading the CMD project back from the parameterization memory

Steps

1. Click on the icon “Parameterization Memory” with the right mouse button to open a context menu.
2. Select “Read…” from this context menu
   ➔ the dialog box “Read Parameterization Memory” will be displayed.
3. Click on the “Read” button to start the reload process.
4. If the separate dialog box, “Read Parameterization Memory” with the warning message “Warning, a project file with the same name already exist” will be displayed, choose your option for “Overwrite”, “New Name” or “Cancel”.
5. A window will inform about the status during this process.
6. If the project should be opened in CMD, click on the “Yes” button in the last dialog box . If not so, click on the “No” button.


IBS CMD G4 C:\IBSCMDEG\PROJECT\T_FANUC.BG4
File Edit View Configuration Monitor Diagnostics Options ?
Project
PLC/PC
Controller Board
Parameterization Memory
Preprocessing
Configuration Frame
Description... F9
Write ... Ctrl+S
Read... Ctrl+L
Compare... Ctrl+V
Write ASCII File
Format
File
1
1.0
Media Converter
Phoenix Contact
IBS PCI SC/RI-LK
ID:8 (8h)
2 2.0 / 1-1 IBS IL 24 BK-LK Phoenix Contact IBS IL 24 BK-LK ID:4 (4h)
3 2.1 / 1-1 IB IL 24 DO 2 Phoenix Contact IB IL 24 DO 2 ID:189 (BDh)
4 2.2 / 1-1 IB IL 24 DO 4 Phoenix Contact IB IL 24 DO 4 ID:189 (BDh)
5 2.3 / 1-1 IB IL 24 DO 16 Phoenix Contact IB IL 24 DO 16 (1.1 - 8.6) ID:189 (BDh)
6 2.4 / 1-1 IB IL AO 1/SF Phoenix Contact IB IL AO 1/SF ID:125 (7Dh)
7 2.5 / 1-1 IB IL 24 DI 2 Phoenix Contact IB IL 24 DI 2 ID:190 (BEh)
8 2.6 / 1-1 IB IL 24 DI 4 Phoenix Contact IB IL 24 DI 4 ID:190 (BEh)
9 2.7 / 1-1 IB IL 24 DI 16 Phoenix Contact IB IL 24 DI 16 (1.1 - 8.6) ID:190 (BEh)
10 2.8 / 1-1 IB IL AI 2/SF Phoenix Contact IB IL AI 2/SF ID:127 (7Fh)
Read project from parameterization file of the controller board

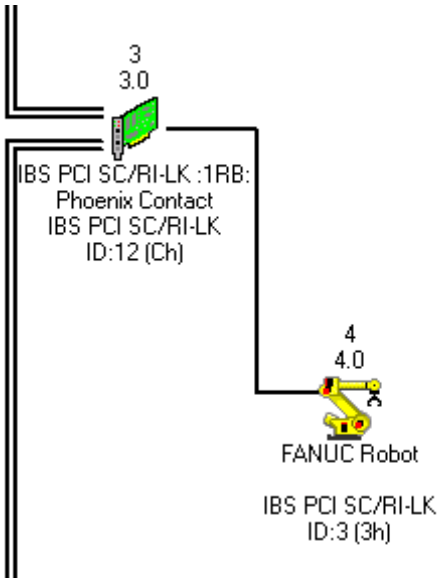

Reading User Files from the Parameterization Memory
Project Description
Author:
Comment:
Stored Files in Project: T_FANUC.BG4
File Name: Status: Date: Size:
T_FANUC.SVC Uncompressed 14.01.2004 1377
1 stored files 1377 Bytes
Store in
Directory...
Read
Cancel
Help

8.6 REPRESENTATION OF SYSTEM COUPLER BOARD IN CMD TOOL

8.6.1 Representation of Slave Board at the Higher Master

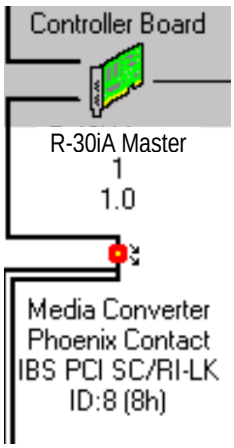
To communicate with higher master, robot uses slave board of the system coupler. The slave board is represented as two devices at the higer master. The first device has ID code = 12 (Ch) without any process data. For the second device, ID code and process data length are variable.

NOTE
The icon for the FANUC robot is available in icon collection “Phoenix.ICL” as icon no. 750. This icon fits for the second device of the system coupler.



8.6.2 Representation of Optical Master Board (IBS PCI SC/RI-LK)

On the master board of optical fiber interface (IBS PCI SC/RI-LK), a slave device is integrated as a media converter to get the OPC functionality for the master board. The slave device is represented as the first slave module that has ID code = 8 (8h) and no process data.



9 PCP FUNCTION

9.1 OVERVIEW OF THE PCP FUNCTIONALITY

The robot controller with the InterBus system coupler works as a PCP server. The system coupler has the process data of the master and the slave on its Multi Port Memory (MPM). The PCP function enables higher control systems to access the MPM of the system coupler directly as a PCP client.

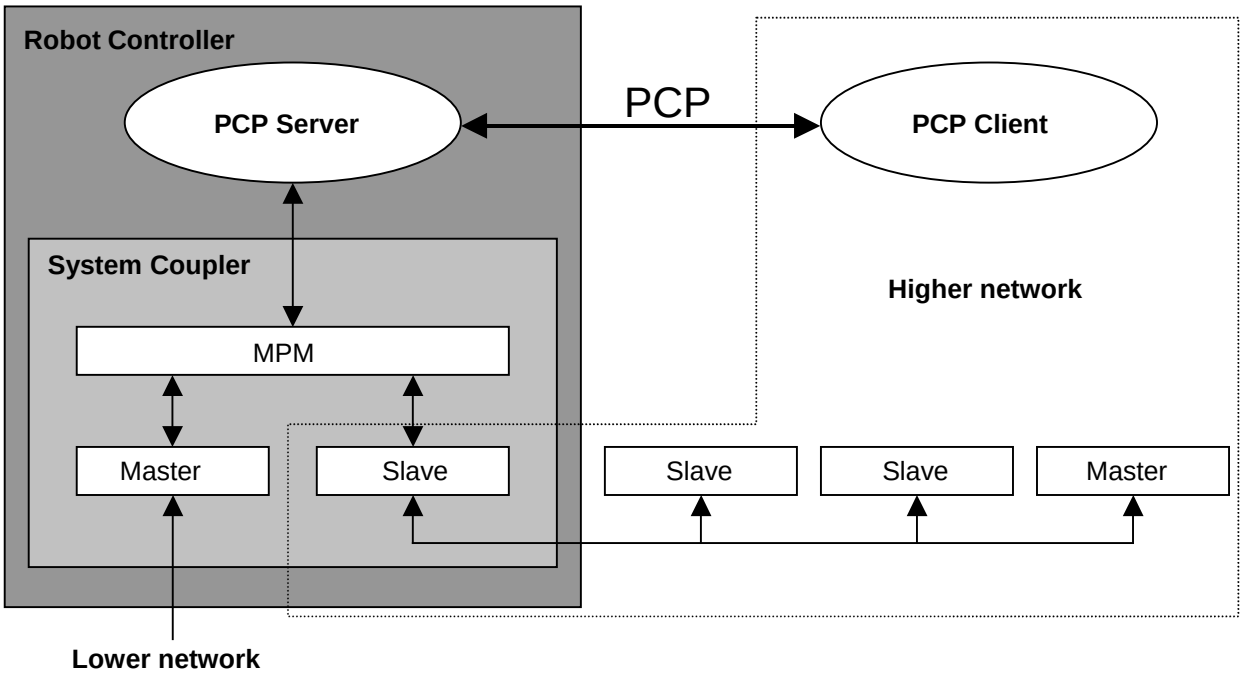


Fig 9.1 Overview of the PCP functionality

The PCP server function is implemented in the system coupler and in the robot software to support PCP services. The PCP server supports the following services :

- Read
- Write
- Initiate
- Abort
- Reject

9.2 OBJECT PROPERTIES FOR THE PCP FUNCTIONALITY

To access the MPM, the following predefined objects must be used:

Table 9.2 (a) PCP objects

Index	Type	Object	Name
0x5FFF	(Byte)	Max. 240 Byte	IO-MPM-Access
0x5FFE	(Byte)	Max. 240 Byte	IO-MPM-Access Parameters

NOTE
The default PDU-Size from the system coupler (slave part) is 64 byte. After the configuration at the master is done, the PDU size will be set to 246 byte for the slave.

The operator must change the PDU size at higher Master also to 246 bytes, before communication can be established.

Inside the MPM, there are 4096 byte, both Input and Output data. Several PCPs have to be sent to transfer this data using a PCP channel. The range of 4096 Bytes is segmented by the subindex (range of values 0 - 255), which is realized by means of 32 packets, each having a size of 128 bytes (see table 9.2 and table 9.3). By using the configuration objects (see table 9.4), the transferred data amount will be optimally adapted to the specific requirements. If, for example, the MPM-range of 0-174 = 87 words should be transferred, it can be exactly set using the object 5FFE Subindex 1.

The read access then occurs on the object 5FFF Subindex 0. If the object 5FFE Subindex 1 is not configured, the MPM default-range of 0 –239 will be transferred.

Table 9.2 (b) Reading the MPM Input data area from address 1000hex

Index	Subindex	MPM-Range	Length	Access
0x5FFF	0	adjustable through object 5FFE Subindex 1	variable by maximum 240 byte	Read-Only
0x5FFF	1	0-127	128 Byte	Read-Only
0x5FFF	2	128-255	128 Byte	Read-Only
0x5FFF	3	256-384	128 Byte	Read-Only
0x5FFF	4	384-511	128 Byte	Read-Only
0x5FFF	5	512-639	128 Byte	Read-Only
0x5FFF	6	640-767	128 Byte	Read-Only
0x5FFF	7	768-895	128 Byte	Read-Only
0x5FFF	8	896-1023	128 Byte	Read-Only
0x5FFF	9	1024-1151	128 Byte	Read-Only
0x5FFF	10	1152-1279	128 Byte	Read-Only
0x5FFF	11	1280-1407	128 Byte	Read-Only
0x5FFF	12	1408-1535	128 Byte	Read-Only
0x5FFF	13	1536-1663	128 Byte	Read-Only
0x5FFF	14	1664-1791	128 Byte	Read-Only
0x5FFF	15	1792-1919	128 Byte	Read-Only
0x5FFF	16	1920-2047	128 Byte	Read-Only
0x5FFF	17	2048-2175	128 Byte	Read-Only
0x5FFF	18	2176-2303	128 Byte	Read-Only
0x5FFF	19	2304-2431	128 Byte	Read-Only
0x5FFF	20	2432-2559	128 Byte	Read-Only
0x5FFF	21	2560-2687	128 Byte	Read-Only
0x5FFF	22	2688-2815	128 Byte	Read-Only
0x5FFF	23	2816-2943	128 Byte	Read-Only
0x5FFF	24	2944-3071	128 Byte	Read-Only
0x5FFF	25	3072-3199	128 Byte	Read-Only
0x5FFF	26	3200-3327	128 Byte	Read-Only
0x5FFF	27	3328-3455	128 Byte	Read-Only
0x5FFF	28	3456-3583	128 Byte	Read-Only
0x5FFF	29	3584-3711	128 Byte	Read-Only
0x5FFF	30	3712-3839	128 Byte	Read-Only
0x5FFF	31	3840-3967	128 Byte	Read-Only
0x5FFF	32	3968-4095	128 Byte	Read-Only

Table 9.2 (c) Reading the MPM Output data area from address 0000hex

Index	Subindex	MPM-Range	Lenght	Access
0x5FFF	33	adjustable through object 5FFE Subindex 2	variable by maximum 240 byte	Read-Only
0x5FFF	34	0-127	128 Byte	Read-Only
0x5FFF	35	128-255	128 Byte	Read-Only
0x5FFF	36	256-384	128 Byte	Read-Only
0x5FFF	37	384-511	128 Byte	Read-Only
0x5FFF	38	512-639	128 Byte	Read-Only
0x5FFF	39	640-767	128 Byte	Read-Only
0x5FFF	40	768-895	128 Byte	Read-Only
0x5FFF	41	896-1023	128 Byte	Read-Only
0x5FFF	42	1024-1151	128 Byte	Read-Only
0x5FFF	43	1152-1279	128 Byte	Read-Only
0x5FFF	44	1280-1407	128 Byte	Read-Only
0x5FFF	45	1408-1535	128 Byte	Read-Only
0x5FFF	46	1536-1663	128 Byte	Read-Only
0x5FFF	47	1664-1791	128 Byte	Read-Only
0x5FFF	48	1792-1919	128 Byte	Read-Only
0x5FFF	49	1920-2047	128 Byte	Read-Only
0x5FFF	50	2048-2175	128 Byte	Read-Only
0x5FFF	51	2176-2303	128 Byte	Read-Only
0x5FFF	52	2304-2431	128 Byte	Read-Only
0x5FFF	53	2432-2559	128 Byte	Read-Only
0x5FFF	54	2560-2687	128 Byte	Read-Only
0x5FFF	55	2688-2815	128 Byte	Read-Only
0x5FFF	56	2816-2943	128 Byte	Read-Only
0x5FFF	57	2944-3071	128 Byte	Read-Only
0x5FFF	58	3072-3199	128 Byte	Read-Only
0x5FFF	59	3200-3327	128 Byte	Read-Only
0x5FFF	60	3328-3455	128 Byte	Read-Only
0x5FFF	61	3456-3583	128 Byte	Read-Only
0x5FFF	62	3584-3711	128 Byte	Read-Only
0x5FFF	63	3712-3839	128 Byte	Read-Only
0x5FFF	64	3840-3967	128 Byte	Read-Only
0x5FFF	65	3968-4095	128 Byte	Read-Only

Table 9.2 (d) Configuration objects - variable access

Index	Subindex	User Data Meaning	Length	Default-Value	Access
0x5FFE	1	Byte[0] = MPM-IN Startaddr. (High) Byte[1] = MPM IN Startaddr. (Low) Byte[2] = Lenght of MPM-area	3 Byte	0 0 240	Read/Write
0x5FFE	2	Byte[0] = MPM-OUT Startaddr. (High) Byte[1] = MPM-OUT Startaddr. (Low) Byte[2] = Lenght of MPM-area	3 Byte	0 0 240	Read/Write

By using the object 5FFE Subindex 10 (see table 9.5), any user data can be written into the MPM out range. The robot controller checks whether a write access for the specific MPM range is allowed.
If the write access is disabled, a negative Write_Confirmation will be sent. The interpretation of the user data is the task of the user application. For example, user data can be included into 8 byte large object numbers, or any other type of information.

Table 9.2 (e) Configuration objects - user data

Index	Subindex	User data meaning	Length	Access
0x5FFE	10	Byte[0] = MPM-Out Startaddr. (High) Byte[1] = MPM Out Startaddr. (Low) Byte[2] = Userdatas 1 ... Byte[n] = Userdatas m	variable by max. 240	Read/Write

⚠WARNING
During the process of writing to the MPM, the robot controller is also writing to the MPM.
The outputs of the robot controller can be changed through the PCP functionality. These changes can not be displayed on the user interface of the robot controller. That means that the controller is not informed about the change and that problems can occurr if, for example, the outputs are cleared by the robot controller and are set at the same time by the PCP function.

9.3 BYTE ORDER OF PCP DATA

The byte order of the PCP data is specified by $IBPX_GNE.$BYTE_ORDER2. The default value is 0. To change the byte order, set $IBPX_GNE.$BYTE_ORDER2 to 1.

Table 9.3 (a) Assignment of input data to the InterBus reference ($BYTE_ORDER2 = 0)

PCP word	Word	Word 0 (HB/LB)															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

PCP word	Word	Word 1 (HB/LB)															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 9.3 (b) Assignment of output data to the InterBus reference ($BYTE_ORDER2 = 0)

PCP word	Word	Word 0 (HB/LB)															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

PCP word	Word	Word 1 (HB/LB)															
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 9.3(c) Assignment of input data to the InterBus reference ($BYTE_ORDER2 = 1)

PCP word	Word	Word 0 (LB/HB)															
	Bit	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

PCP word	Word	Word 1 (LB/HB)															
	Bit	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Table 9.3(d) Assignment of output data to the InterBus reference ($BYTE_ORDER2 = 1)

PCP word	Word	Word 0 (LB/HB)															
	Bit	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
INTERBUS	Byte	Byte 0								Byte 1							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

PCP word	Word	Word 1 (LB/HB)															
	Bit	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
INTERBUS	Byte	Byte 2								Byte 3							
Reference	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

10 STATUS INTERBUS

10.1 STATUS SCREENS

The following figure shows a tree diagram of the sub screens that belong to InterBus status. The operator can switch between the screens in a column of the [Other] function key menu. The operator can move to and from the branched screen.

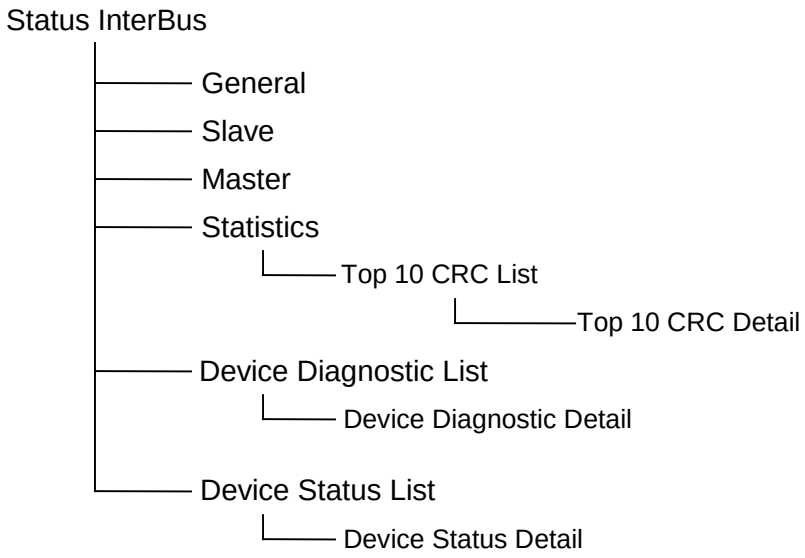


Fig 10.1 Tree diagram of the sub screens under STATUS InterBus

10.2 SUB MENU UNDER STATUS INTERBUS

The first level of the tree diagram consists of six main InterBus status screens. To switch between these screens, press F3 [Other] and select one of the screen names from the pop-up menu.

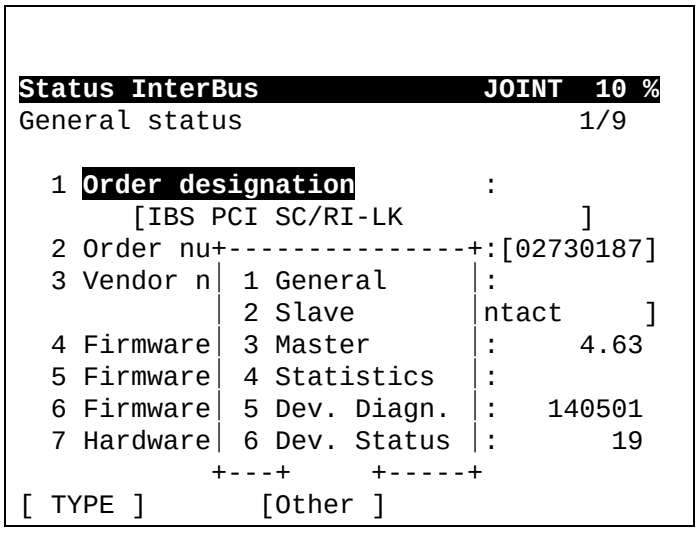


Fig 10.2 Submenu at Status InterBus

Table 10.2 Submenu under Status InterBus

#	Menu item	Description	Chapter
1	General	General settings	10.2.1
2	Slave	Slave settings	10.2.2
3	Master	Master settings	10.2.3
4	Statistics	Statistics	10.2.4
5	Diagnostic	Device diagnostic	10.2.7
6	Status	Device status	10.2.9

10.2.1 General Status Screen

This screen shows the hardware information of the system coupler and the firmware installed in the system coupler.

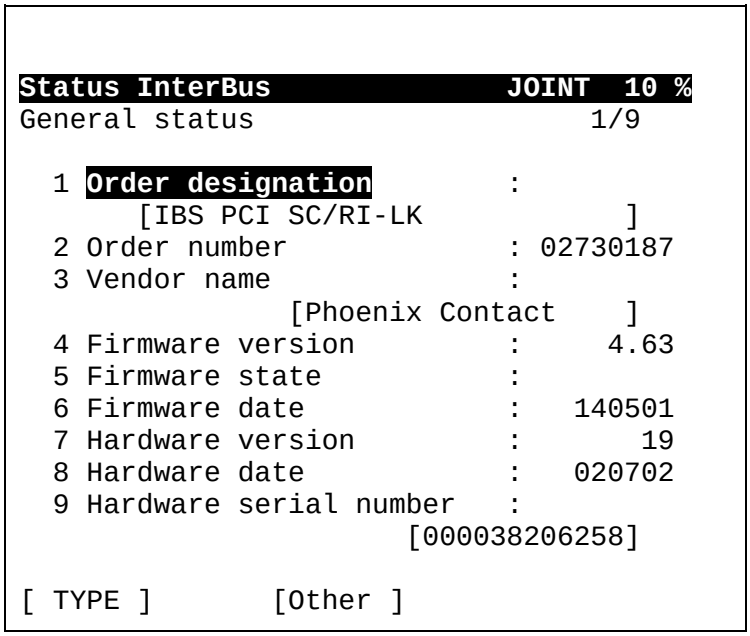


Fig 10.2.1 General status

Table 10.2.1 General status

#	TP Words	Description
1	Order designation	Order designation of the system coupler
2	Order number	Order number of the system coupler
3	Vendor name	Manufacturer of the system coupler
4	Firmware version	Version of the firmware core of the system coupler
5	Firmware State	Status of the firmware
6	Firmware Date	Creation date of the firmware
7	Hardware Version	Hardware version of the system coupler
8	Hardware Date	Manufactured date of the system coupler
9	Hardware serial number	Serial number of the system coupler

10.2.2 Slave Status Screen

This screen shows the latest information of the system coupler's slave part.

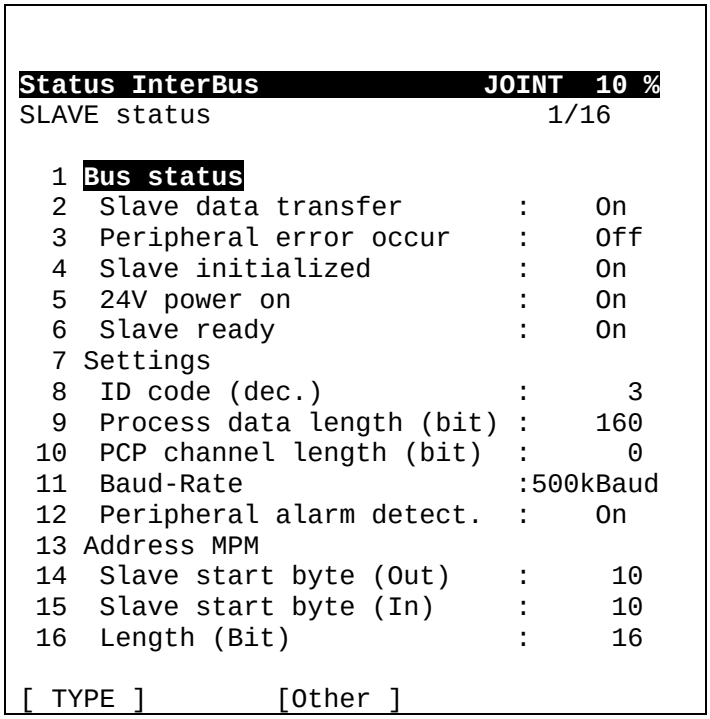


Fig 10.2.2 SLAVE status

Table 10.2.2 SLAVE Status

#	TP Words	Description
1	Bus status	
2	Slave data transfer	A data exchange takes place on the slave interface board. (Slave diagnostic register bit 0)
3	Peripheral error occur	Peripheral error (I/O error) has occurred on the system coupler's slave part. (Slave diagnostic register bit 1)
4	Slave initialized	The board initialization is complete. (Slave diagnostic register bit 2)
5	24V power on	The supply voltage is present. (Slave diagnostic register bit 3)
6	Slave ready	The slave interface board is in the state READY. (Slave diagnostic register bit 4)
7	Settings	
8	ID code (dec.)	ID code of the system coupler's slave part
9	Process data length (bit)	Process data length (bit) of the system coupler's slave part
10	PCP channel length (bit)	Parameter channel length (bit) of the system coupler's slave part
11	Baud-Rate	Baud-Rate of the system coupler's slave part
12	Peripheral alarm detect.	Peripheral alarm detection enabled
13	Address MPM	
14	Slave start byte (Out)	The MPM address of the process data output of the system coupler's slave part
15	Slave start byte (In)	The MPM address of the process data input of the system coupler's slave part
16	Length (bit)	The length of process data of the system coupler's slave part

10.2.3 Master Screen

This screen shows the latest information about the system coupler's master part.

```
Status InterBus                JOINT  10 %
MASTER status                    1/21

  1 Diagnostic status register
  2  READY                    :    On
  3  ACTIVE                   :    On
  4  RUN                      :    On
  5  DETECT                   :    Off
  6  CRTL                     :    Off
  7  BUS                      :    Off
  8  PF                       :    Off
  9  USER                     :    Off
 10  SDSI                     :    Off
 11  QUALITY                  :    Off
 12  WARNING                  :    Off
 13  DC-RESULT                :    Off
 14  SY-RESULT                :    Off
 15  RESULT                   :    Off
 16  BASP/SYS-FAIL/CLAB/STOP  :    Off
 17  BSA                      :    Off
 18 Diagnostic parameter reg. :      0
 19 Ext. diag. parameter reg. :      0
 20 Current cycle time (ms)   :  0.000
 21 Baud-Rate                 : 500kBaud

[ TYPE ]        [Other ]
```

Fig 10.2.3 MASTER status

Table 10.2.3 MASTER status

#	TP Words	Description
1	Diagnose status register	
2	READY	Controller board is ready to operate. (Diagnostic status register bit 7)
3	ACTIVE	InterBus configuration is active. (Diagnostic status register bit 6)
4	RUN	Data transmission is running. (Diagnostic status register bit 5)
5	DETECT	Diagnostic routine of the system coupler is active. (Diagnostic status register bit 4)
6	CRTL	Error in the system coupler's hardware. (Diagnostic status register bit 3)
7	BUS	Bus error (Diagnostic status register bit 2)
8	PF	Peripheral Fault (I/O error) (Diagnostic status register bit 1)
9	USER	User error or parameterization error. Due to wrong command usage or parameter. (Diagnostic status register bit 0)
10	SDSI	Message to control system present (Diagnostic status register bit 15)

#	TP Words	Description
11	QUALITY	Specified error density exceeded (Diagnostic status register bit 14)
12	WARNING	Specified warning time exceeded (Diagnostic status register bit 13)
13	DC-RESULT	Faulty data cycles (Diagnostic status register bit 12)
14	SY-RESULT	Synchronization error has occurred (Diagnostic status register bit 11)
15	RESULT	Standard function processed negatively (Diagnostic status register bit 10)
16	BASP/SYS_FAIL/CLAB/STOP	Outputs are reset (Diagnostic status register bit 9)
17	BSA	Bus segment disconnected (Diagnostic status register bit 8)
18	Diagnostic parameter register	Value of the diagnostic parameter register (hexadecimal)
19	Ext. diag. parameter register	Value of the extended diagnostic parameter register
20	Current cycle time (ms)	Current cycle time in ms (variable ID 2216hex)
21	Baud-Rate	Current Baud-Rate

10.2.4 Statistic Status Screen

This screen shows the statistics of the operation of the system coupler.

```
Status InterBus                  JOINT  10 %
MASTER statistic                     1/13

  1 Count of InterBus cycles :1234567890
  2  of faulty cycles        :         0
  3 Count of ID cycles       :         0
  4  of faulty cycles        :         0
  5 Count of data cycles     :1234567890
  6  of faulty cycles        :         0
  7 Count of Top of Ten CRC  :         0
  8  Display Top of Ten CRC  :   <Detail>
  9 Count of last 10 PF      :         0
 10 Count of IPMS error      :         0
 11 Count of bus error       :         0
 12 Count of peripheral err  :         0
 13 Count of Time-out-error  :         0

[ TYPE ]       [Other ]         RESET
```

Fig 10.2.4 (a) MASTER statistic

Table 10.2.4 (a) MASTER statistic

#	TP Words	Description
1	Count of InterBus cycles	Count of InterBus cycles
2	of faulty cycles	Count of faulty InterBus cycles
3	Count of ID cycles	Count of ID cycles
4	of faults cycles	Count of faulty ID cycles
5	Count of data cycles	Count of data cycles
6	of faulty cycles	Count of faulty data cycles
7	Count of Top of Ten CRC	Count of Top of Ten CRC information updates
8	Display Top of Ten CRC	Go to 10.2.5
9	Count of last 10 PF	Count of last 10 PF information updates
10	Count of IPMS error	Count of IPMS error information updates
11	Count of bus error	Count of bus error information updates
12	Count of peripheral error	Count of peripheral fault information updates
13	Count of Time-out-error	Count of Time out error information updates

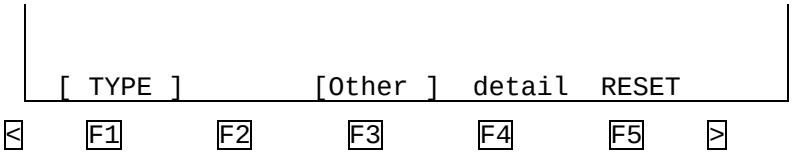


Fig 10.2.4 (b) Function keys „MASTER Statistic“

Table 10.2.4 (b) Function keys „MASTER Statistic“

Function key	Words	Description of function keys
F1	[Type]	
F3	[Other]	
F4	detail	Goes to the “Status Top 10 CRC List” screen. (refer to 10.2.5)
F5	RESET	Reset of statistic diagnostic information (Message 030F hex) *Reset statistic?*

10.2.5 Status Top 10 CRC List Screen

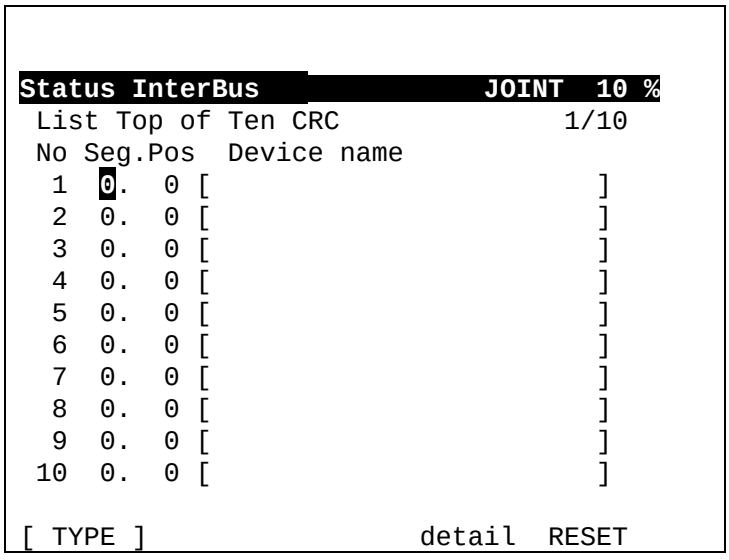


Fig 10.2.5 (a) Top Of Ten CRC List

Table 10.2.5 (a) List Top of Ten CRC

Column	Description
No	
Seg.Pos	Segment position number
Device name	Device name

Fig 10.2.5 (b) Function keys „ Top of Ten CRC List“

Table 10.2.5 (b) Function keys „Top of Ten CRC List“

Function key	Words	Description of function keys
F1	[Type]	
F2	detail	Goes to the “Status Top 10 CRC Detail” screen(refer to 10.2.6)
F5	RESET	Reset of statistic diagnostic information (Message 030F hex) *Reset statistic?*

10.2.6 Top 10 CRC Detail Status Screen

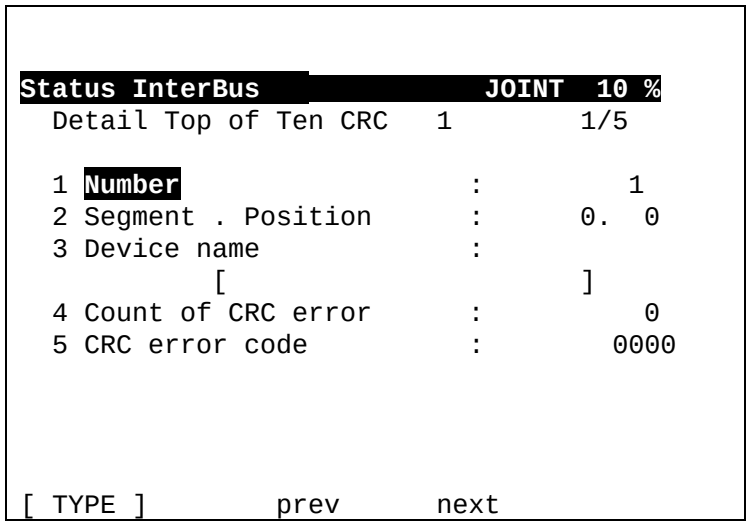


Fig 10.2.6 (a) Top of Ten CRC Detail

Table 10.2.6 (a) Top of Ten CRC Detail

#	TP Words	Description
1	Number	
2	Segment	Segment number
	Position	Position number
3	Device name	Device name
4	Count of CRC error	Error count (32-bit integer)
5	CRC error code	Error code

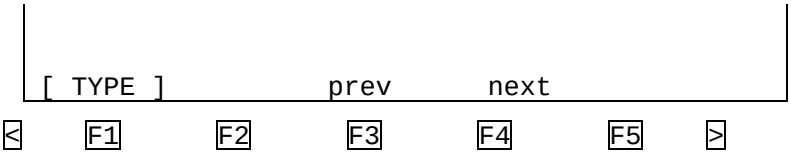


Fig 10.2.6 (b) Function keys „Top of Ten CRC Detail“

Table 10.2.6 (b) Function keys „Top of Ten CRC Detail“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Goes to the “Status Top 10 CRC List” screen (refer to 10.2.5)
F3	prev	Goes to the previous entry
F4	next	Goes to the next entry

10.2.7 Device Diagnostic List Status Screen

This screen shows the actual configuration of the InterBus controlled by the system coupler's master part.

```
Status InterBus                JOINT  10 %
List device diagnostic                1/128
 No  Seg.Pos ID   Device name
  1 D  0.  0   0 [                     ]
  2 D  0.  0   0 [                     ]
  3 D  0.  0   0 [                     ]
  4 D  0.  0   0 [                     ]
  5 D  0.  0   0 [                     ]
  6 D  0.  0   0 [                     ]
  7 D  0.  0   0 [                     ]
  8 D  0.  0   0 [                     ]
  9 D  0.  0   0 [                     ]

[ TYPE ] detail [Other ]
```

Fig 10.2.7 (a) List device diagnostic

Table 10.2.7 (a) List device diagnostic

Column	Description
No	
	When sign D is displayed, device will be disabled
Seg	Segment number
Pos	Position number
ID	ID Code
Device name	Device name (only 21 characters will be displayed)

```
 [ TYPE ] detail [Other ]
```

< F1 F2 F3 F4 F5 >

Fig 10.2.7 (b) Function keys „List device diagnostic“

Table 10.2.7 (b) Function keys „List device diagnostic“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	detail	Goes to the“Status Device Diagnostic Detail” screen (refer to 10.2.8)
F3	[Other]	

10.2.8 Device Diagnostic Detail Status Screen

This screen shows the actual configuration of the device in the InterBus network controlled by the system coupler's master part. As the actual configuration is read back from the system coupler to the robot and displayed on this screen, it is useful to check the actual configuration. Several device status information are also read out of the configuration and displayed on this screen.

If the Service-Info is used for a device and the device name is registered in the robot, the device name can be confirmed on this screen. To register a device name, define the Service-info and the device name in the "Device name" setup screen. Perform "Parameterization execute" in TP mode. Perform the "Load Configuration" operation in on the "Setup Control" screen in CMD mode.

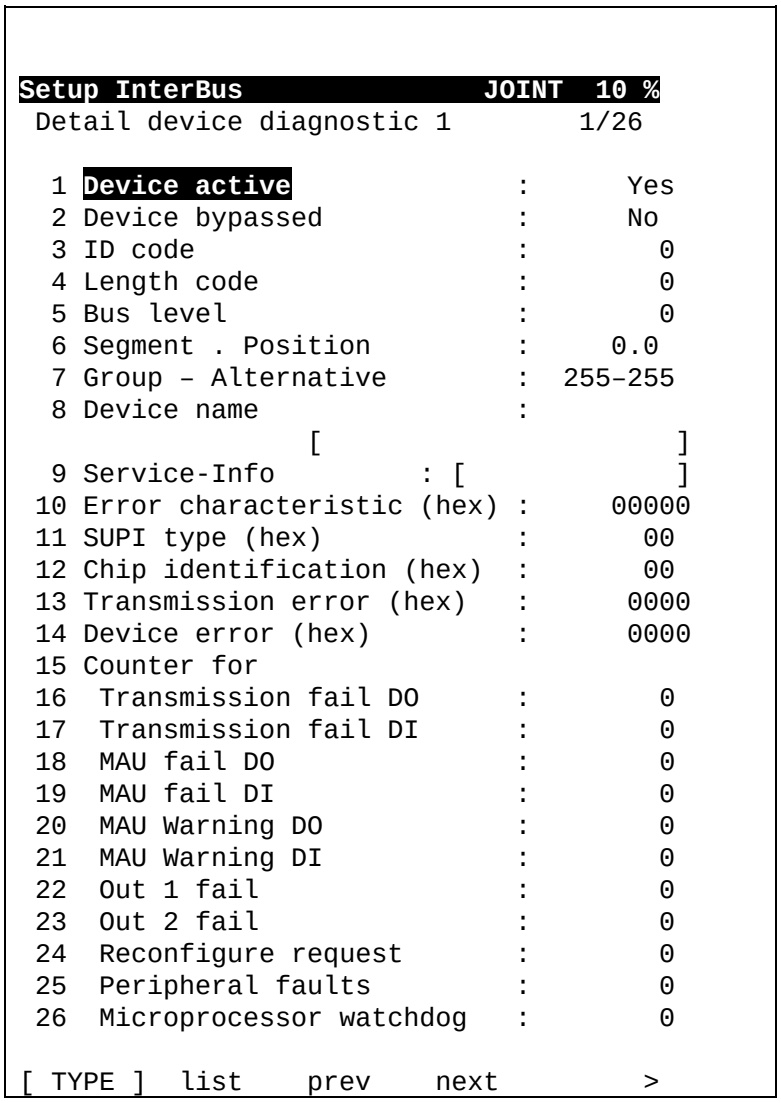


Fig 10.2.8 (a) Detail diagnostic device

Table 10.2.8 (a) Detail diagnostic device

#	TP Words	Remark
1	Device active	Device is active in configuration Device is not active in configuration
2	Device bypassed	Device is not bypassed in configuration Device is bypassed in configuration
3	ID code	Actual ID code
4	Process data length (bit)	Actual process data length
5	Bus level	Actual bus level
6	Position	Actual position number
	Segment	Actual segment number
7	Group	Actual group number
	Alternative	Actual alternative number
8	Device name	Device name associated with the Service-Info in the robot controller
9	Service-Info	Actual Service-Info
10	Error characteristic (hex)	Error characteristics Bit 0 : Isolated switching active (1) or not active (0) Bit 1-15 : Reserved
11	SUPI type (hex)	SUPI Type xx00: Old SUPIs and SUPI2 xx01: SUPI1 xx03: SUPI3 and later
12	Chip identification (hex)	SUPI chip Identification 00h: SUPI older than SUPI2 A1h: IB8052 A2h: LPC2 A3h: LPC1 A4h: SUPI3-DPC A5h: SUPI3 D0h: SUPI3-OPC FFh: Reserved
13	Transmission error (hex)	Transmission error
14	Device error	Peripheral Fault
15	Counter for	
16	Transmission fail DO	Counter for transmission errors in the data forward path
17	Transmission fail DI	Counter for transmission errors in the data return path
18	MAU fail DO	Counter for cable interrupts in the data forward path
19	MAU fail DI	Counter for cable interrupts in the data return path
20	MAU warning DO	Counter for deterioration of the transmission quality in the forward path (for optic transmission); for chip LPC2: overloaded internal power source
21	MAU warning DI	Counter for deterioration of the transmission quality in the return path (for optic transmission); for chip LPC2: IBS protocol chip temperature too high
22	Out 1 fail	Counter for errors on the RBST signal (jumper in the connector) on the outgoing interface or error on the unused OUT1 interface
23	Out 2 fail	Counter for errors on the LBST signal (jumper in the connector) on the outgoing interface or error on the unused OUT2 interface
24	Reconfigure request	Counter for reconfiguration requests; for chip LPC2: voltage too low for initiators
25	Peripheral error	Counter for peripheral faults
26	Microprocessor Watchdog	Counter for resets of the connected microprocessor, for chip LPC2: permitted output current of the power drive exceeded

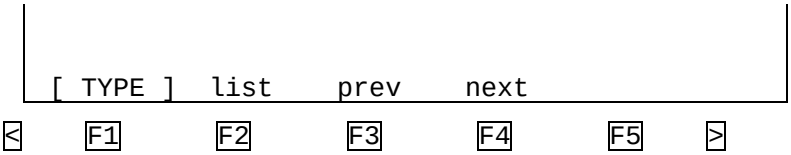


Fig 10.2.8 (b) Function keys „Detail diagnostic device“

Table 10.2.8 (b) Function keys „Detail diagnostic device“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Same as the button PREV
F3	prev	Goes to the previous device
F4	next	Go to the next device

10.2.9 Device Status List Status Screen

This screen shows the contents of the status register of each device.

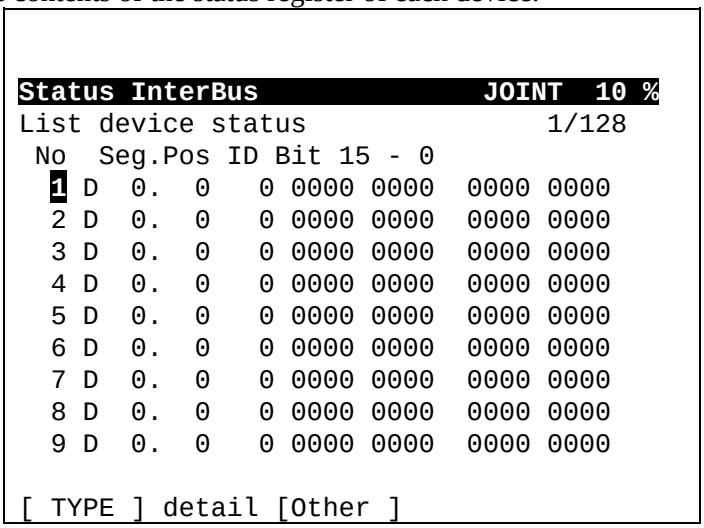


Fig 10.2.9 (a) List device status

Table 10.2.9 (a) List device status

Column	Description
No	
	When sign D is displayed, device will be disabled
Seg	Segment number
Pos	Position number
ID	Ident-Code
Bit 15 - 0	Display of the 15 status bits

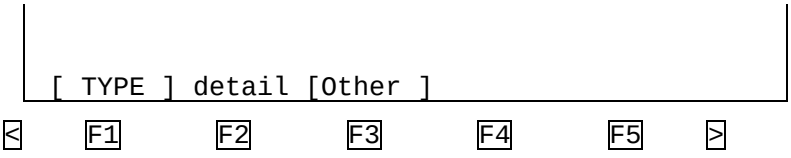


Fig 10.2.9 (b) Function keys „Detail device diagnostic“

Table 10.2.9 (b) Function keys „Detail device diagnostic“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	Detail	Goes to the “Device Status Detail” status screen (refer to 10.2.10)
F3	[Other]	

10.2.10 Device Status Detail Status Screen

This screen displays the details of the status register of a device.

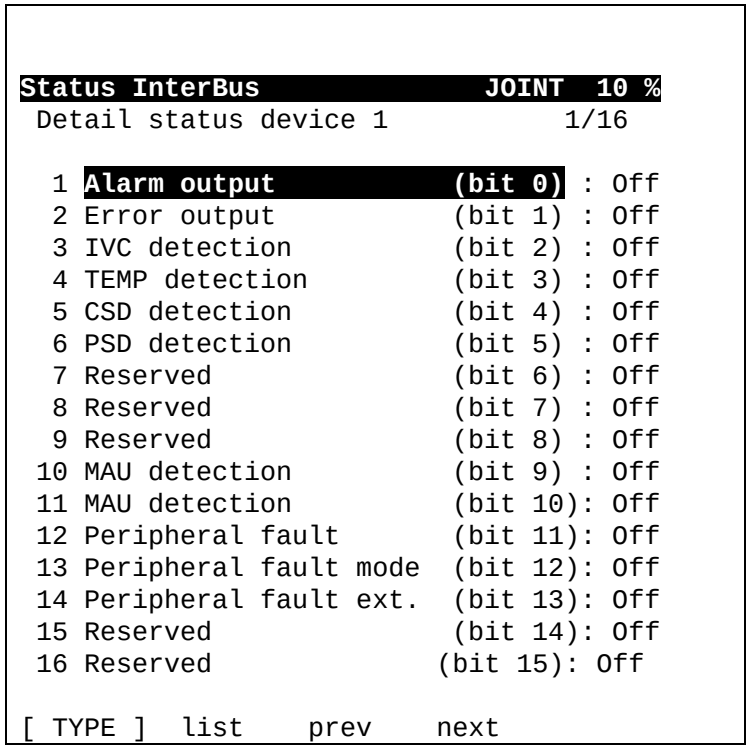


Fig 10.2.10 (a) Detail status device

Table 10.2.10 (a) Detail status device

#	TP Words	Meaning
1	Alarm output (bit 0)	The alarm output of the specified InterBus device is set.
2	Error output (bit 1)	The specified InterBus device is indicating an error.
3	IVC detection (bit 2)	The voltage is too low for the initiators.
4	TEMP detection (bit 3)	The ambient temperature is too high.
5	CSD detection (bit 4)	The internal power source is overloaded.
6	PSD detection (bit 5)	The permitted output current of the power drive has been exceeded.
7	Reserved (bit 6)	
8	Reserved (bit 7)	
9	Reserved (bit 8)	
10	MAU detection (bit 9)	MAU (Media Attachment Unit) detection of the incoming remote bus interface (data ring forward path). The set bit indicates that the attenuation is too high, e.g. for fiber optic paths.
11	MAU detection (bit 10)	MAU detection of the incoming remote bus interface (data ring return path)
12	Peripheral fault (bit 11)	Depending on the value of bit 12, the InterBus device indicates a peripheral fault or a microprocessor reset.
13	Peripheral fault mode (bit 12)	0: Bit 11 indicates a peripheral fault 1: Bit 11 indicates a microprocessor reset
14	Peripheral fault ext. (bit 13)	If bit 13 and bit 11 are set, the single channel diagnostics provides additional details about the peripheral fault. This data can be read with the “Read_Configuration” service (0309h) as an additional module status information.
15	Reserved (bit 14)	
16	Reserved (bit 15)	

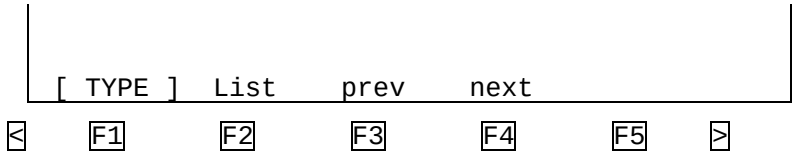


Fig 10.2.10 (b) Function keys „Detail status device“

Table 10.2.10 (b) Function keys „ Detail status device“

Function key	Words	Description of function keys
F1	[TYPE]	
F2	list	Goes to the “Device Status List” status screen (refer to 10.2.9)
F3	prev	Goes to the previous device
F4	next	Goes to the next device

11 MAINTENANCE & TROUBLESHOOTING

11.1 ALARM CODES

11.1.1 Alarm Reported from the Firmware of the System Coupler

The alarm messages listed in this section will be posted when the firmware of the system coupler reports an error to the robot containing the firmware error code. The part of the error message, represented as XXXX, displays the firmware error code (4 hexadecimal numbers). Please refer to IBS SYS FW G4 UM of the firmware error code for a detailed cause and remedy.

The most error messages includes a error code number from Phoenix Contact.
Please refer for “Meaning” and “Remedy” also to the following manuals from Phoenix Contact:

No.	Title	Designation
1	Diagnostic Guide	IBS SYS DIAG DSC UM E
2	User Manual: Firmware Services and Error Messages	IBS SYS FW G4 UM E

Message	IB-S-300 STOP XXXX:Bus error
Meaning	Data transfer stops because of a bus error.
Firmware Error code	0BE1, 0BE3, 0BE4, 0BE5, 0BE8, 0BE9, 0BEC, 0BED, 0BEE, 0BEF, 0BF0, 0BF1, 0BF2, 0BF3, 0BF6, 0BF7, 0BF8, 0BF9, 0BFA, 0BFB, 0BFC
Remedy	Refer to IBS SYS FW G4 UM of the firmware error code.

Message	IB-S-301 STOP 0BE2:Max. number was exceeded
Meaning	The maximum number of InterBus words or devices have been exceeded.

Error code	IB-S-302 STOP 0BE6:Too many faulty data cycle
Meaning	The bus is switched off because of an error. No error could be found in the current configuration though. This might be an intermittent error. The error affects data cycles but not ID cycles.
Cause	The error occurs due to installation errors or a defective INTERBUS device.
Remedy	Check your system according to 11.2

Message	IB-S-303 STOP 0BE7:Configuration not activated
Meaning	The configuration could not be activated.
Cause	The error occurs due to installation errors or a defective INTERBUS device.
Remedy	Check your system according to 11.2

Message	IB-S-304 STOP 0BEA:Control_Device_Function
Meaning	The "Control_Device_Function" service (0714 hex) could not be executed.
Cause	A fatal error occurred.
Remedy	Repeat the service if the controller board is still in the state RUN or ACTIVE. If diagnostics is active, you must wait for the result. The bus error will show the error location.

Message	IB-S-305 STOP 0BF4:CRC error in segment
Meaning	Transmission error (CRC error) on the data forward path of the incoming bus interface (IN) of the indicated INTERBUS device.
Cause	Transmission error
Remedy	Check your system according to 11.2

Message	IB-S-306 STOP 0BF5:Error at interface (In)
Meaning	Transmission error (CRC error) on the data return path of the incoming bus interface (IN) of the indicated INTERBUS device.
Remedy	Check your system according to 11.2

Message	IB-S-307 STOP XXXX:Bus error occurred
Meaning	Bus error is indicated by the firmware with the firmware error code
Cause	Refer to the firmware error code
Remedy	Refer to IBS SYS FW G4 UM of the firmware error code

Message	IB-S-308 STOP XXXX:Device is missing
Meaning	An INTERBUS device is missing.
Firmware Error code	0C10, 0C11, 0C12, 0C13, 0D10, 0D11, 0D12, 0D13
Cause	A device, entered in the connected bus configuration and not marked as switched off, is missing in the bus configuration. The active configuration is the quantity of INTERBUS devices connected to the INTERBUS system whose data is within the summation frame during bus cycles. The active configuration may differ from the connected bus configuration only when physically connected bus segments have been switched off.
Remedy	Compare the active configuration with the connected bus configuration, taking any disabled bus segments into account.

Message	IB-S-309 STOP XXXX:Multiple errors in segment
Meaning	Multiple errors in the segment of the indicated INTERBUS device
Firmware Error code	0C14, 0C15, 0C16, 0C17, 0D14, 0D15, 0D16, 0D17
Cause	Transmission errors
Remedy	Check your system according to 11.2

Message	IB-S-310 STOP XXXX:Multiple timeouts in segment
Meaning	Multiple timeouts in the segment of the indicated INTERBUS device
Firmware Error code	0C18, 0C19, 0C1A, 0C1B, 0D18, 0D19, 0D1A, 0D1B
Cause	Transmission errors
Remedy	Check your system according to 11.2

Message	IB-S-311 STOP XXXX:CRC error (In)
Meaning	Transmission error (CRC error) on the data forward path of the incoming bus interface (IN) of the indicated INTERBUS device.
Firmware Error code	0C1C, 0C1D, 0C1E, 0C1F, 0D1C, 0D1D, 0D1E, 0D1F
Cause	Transmission errors
Remedy	Check your system according to 11.2

Message	IB-S-312 STOP XXXX:Defective interface (In)
Meaning	The Medium Attachment Unit (MAU) firmware component diagnosed an interruption of the data transmission.
Firmware Error code	0C20, 0C21, 0C22, 0C23, 0D20, 0D21, 0D22, 0D23
Cause	Cable break on the data forward path of the incoming bus interface (IN) of the indicated INTERBUS device.
Remedy	Check the cables, connectors and INTERBUS connections for interruptions and repair them, if necessary.

Message	IB-S-313 STOP XXXX:Error at interface (In)
Meaning	Transmission error (CRC error) on the data return path of the incoming bus interface (IN) of the indicated INTERBUS device.
Firmware Error code	0C24, 0C25, 0C26, 0C27, 0D24, 0D25, 0D26, 0D27
Cause	Transmission errors
Remedy	Check your system according to 11.2

Message	IB-S-314 STOP XXXX:Interrupted interface (In)
Meaning	The Medium Attachment Unit (MAU) diagnosed an interruption of the data transmission.
Firmware Error code	0C28, 0C29, 0C2A, 0C2B, 0D28, 0D29, 0D2A, 0D2B
Cause	Cable break on the data return path of the incoming bus interface (IN) of the indicated INTERBUS device.
Remedy	Check the cables, connectors and INTERBUS connections for interruptions and repair them, if necessary.

Message	IB-S-315 STOP XXXX:Transmission error
Meaning	Unexpected change of the RBST or LBST signal.
Firmware Error code	0C2C, 0C2D, 0C2E, 0C2F, 0D2C, 0D2D, 0D2E, 0D2F
Cause	Missing or defective bridge (loose contact, cold junction) in the outgoing interface of the preceding bus device.
Remedy	Check the segment of the specified INTERBUS device for interruptions in the connector (loose contact, cold junction). Solder a bridge or ensure the proper connection of the already existing bridge to generate an error-free RBST or LBST signal.

Message	IB-S-316 STOP XXXX:Error in segment
Meaning	Multiple errors in the segment of the indicated INTERBUS device
Firmware Error code	0C30, 0C31, 0C32, 0C33
Cause	1. Transmission errors 2. The specified INTERBUS device has a SUPI 1 slave chip which is operated in μP mode. This mode is not supported by the firmware of your controller board.
Remedy	1. Check your system according to 11.2 2. Replace the indicated device with a device that has a SUPI 3 chip.

Message	IB-S-317 STOP XXXX:Wrong length code
Meaning	The length code of the specified INTERBUS device is not identical to the entry in the configuration frame.
Firmware Error code	0C40, 0C41, 0C42, 0C43, 0D40, 0D41, 0D42, 0D43
Remedy	Adapt the active configuration frame to the bus configuration.

Message	IB-S-318 STOP XXXX:Wrong ID code
Meaning	The ID code of the specified INTERBUS device is not identical to the entry in the configuration frame.
Firmware Error code	0C44, 0C45, 0C46, 0C47, 0D44, 0D45, 0D46, 0D47
Remedy	Adapt the active configuration frame to the bus configuration.

Message	IB-S-319 STOP XXXX:Data register error
Meaning	The bus can be read in but not started up. Only ID cycles but not data cycles can be run.
Firmware Error code	0C48, 0C49, 0C4A, 0C4B, 0D48, 0D49, 0D4A, 0D4B
Cause	The data register of the indicated INTERBUS device is interrupted. The number of data registers of the specified INTERBUS device is not identical to the length code entered in the configuration frame.

Message	IB-S-320 STOP XXXX:Invalid ID code
Meaning	The specified INTERBUS device has an invalid ID code.
Firmware Error code	0C4C, 0C4D, 0C4E, 0C4F, 0D4C, 0D4D, 0D4E, 0D4F

Message	IB-S-321 STOP XXXX:Remote device in local bus
Meaning	The specified INTERBUS device has the ID code of a remote bus device, but is located in a local bus.
Firmware Error code	0D50, 0D51, 0D52, 0D53

Message	IB-S-322 STOP XXXX:Device not possible
Meaning	The specified INTERBUS device has a SUPI 1 slave chip which is operated in P mode. This mode is not supported by the firmware of your controller board.
Firmware Error code	0C54, 0C55, 0C56, 0C57, 0D54, 0D55, 0D56, 0D57
Remedy	Replace the device with a device which has a SUPI 3 chip.

Message	IB-S-323 STOP XXXX:Defective interface (Out1)
Meaning	Data transmission is interrupted at the outgoing remote bus interface (OUT1) of the specified INTERBUS device.
Firmware Error code	0C58, 0C59, 0C5A, 0C5B, 0D58, 0D59, 0D5A, 0D5B
Cause	1. The connector is not plugged in. 2. The bridge for connector identification (RBST or LBST) is defective.
Remedy	1. Check that the connector is plugged in. 2. Check whether the bridge for connector identification (RBST or LBST)is defective.

Message	IB-S-324 STOP XXXX:Defective interface (Out2)
Meaning	Data transmission is interrupted at the branching bus interface (OUT2) of the specified INTERBUS device.
Firmware Error code	0C5C, 0C5D, 0C5E, 0C5F, 0D5C, 0D5D, 0D5E, 0D5F
Cause	1. The connector is not plugged in. 2. The bridge for connector identification (RBST or LBST) is defective.
Remedy	1. Check that the connector is plugged in. 2. Check whether the bridge for connector identification (RBST or LBST) is defective.

Message	IB-S-325 STOP XXXX:Interrupted interf. (Out1)
Meaning	Data transmission was temporarily interrupted at the outgoing remote bus interface (OUT1) of the specified INTERBUS device (with SUPI 3), although this interface is not used.
Firmware Error code	0C60, 0C61, 0C62, 0C63, 0D60, 0D61, 0D62, 0D63
Cause	The SUPI 3 protocol chip detected a CRC or MAU error.
Remedy	Replace the INTERBUS device.

Message	IB-S-326 STOP XXXX:Interrupted interf. (Out2)
Meaning	Data transmission was temporarily interrupted at the branching bus interface (OUT2) of the specified INTERBUS device (with SUPI 3), although this interface is not used.
Firmware Error code	0C64, 0C65, 0C66, 0C67, 0D64, 0D65, 0D66, 0D67
Cause	The SUPI 3 protocol chip detected a CRC or MAU error.
Remedy	Replace the INTERBUS device.

Message	IB-S-327 STOP XXXX:I/O timeout
Meaning	The SUPI 3 protocol chip of the specified INTERBUS device detected an I/O timeout.
Firmware Error code	0C68, 0C69, 0C6A, 0C6B, 0D68, 0D69, 0D6A, 0D6B

Message	IB-S-328 STOP XXXX:Reset of device
Meaning	The specified INTERBUS device carried out a reset.
Firmware Error code	0C6C, 0C6D, 0C6E, 0C6F, 0D6C, 0D6D, 0D6E, 0D6F
Cause	The specified INTERBUS device is insufficiently supplied with power or is defective.
Remedy	Check this INTERBUS device. Check the supply voltage of this INTERBUS device to determine whether it conforms to the rated value and whether the permissible AC voltage portion is exceeded. Refer to the relevant data sheet for the values. Check the BK module's power supply unit for an overload condition. Refer to the relevant data sheets for the maximum permissible output current of the BK module and for the typical current consumption of the connected local bus devices.

Message	IB-S-329 STOP XXXX:Device not initialized yet
Meaning	Data transmission was aborted. In an INTERBUS device whose protocol chip is run in the microprocessor mode, the microprocessor failed to initialize the protocol chip.
Firmware Error code	0C70, 0C71, 0C72, 0C73, 0D70, 0D71, 0D72, 0D73
Cause	1. The controller board tried to switch the bus into the state ACTIVE faster than the microprocessor of the INTERBUS device could initialize the protocol chip. 2. The INTERBUS device is defective.
Remedy	1. Delay the call of the "Activate_Configuration" (0711 hex) service until the microprocessor has initialized the protocol chip. 2. Replace the INTERBUS device.

Message	IB-S-330 STOP XXXX:Invalid mode at device
Meaning	Data transmission was aborted.
Firmware Error code	0C74, 0C75, 0C76, 0C77, 0D74, 0D75, 0D76, 0D77
Cause	An invalid mode has been set on the protocol chip of an INTERBUS device.
Remedy	Set a valid mode or replace the device

Message	IB-S-331 STOP XXXX:Wrong data length
Meaning	If the dynamic PCP channel is switched on, the data length of the specified device is not identical to the configuration frame.
Firmware Error code	0C78, 0D78

Message	IB-S-332 STOP XXXX:Wrong ID code (PCP)
Meaning	If the dynamic PCP channel is switched on, the ID code of the specified device is not identical to the configuration frame.
Firmware Error code	0C79, 0D79

Message	IB-S-333 STOP XXXX:Inadmissible width (PCP)
Meaning	If the dynamic PCP channel is switched on, the ID code of the specified device is not identical to the configuration frame.
Firmware Error code	0C7A, 0D7A

Message	IB-S-334 STOP XXXX:Dynamic PCP cannot be used
Meaning	The specified device has an ID code for devices with dynamic PCP channel, but cannot use this channel.
Firmware Error code	0C7B, 0D7B
Cause	The specified device is not provided with a corresponding protocol chip. The firmware of the controller board does not support devices with dynamic PCP channels yet.

Message	IB-S-335 STOP XXXX:State conflict (On)
Meaning	The dynamic PCP channel of the specified device is switched on, even though it should be switched off.
Firmware Error code	0C7C, 0D7C

Message	IB-S-336 STOP XXXX:State conflict (Off)
Meaning	The dynamic PCP channel of the specified device is switched off, even if it should be switched on.
Firmware Error code	0C7D, 0D7D

Message	IB-S-337 STOP XXXX:Operation not possible
Meaning	The INTERBUS protocol chip in the specified device cannot be operated in the specified configuration.
Firmware Error code	0C7E, 0D7E
Cause	The INTERBUS protocol chip does not support the necessary functions.
Remedy	Replace the device.

Message	IB-S-338 STOP XXXX:Multiple errors (Out1)
Meaning	Multiple errors at the outgoing bus interface (OUT1) of the specified INTERBUS device.
Firmware Error code	0C80, 0C81, 0C82, 0C83, 0D80, 0D81, 0D82, 0D83
Cause	A defective bus cable is connected to this bus interface, of the following INTERBUS device or of a device of any subsequent local bus.
Remedy	Check your system according to 11.2

Message	IB-S-339 STOP XXXX:Multiple timeouts (Out1)
Meaning	Multiple timeout at the outgoing bus interface (OUT1) of the specified INTERBUS device.
Firmware Error code	0C84, 0C85, 0C86, 0C87, 0D84, 0D85, 0D86, 0D87
Cause	A defective bus cable is connected to this bus interface, of the following INTERBUS device or of a device in any following local bus.
Remedy	Check your system according to 11.2

Message	IB-S-340 STOP XXXX:Further device at bus
Meaning	An unexpected device was detected at the outgoing bus interface (OUT1) of the specified INTERBUS device.
Firmware Error code	0C88, 0C89, 0C8A, 0C8B, 0D88, 0D89, 0D8A, 0D8B
Cause	An INTERBUS device is connected that has not been entered in the active configuration. An INTERBUS cable is connected without any further INTERBUS devices.
Remedy	Check the bus configuration.

Message	IB-S-341 STOP XXXX:Data register error (Out1)
Meaning	Only ID cycles but not data cycles can be run.
Firmware Error code	0C8C, 0C8D, 0C8E, 0C8F, 0D8C, 0D8D, 0D8E, 0D8F
Cause	Interrupted data register of the INTERBUS device connected to the outgoing remote bus interface (OUT1) of the specified INTERBUS device. The number of data registers for the INTERBUS device connected to the outgoing remote bus interface (OUT1) of the specified INTERBUS device is not identical to the length code.
Message	IB-S-342 STOP XXXX:Defective interface (Out1)
Meaning	The specified INTERBUS device could not activate the following bus segment.
Firmware Error code	0C90, 0C91, 0C92, 0C93
Cause	The INTERBUS device connected to the outgoing interface (OUT1) of the specified INTERBUS device carried out a voltage reset or is defective.
Remedy	Check this INTERBUS device. Check the supply voltage of this INTERBUS device to determine whether it conforms to the rated value and whether the permissible AC voltage portion is exceeded. Refer to the relevant data sheet for the values. Check the BK module's power supply unit for an overload condition. Refer to the relevant data sheets for the maximum permissible output current of the BK module and for the typical current consumption of the connected local bus devices.

Message	IB-S-343 STOP XXXX:Further local bus device
Meaning	An INTERBUS device with the ID code of a local bus device was found at the outgoing remote bus interface (OUT1) of the specified INTERBUS device.
Firmware Error code	0C94, 0C95, 0C96, 0C97
Remedy	Connect a remote bus device.

Message	IB-S-344 STOP XXXX:Invalid ID code (Out1)
Meaning	The INTERBUS device connected to the outgoing remote bus interface (OUT1) of the specified INTERBUS device has an invalid ID code.
Firmware Error code	0C98, 0C99, 0C9A, 0C9B, 0D98, 0D99, 0D9A, 0D9B
Remedy	Replace this device.

Message	IB-S-345 STOP XXXX:Too many devices at local bus
Meaning	The local bus connected directly to the controller board consists of more INTERBUS devices than have been entered in the active configuration.
Firmware Error code	0D9C, 0D9D, 0D9E, 0D9F
Remedy	Check this local bus.

Message	IB-S-346 STOP XXXX:Multiple errors (Out2)
Meaning	Multiple error at the branching bus interface (OUT2) of the specified INTERBUS device.
Firmware Error code	0CC0, 0CC1, 0CC2, 0CC3, 0DC0, 0DC1, 0DC2, 0DC3
Cause	An INTERBUS cable is connected to the outgoing bus interface (OUT2) without any further INTERBUS devices. A local/remote bus cable is defective that belongs to the local/remote bus of the specified INTERBUS device. A defective INTERBUS device is connected to the local/remote bus of the specified INTERBUS device. Failure of the voltage supply for the module electronics (communication voltage U with small L) made available by the BK module. Failure of the voltage supply (communication voltage U with small L) for the BK module.
Remedy	Check this local/remote bus.

Message	IB-S-347 STOP XXXX:Multiple timeouts (Out2)
Meaning	Multiple timeouts at the branching bus interface (OUT2) of the specified INTERBUS device.
Firmware Error code	0CC4, 0CC5, 0CC6, 0CC7, 0DC4, 0DC5, 0DC6, 0DC7
Cause	A local/remote bus cable is defective that belongs to the local/remote bus of the specified INTERBUS device. A defective INTERBUS device is connected to the local/remote bus of the specified INTERBUS device. Failure of the voltage supply for the module electronics (communication voltage U with small L) made available by the BK module. Failure of the voltage supply (communication voltage U with small L) for the BK module.
Remedy	Check this local/remote bus.

Message	IB-S-348 STOP XXXX:Further device at (Out2)
Meaning	An unexpected device was detected at the branching bus interface (OUT2) of the specified INTERBUS device.
Firmware Error code	0CC8, 0CC9, 0CCA, 0CCB, 0DC8, 0DC9, 0DCA, 0DCB
Cause	An INTERBUS device is connected that has not been entered in the active configuration. An INTERBUS cable is connected without any further INTERBUS devices.
Remedy	Check your INTERBUS network at the specified error location.

Message	IB-S-349 STOP XXXX:Data register error (Out2)
Meaning	The bus can be read in but not started up. Only ID cycles but not data cycles can be run.
Firmware Error code	0CCC, 0CCD, 0CCE, 0CCF, 0DCC, 0DCD, 0DCE, 0DCF
Cause	1. The data register of the INTERBUS device connected to OUT2 is interrupted. 2. The number of data registers for the INTERBUS device connected to the branching bus interface (OUT2) of the specified INTERBUS device is not identical to the length code entered in the configuration frame.
Remedy	1. Replace the INTERBUS device which is connected to the branching bus interface (OUT2) of the specified INTERBUS device. 2. Adapt the entry for the length code in the configuration frame.

Message	IB-S-350 STOP XXXX:Too many devices activated
Meaning	After opening the branching bus interface (OUT2) of the specified INTERBUS device, further INTERBUS devices were added to the BK module in the data ring.
Firmware Error code	0CD0, 0CD1, 0CD2, 0CD3, 0DD0, 0DD1, 0DD2, 0DD3
Cause	The INTERBUS device connected to the branching bus interface (OUT2) of the specified INTERBUS device caused a reset or is defective.
Remedy	Check this INTERBUS device. Check the supply voltage of this INTERBUS device to determine whether it conforms to the rated value and whether the permissible AC voltage portion is exceeded. Refer to the relevant data sheet for the values. Check the BK module's power supply unit for an overload condition. Refer to the relevant data sheets for the maximum permissible output current of the BK module and for the typical current consumption of the connected local bus devices.

Message	IB-S-351 STOP XXXX:Error in local bus
Meaning	Local bus error in the 8-wire local bus connected to the specified INTERBUS device.
Firmware Error code	0CD4, 0CD5, 0CD6, 0CD7, 0DD4, 0DD5, 0DD6, 0DD7
Cause	A local bus cable is defective that belongs to the local bus of the specified INTERBUS device. A defective INTERBUS device is connected to the local bus of the specified INTERBUS device. Failure of the voltage supply for the module electronics (communication voltage U with small L) made available by the BK module.
Remedy	Check this local bus.

Message	IB-S-352 STOP XXXX:Too many devices in local bus
Meaning	The local bus connected to the specified bus terminal module consists of more local bus devices than were entered in the active configuration.
Firmware Error code	0CD8, 0CD9, 0CDA, 0CDB, 0DD8, 0DD9, 0DDA, 0DDB

Message	IB-S-353 STOP XXXX:Invalid ID code (Out2)
Meaning	The INTERBUS device connected to the branching bus interface (OUT2) of the specified INTERBUS device has an invalid ID code.
Firmware Error code	0CDC, 0CDD, 0CDE, 0CDF, 0DDC, 0DDD, 0DDE, 0DDF

Message	IB-S-354 STOP 8040:Error on channel
Meaning	The specified INTERBUS device indicates a single-channel error.
Remedy	Check the channel of the specified INTERBUS device.

Message	IB-S-355 STOP 8060:Short circuit at output
Meaning	The specified INTERBUS device is indicating a short circuit at the output.
Remedy	Check the output protective circuit of the specified INTERBUS device.

Message	IB-S-356 STOP 8080:Initiator supply error
Meaning	The specified INTERBUS device indicates an initiator supply error in one or more groups.
Remedy	Check the group(s) of the specified INTERBUS device.

Message	IB-S-357 STOP 80A0:Power supply error
Meaning	The specified INTERBUS device indicates a voltage supply error in one or more groups.
Remedy	Check the group(s) of the specified INTERBUS device.

Message	IB-S-358 STOP 80B1:Configuration error
Meaning	The specified INTERBUS device indicates a configuration error.
Remedy	Check the parameters of the specified INTERBUS device.

Message	IB-S-359 STOP 80B2:Peripheral electronic error
Meaning	The specified INTERBUS device indicates an error in the I/O electronics.
Remedy	Check the sensors and actuators connected to the specified INTERBUS device.

Message	IB-S-360 STOP 80B4:Temperature excess
Meaning	The specified INTERBUS device indicates that the temperature has been exceeded.
Remedy	Check the sensors and actuators connected to the specified INTERBUS device.

Message	IB-S-361 STOP 8400:Loop error (Out2)
Meaning	The specified INTERBUS device indicates an error at the outgoing interface (OUT2).
Cause	There is an error in the lower-level installation local bus.
Remedy	Check the modules connected to the specified INTERBUS device. You can find the installation local bus device which is causing the error by counting the specified number of devices beginning with the last module.

Message	IB-S-362 STOP 0CA0:Isolated disconnection error
Meaning	The controller board could not start up the bus configuration.
Cause	An attempt was made to parameterize a bus for isolated disconnection, which does not contain only SUPI 3 devices.
Remedy	Only use devices with SUPI 3.

Message	IB-S-380 STOP 0BDF:Look for Failure
Meaning	The system coupler has stopped data transmission and is searching for the error location and error cause.
Cause	A bus error occurred.
Remedy	Wait until the search for the error has been completed. The system coupler will inform you of the result.

Message	IB-S-381 WARN 0BB1:Peripheral warning
Meaning	The specified INTERBUS device indicates a peripheral fault.
Remedy	Check the specified INTERBUS device.

Message	IB-S-390 STOP 0902:Controller Board Error
Meaning	The controller board could not process the service called last.
Cause	Hardware or firmware error on the system coupler.
Remedy	Replace the controller board.

Message	IB-S-391 STOP 0903:Board has not enough memory
Meaning	Insufficient memory on the controller board.
Cause	The main memory may, for example, be too fragmented.
Remedy	Use the "Reset_Controller_Board" service (0956 hex) to execute a warm start of the controller board, and try again.

Message	IB-S-392 STOP 0FA4:Board checksum error
Meaning	Writing the parameterization memory was aborted.
Cause	A checksum error was detected on the parameterization memory.
Remedy	Format the parameterization memory with a firmware version > 4.11.

Message	IB-S-393 STOP XXXX:Board system error
Meaning	A system error (e.g., hardware or firmware error) occurred on the system coupler.
Firmware Error code	0FXX

Message	IB-S-394 STOP XXXX:is reported by firmware
Meaning	Error is reported from firmware with firmware error code that does not belong to a specific error message.
Cause	Firmware error code XXXX is reported by firmware
Remedy	Refer to IBS SYS FW G4 UM of firmware code XXXX

Message	IB-S-395 STOP 0A02: Can't execute service
Meaning	The controller board could not process the service called last.
Cause	You sent a service which is not permitted in the current state of the controller board. For example, you cannot send the "Start_Data_Transfer" service (0701 hex) when the controller board is in the state Ready. To start data transfer, the controller board must be in the state Active.
Remedy	Set the controller board to the required state before calling the desired service. For example, perform “Alarm Stop” on the “Control” setup screen.
Additional Information	Secondary alarm code or additional information are displayed to notify the current status. IB-S-396 Board status is READY IB-S-397 Board status is ACTIVE IB-S-398 Board status is RUN IB-S-399 Board status is Bus Fail IB-S-451 Additional Info XXXX When IB-S-451 is displayed, perform “Alarm Stop” before retrying parameterization. The hexadecimal number as additional info represents the status. Please refer to IBS SYS FW G4 UM for more details.

Message	IB-S-400 STOP 0928: Service called w/o Rights
Meaning	The controller board cannot process the called service.
Firmware Error code	0928
Cause	You called an exclusive service without being authorized to do so.
Remedy	Release exclusive right held by others (CMD tool and so on) and try again.

Message	IB-S-401 WARN 0A08: Firm command busy now
Meaning	You called a service, which causes a processing conflict with another service called before.
Firmware Error code	0A08
Cause	The firmware cannot process two services at the same time.
Remedy	Wait for the service called previously to be completed, and then try again.
Additional Information	Code of the service called previously.

Message	IB-S-402 SYSTEM 0AFC: Board error reported
Firmware Error code	0AFC
Meaning	A hardware error occurred on the controller board.
Remedy	Replace the controller board.

Message	IB-S-403 SYSTEM XXXX: Firmware error reported
Meaning	A firmware error occurred on the controller board.
Firmware Error code	0B00, 0B01, 0B03
Remedy	Replace the controller board.

Message	IB-S-404 WARN 0BD2: Bus warning time elasped
Meaning	The bus warning time has elapsed.
Firmware Error code	0BD2
Cause	No data cycle could be transmitted within the bus warning time specified with the "Set_Value" service (0750 hex).
Remedy	Check your system. Increase the bus warning time with the "Set_Value" service (0750 hex).

Message	IB-S-405 WARN XXXX: Wrong Variable ID
Meaning	Variable ID is wrong.
Firmware Error code	0931, 0B80
Cause	You specified an invalid value for the Variable_ID parameter. You used a non-defined value for the Variable_ID parameter.
Remedy	Check the Variable_ID parameter.

Message	IB-S-420 WARN 0A20: 1st Seg. Unswitchable
Meaning	The first physical INTERBUS device in the INTERBUS network was not switched off.
Firmware Error code	0A20
Cause	The first physical INTERBUS device cannot be switched off.

Message	IB-S-421 STOP 0A28: Can't enable multiple Alt
Meaning	The controller board could not activate the specified groups.
Firmware Error code	0A28
Cause	You tried to activate alternative groups at the same time.

Message	IB-S-422 STOP 0A2A: Dev dependency conflict
Meaning	Conflict of mutual INTERBUS device dependencies (active/inactive).
Firmware Error code	0A2A
Cause	Using the "Control_Active_Configuration" service (0713 hex), you caused inconsistencies when switching mutually dependent INTERBUS devices.

Message	IB-S-423 STOP 0933: Can't take Exclusive Rights
Meaning	The request for exclusive rights was denied.
Firmware Error code	0933
Cause	Someone else still has the exclusive rights.
Remedy	Use the "Change_Exclusive_Rights_Request" service (014F hex) to enable the exclusive rights only when no one else already has these rights.

Message	IB-S-424 WARN Peripheral warning exists
Meaning	Peripheral Fault exists
Description	This message is displayed when the operator presses the reset button, but the peripheral fault still exists on one or more devices. This error message is displayed with error location.

Message	IB-S-425 WARN Peripheral warning cleared
Meaning	Peripheral fault could be reset and does not exist anymore.
Description	This message indicates all peripheral faults are cleared.

Message	IB-S-447 WARN Seg.X at outgoing remote bus IB-S-448 WARN Seg.X at outgoing local bus IB-S-449 WARN X.X device not found IB-S-450 WARN X.X “device name”
Meaning	These messages are displayed with other massage to inform the error location. Please refer to error message in upper line at the Teach-Pendant. IB-S-449 and IB-S-450 show that the error location is a device. IB-S-450 shows the device name with error location. If the device is not found in the configuration, IB-S-449 is displayed.

Message	IB-S-451 WARN Additional Info XXXX
Meaning	This message is displayed with other message to show additional information, such as firmware service code, index and so forth. The meaning of additional information differs in each firmware error code. Refer to IBS SYS FW G4 UM for more details.

11.1.2 Alarm Indicated by Robot

The alarm messages listed in this section are posted by the robot when a specific operation is performed or when a part of the system gets to a specific status.

Message	IB-S-452 STOP Slave No data Exchange
Meaning	This message is displayed when the system coupler's slave part is not transferring process data to prevent the robot from moving without slave data transfer.
Remedy	Start the data transfer of the InterBus network that the system coupler's slave part is connected to. If it is in the system setup phase and the robot should move without slave data transfer, enable the “Error 1shot” setting. Refer to 5.2.2 for TP mode and refer to 6.2.2 for CMD mode.

Message	IB-S-453 STOP Bus Fault is indicated
Meaning	This message is displayed when a bus fault is indicated by the firmware. Wait until the firmware reports the cause of the bus fault.
Remedy	Wait until the firmware send the error report. The error code reported by firmware indicates the cause of the bus error. Clear the error and press the reset button to start data transfer again.

Message	IB-S-454 STOP CMD mode is selected
Meaning	This message is displayed when the “Use CMD” setting is changed to Enable. Power off/on is required to activate the change of “Use CMD”.

Message	IB-S-455 STOP TP mode is selected
Meaning	This message is displayed when the “Use CMD” setting is changed to Disable. Power off/on is required to activate the change of “Use CMD”.

Message	IB-S-456 WARN Device X is inserted
Meaning	This message is displayed when a device is inserted into the “Configured device List/Detail” setup screen in TP mode to inform the operator.

Message	IB-S-457 WARN Device X is deleted
Meaning	This message is displayed when a device is deleted in the “Configured device List/Detail” setup screen in TP mode to inform the operator.

Message	IB-S-458 STOP Please power OFF/ON for Master
Meaning	This message is displayed when “Read In” is performed in the “Configured device List” setup screen. After the “Read In” operation, power off/on is required to start the data transfer.

Message	IB-S-459 STOP Too many device
Meaning	This message is displayed when more than 128 devices are present in the current configuration.
Remedy	Decrease the number of devices in the configuration and parameterize the system coupler again.

Message	IB-S-461 WARN Can't switch at READY state
Meaning	This message is displayed when the alternative group is switched at the state READY of the system coupler's master part.
Remedy	Let the state of the system coupler be ACTIVE or RUN. For example, perform “Start Data Transfer” or “Parameterization execute”.

Message	IB-S-462 WARN Parameterization is performed
Meaning	This message informs the operator that “Parameterization execute” is performed.

Message	IB-S-463 WARN Load SVC successful
Meaning	This message inform the operator that SVC file has been loaded successfully and stored to the robot as PXC_SVC.DT.

Message	IB-S-464 WARN Clear parm mem is performed
Meaning	This message informs the operator that “Clear parameterization memory” is performed.

Message	IB-S-465 WARN Load Config is performed
Meaning	This message informs the operator that “Load Configuration” is performed.

Message	IB-S-466 SYSTEM Board not ready
Meaning	The system coupler is not ready to operate.
Cause	Reset_Control_Host register (read access) of I/O has a wrong value.
Remedy	Check hardware of the system coupler.

Message	IB-S-467 WARN BackUp X board files (Device name)
Meaning	This message shows the result of “Backup board files” operations in the “Control” setup screen in CMD mode. The number of stored files is displayed with the selected device name (e.g. “MC:” or “FLPY”). If the number is 0, the operation has failed. Check if the device name is correct or parameterization memory holds any files.

Message	IB-S-468 STOP Slave external power off
Meaning	This message indicates that the external power supply of the system coupler's slave part has been lost.
Remedy	Check if the external power supply of the system coupler's slave part is correctly plugged in and that 24V are provided.

Message	IB-S-469 STOP Slave not Init/Ready
Meaning	The system coupler is not initialized or is not in the state READY.
Remedy	Check the external power supply of the system coupler's slave part. If the external power supply is OK, power off/on the controller and check if the alarm is released. If this error message is still present, check the hardware of the system coupler's slave part.

Message	IB-S-470 STOP Slave DIP setting mismatch
Meaning	This alarm message indicates that the baud rate setting of the DIP switch does not correspond to the baud rate setting held in the robot when the DIP 10 of the system coupler's slave part is set to ON.
Remedy	Select one of the following solutions. 1. Change DIP 10 of the system coupler's slave part to OFF. 2. Change DIP 9 according to the baud rate setting of the robot. 3. Change the baud rate setting of the robot according to DIP 9. Refer to 4.4 for the DIP switch of the system coupler's slave part. Refer to 5.2.2 for the baud rate setting of the robot.

Message	IB-S-471 STOP Firmware version mismatch
Meaning	The first two numbers of the firmware version number are different from the supported firmware version.
Remedy	Update the firmware to the supported version. The supported firmware version is written in $IBPX_PRM.$FIRM_VAR. Refer to 11.2.2 to update firmware.

Message	IB-S-473 STOP Parameterization not finished
Meaning	“Start Data Transfer” is performed when the parameterization of the system coupler has not completed.
Remedy	Perform the parameterization before “Start Data Transfer”. Check whether the former parameterization have failed because of an error. Solve any errors related to the parameterization in order to complete the parameterization.

Message	IB-S-474 WARN Use CMD setting mismatch
Meaning	The “Use CMD” setting has been changed by loading IBPXC.SV. The commands related to the parameterization or the started data transfer cannot be used due to the change of the “Use CMD” setting
Remedy	Power off/on the controller.

Message	IB-S-475 STOP PCI board not installed
Meaning	PCI board is not installed.
Remedy	Turn off the controller and install the system coupler.

Message	IB-S-476 SYSTEM newmem X failed
Meaning	System error
Remedy	Write down the error code with the number and contact FANUC service.

Message	IB-S-477 SYSTEM mktsk X failed X
Meaning	System error
Remedy	Write down the error code with the number and contact FANUC service.

Message	IB-S-478 STOP Slave Parameterization invalid
Meaning	This message indicates that the slave parameterization has not been performed. This message is posted when the robot does not possess a configuration when powered up in TP mode.
Remedy	Create configuration and perform “Parameterization Execute”.

Message	IB-S-479 SYSTEM Firmware Updating Mode
Meaning	The system starts up in a firmware updating mode. It is required to start up in this mode to update the firmware (Refer to 11.2.2 for more details). The robot cannot use the firmware service in this mode though, as it might interrupt the firmware updating. Therefore, data transfer, parameterization, and other operations are not available.
Remedy	Power off/on the controller.

Message	IB-S-480 SYSTEM Sysfail Reset Failed
Meaning	Initialization of the system coupler has failed.
Remedy	Check that the system coupler is firmly attached to the PCI motherboard. Check if the PCI motherboard is firmly inserted into robot controller backplane. Check the hardware of the system coupler. Contact FANUC service.

Message	IB-S-481 SYSTEM MPM1 Ready Bit OFF
Meaning	Initialization of MPM failed.
Remedy	Check that the system coupler is firmly attached to the PCI motherboard. Check if the PCI motherboard is firmly inserted into robot controller backplane. Check the hardware of the system coupler. Contact FANUC service.

Message	IB-S-482 WARN Alternative Recovery Disabled
Meaning	This message indicates that the alternative recovery function is disabled because the configuration has been changed by the operation. This alarm message will be also displayed when IBPXC.SV is loaded.
Remedy	If configuration has been changed, perform “Parameterization execute”. If IBPXC.SV has been loaded, power the system off/on and recover alternative groups manually if required.

Message	IB-S-483 STOP Execute param. for Baud-Rate
Meaning	This error message will be posted with IB-S-484 when the baud rate setting is changed in TP mode. This error message informs the operator that “Parameterization execute” is required to download a new baud rate setting to the system coupler before switching it off.
Remedy	Perform “Parameterization execute”. Please refer to the description of IB-S-484 to activate a new baud rate setting.

Message	IB-S-484 STOP Slave : Power off, Discon. 24V
Meaning	This error message will be posted with IB-S-483 when the baud rate setting is changed in TP mode. Please refer to the description of IB-S-484 first. This error message informs the operator that the robot must be turned off and that the external power supply of the system coupler's slave part must be disconnected for several seconds to activate a new baud rate. Please note that new baud rate settings must be downloaded first.
Remedy	Turn off the robot controller and disconnect the external power supply of the system coupler's slave part. Turn on the robot controller again and connect the external power supply after several seconds.

Message	IB-S-485 STOP Power off or Execute param.
Meaning	This error message indicates that the settings have been changed and that the operator must turn off the robot controller or perform “Parameterization execute” to activate the new settings.
Remedy	Turn off the robot controller or perform “Parameterization execute”.

Message	IB-S-486 STOP Power OFF/ON is necessary
Meaning	This error message indicates that the settings have been changed and that the operator must turn off the system to activate the new settings.
Remedy	Trun off the robot controller.

Message	IB-S-487 STOP Trying to reset Bus Fault
Meaning	This alarm message will be posted when the reset button is pressed to reset a bus fault to prevent the robot from moving until the bus fault has been cleared.
Remedy	This message will be automatically cleared when the bus fault has been cleared. If the bus fault still exists, other error messages will be displayed.

Message	IB-S-488 STOP Master is not running
Meaning	This alarm message will be posted when the system coupler's master part is not transferring process data and the parameterization has completed once since start up.
Remedy	Perform “Start Data Transfer” or “Parameterization execute”.

Message	IB-S-489 WARN Update Dev. Name by Load Conf.
Meaning	When the device name is changed in CMD mode, this message informs the operator that “Load Configuration” must be performed to activate the new device name.
Remedy	Perform “Load Configuration”.

Message	IB-S-490 STOP Parameterization by SVC failed
Meaning	This message indicates that the parameterization based on the SVC file has failed.
Remedy	Check for other error codes that are posted with IB-S-490 to find a cause and remedy.

Message	IB-S-491 STOP SVC file is not loaded
Meaning	This message will be posted when turning on the system and the SVC file has not been loaded to the robot yet. The parameterization will not be performed when this error message is displayed.
Remedy	Load the SVC file according to procedure 6-1 (refer to 6.3.1 for more details).

Message	IB-S-492 STOP Alternative is not recovered
Meaning	This message will be displayed when the alternative recovery fails.
Cause	1. The firmware reports an error for a group switching service sent by an alternative recovery function. 2. One of the following conditions is true. - The configuration has been modified since the last parameterization. - The list of the alternative groups, when last turned off, does not match the list of the current alternative groups. - IBPXC.SV has been loaded before the system was turned off.
Remedy	1. Check which error is reported by the firmware. 2. Enable the alternative groups manually.

Message	IB-S-493 STOP Firmware reply XXXX timeout
Meaning	The robot waits for the confirmation of the firmware service XXXX, but it results in a timeout.
Remedy	Wait a few seconds and try again. In case the error has not been cleared, contact FANUC service.

Message	IB-S-494 STOP Slave err1shot is disabled
Meaning	This message indicates that the “Error one shot” setting of slave is disabled when the “ALL_CLR” operation for configuration is being performed or when the “Use CMD” setting is being changed.

Message	IB-S-495 WARN Failed to enable byte swap IB-S-496 WARN len/ofs not multiple of 16
Meaning	“DI/DO byte swap” has been enabled but the length or the offset are not multiples of 16. Therefore “DI/DO byte swap” is disabled.
Remedy	If “DI/DO byte swap should be enabled, set the length and the offset to multiples of 16 and then enable “DI/DO byte swap”.

Message	IB-S-497 WARN Failed to change len/ofs IB-S-498 WARN len/ofs must be multiple of 16
Meaning	The new value of the length or the offset are not multiples of 16 when “DI/DO byte swap” is enabled. Therefore the change of the length or the offset has not been performed.
Remedy	If the length or offset should be modified to a different number than multiples of 16, disable “DI/DO byte swap”.

Message	IB-S-500 STOP Analog I/O setting is invalid
Meaning	Analog I/O settings are configured, but the analog I/O option software is not installed.
Remedy	Delete all analog I/O settings.

Message	IB-S-501 STOP Welding I/O setting is invalid
Meaning	Welding I/O settings are configured, but the tool is not ArcTool.
Remedy	Delete all welding I/O settings.

Message	IB-S-502 WARN AI/AO needs analog I/O option
Meaning	Operator tries to modify analog I/O settings when the analog option is not installed.

Message	IB-S-503 WARN Welding I/O needs Arc Tool
Meaning	Operator tries to modify welding I/O settings when tool is not ArcTool.

Message	IB-S-504 WARN Restore Alternative manually
Meaning	Alternative is not recovered automatically and therefore data transfer is not started.
Remedy	Activate connected alternative group by manual and start data transfer.

Message	IB-S-505 STOP Loading IBPXC.SV (need 1 minute)
Meaning	IBPXC.SV is being loaded by operation in InterBus setup screen.
Remedy	Just wait for 1 minute without any operations.

Message	IB-S-530 STOP Save: Internal Error (%s)
Meaning	An internal error in program to save the device name list occurred. Refer to the error code in the lower error line.
Remedy	- Check the help for the error code in the next line. - Write down the error code with the number and contact the service from FANUC Robotics.

Message	IB-S-531 WARN Start saving DevName List
Meaning	The program to save the device name list starts.

Message	IB-S-532 WARN Saving DevName List finished
Meaning	The program to save the device name list finished.

Message	IB-S-535 STOP Load: Internal Error (%s)
Meaning	An internal error in program to load the device name list occurred. Refer to the error code in the lower error line.
Remedy	- Check the help of the error code in the next line. - Write down the error code with the number and contact the service from FANUC Robotics.

Message	IB-S-536 WARN Start loading DevName List
Meaning	The program to load the device name list starts.

Message	IB-S-537 WARN Loading DevName List finished
Meaning	The program to load the device name list finished.

Message	IB-S-538 STOP No integer in Line (%s)
Meaning	In line (%s) of the file “DevNamL.dt” is an integer value expected, but value in this line is not an integer value.
Remedy	Check the value after “:” in file “DevNamL.dt”. The type of this value must be an integer value.

Message	IB-S-539 STOP Load: System error (%s)
Meaning	A system error in program to load the device name list occurred. Refer to the error code in the lower error line.
Remedy	- Check the help of the error code in the next line. - Write down the error code with the number and contact the service from FANUC Robotics.

Message	IB-S-550 WARN Internal error (%d)
Meaning	Load/Save of IBBDFIL.IBA failed because of system error.
Remedy	Write down the error code with the number and contact the service from FANUC Robotics.

Message	IB-S-551 WARN Can't open InterBus Archive
Meaning	Can’t open IBBDFIL.IBA in the selected device.
Remedy	Check the selected device is correctly attached.

Message	IB-S-552 WARN Get_Directory failed
Meaning	Firmware service Get_Directory failed.
Remedy	Check that the system coupler is firmly attached to the PCI motherboard. Check if the PCI motherboard is firmly inserted into robot controller backplane. Check the system coupler. Contact FANUC service.

Message	IB-S-553 WARN File_Open %s failed
Meaning	Firmware service File_Open failed. File name is displayed in the error message.
Remedy	Check the system coupler.

Message	IB-S-554 WARN File_Read %s failed
Meaning	Firmware service File_Read failed. File name is displayed in the error message.
Remedy	Check the system coupler.

Message	IB-S-555 WARN File_Write %s failed
Meaning	Firmware service File_Write failed. File name is displayed in the error message.
Remedy	Check the system coupler.

Message	IB-S-556 WARN File_Close %s failed
Meaning	Firmware service File_Close failed. File name is displayed in the error message.
Remedy	Check the system coupler.

Message	IB-S-557 WARN Archive version (%x) unsupported
Meaning	This version of IBBDFIL.IBA is not supported, or the contents of IBBDFIL.IBA could be broken. The version is displayed in the error message.
Remedy	Write down the error code with the number and contact the service from FANUC Robotics.

Message	IB-S-558 WARN Clear_Param_Mem failed
Meaning	Firmware service Clear_Parameterization_Memory failed.
Remedy	Check the system coupler.

Message	IB-S-559 WARN %d files saved as ibbdfil.iba
Meaning	IBBDFIL.IBA is successfully created with the files whose number is displayed in the message.
Description	Verify this message in the operation to save IBBDFIL.IBA. If this message does not show up, the operation might have failed. Please check the system coupler is installed to the controller.

Message	IB-S-560 WARN %d files loaded by ibbdfil.iba
Meaning	IBBDFIL.IBA is successfully loaded and the files whose number is displayed in the message are restored to the parameterization memory.
Description	Verify this message in the operation to load IBBDFIL.IBA. If this message does not show up, the operation might have failed. Please check the system coupler is installed to the controller.

Message	IB-S-561 WARN No file to backup/restore
Meaning	1. If this message shows up while the operation to save IBBDFIL.IBA, there is no files in the parameterization memory to be stored. 2. If this message shows up while the operation to load IBBDFIL.IBA, there is no files stored in IBBDFIL.IBA.

Message	IB-S-562 WARN File size in archive is wrong
Meaning	Total file size recorded in IBBDFIL.IBA is larger than the actual file size of IBBDFIL.IBA.
Description	IBBDFIL.IBA could be broken.

Message	IB-S-563 WARN ibbdfil.iba is truncated %d
Meaning	Can't read information about files in IBBDFIL.IBA.
Description	IBBDFIL.IBA could be broken.

Message	IB-S-564 WARN File name must be MS DOS format
Meaning	File name is not MS DOS format.
Description	This error is posted with IB-S-565 or IB-S-566 File name must be MS DOS format : name(1-8), extension(0-3)

Message	IB-S-565 WARN Can't backup %s
Meaning	Can’t backup the file whose name is displayed in the error message.
Remedy	Refer to the error message displayed together.

Message	IB-S-566 WARN Can't restore %s
Meaning	Can’t restore the file whose name is displayed in the error message.
Remedy	Refer to the error message displayed together.

Message	IB-S-567 WARN Too many files in ibbdfil.iba
Meaning	The number of file in ibbdfil.iba is too many.
Remedy	Increase $IBPX_PRM.$MAX_FIL_IBA and turn off/on the controller. The default value is 64 and the setting can be increased up to 128.

Message	IB-S-568 WARN File list is too small
Meaning	The number of file to backup/restore is too many.
Remedy	Increase $IBPX_PRM.$MAX_FIL_IBA and turn off/on the controller. The default value is 64 and the setting can be increased up to 128.

Message	IB-S-569 WARN Can't get right. Try again.
Meaning	The controller can't take the exclusive right of the system coupler. The exclusive right is taken by others at present.
Remedy	Try again after a while. If CMD tool is used, try to release the exclusive right.

Message	IB-S-570 STOP Too many PCI board found
Meaning	More than one system coupler are found.
Remedy	Only one system coupler can be used. Remove other system couplers.

Message	IB-S-571 WARN Failed to backup ibbdfil.iba
Meaning	Not all files in the parameterization memory are stored to IBBDFIL.IBA

11.1.3 Alarm for Master-Only Controller Board

Message	IB_S-572 STOP Set Master-Only HW. setting
Meaning	Master-Only board is found but hardware type setting is not done.
Remedy	Set $IBPX_HW.$HW_TYPE = 1 and cycle power.

Message	IB_S-573 STOP Remove Master-Only HW. setting
Meaning	System coupler board is found but hardware type setting is done.
Remedy	Set $IBPX_HW.$HW_TYPE = 0 and cycle power.

Message	IB_S-574 STOP Use CMD for Master-Only HW.
Meaning	Use CMD is disabled but Master-Only board is found.
Remedy	Enable Use CMD setting and cycle power.

Message	IB_S-575 STOP SVC type mismatch
Meaning	The SVC file stored in the controller does not match the type of installed InterBus board.
Remedy	Create the SVC file for the installed InterBus board, and load it to the controller.

Message	IB_S-576 WARN ibbdfil.iba type mismatch
Meaning	The IBA file being restored to the controller does not match the type of installed InterBus board.
Remedy	Check if the IBA file is really for the installed InterBus board.

11.2 MAINTENANCE

11.2.1 Investigation Points of the InterBus Network

The following conditions are likely to cause bus errors or device errors. Sometimes the error location is reported. Check the segment or the device according to the following points.

Missing or incorrect shielding of the bus cables (connectors)
Missing or incorrect grounding/equipotential bonding
Poor connections in the connector (loose contact, cold junction)
Voltage dips on the communication voltage supply for remote bus devices
Faulty optical fiber assembly

11.2.2 Updating the Firmware of the System Coupler

When powered up, the robot checks whether the firmware version of the system coupler is supported. If the firmware version is not supported, IB-S-471 will be posted and parameterization will not be performed. In this case, an update of the firmware is necessary.

The firmware of the system coupler can be updated by means of the software provided by Phoenix Contact for PC. A specified RS-232C cable for the system coupler is also required to connect the PC and the system coupler (Refer to 4.7 for part numbers).

When the system coupler is installed in the robot, please follow procedure 3 to update the firmware. The robot InterBus option should be halted during the firmware update. Before updating the firmware, make sure that the new firmware version is supported by the robot according to procedure 1. If the new firmware version is not supported, cancel the operation.

Procedure 1 Confirming that the firmware version is supported

Steps

1. Press [MENU] key.
2. Select “SYSTEM”.
3. Press F1, [TYPE].
4. Select “Variables”.
5. View $IBPX_GNE.$FIRM_VER.
6. If the first two numbers correspond to the firmware version, it will be supported.

For example, if $IBPX_GNE.$FIRM_VER = “4.6” and firmware version 4.6X (such as 4.61, 4.62, 4.69), then the version is supported. If $IBPX_GNE.$FIRM_VER = “4.6”and firmware version 4.XX (such as 4.48 or 4.70), the version is not supported. Do not update the firmware to the version that is not supported.

Procedure 2 Confirming the current firmware version

Steps

1. Press [MENU] key.
2. Select “STATUS”.
3. Press F1, [TYPE].
4. Select “InterBus”.
5. Go to the “General” screen according to the tree diagram (Figure 10.1).
6. View “Firmware version”.

Procedure 3 Updating the firmware by updating the software of the PC

Steps

1. Press [MENU] key.
2. Select “SYSTEM”.
3. Press F1, [TYPE].
4. Select “Variables”.
5. Change $IBPX_MASTER.$FIRM_UPDATE = 1.
6. Power off/on the controller.
7. Wait until the TP screen will be displayed. IB-S-479 will be posted to inform the operator that the robot is in the firmware updating mode.
8. Update firmware by updating the software of the PC.
9. When the firmware has been updated, turn the controller off and on again.
10. The robot starts up and is able to use the new firmware.
11. Make sure that firmware has been successfully updated by looking firmware version according to the procedure 2.

NOTE

When the system coupler has been installed in the robot, follow the procedure 3 to start the robot in the firmware updating mode. Otherwise, the firmware update will be interrupted.

APPENDIX

A MASTER-ONLY CONTROLLER BOARD

A.1 INTRODUCTION

InterBus function has been improved to support IBS PCI SC-LK, an InterBus controller board without slave interface. IBS PCI SC-LK can be used only in CMD mode. Any slave functions or PCP functions aren't available because it doesn't have slave interface.

NOTE
IBS PCI SC-LK is supported by V7.63P05 (7DB6/P05) or later, or V7.70P24 (7DB7/P24) or later in R-30iA, by V8.10 (7DC1) or later in R-30iB.

A.2 SETTING FOR INTERBUS BOARD TYPE

InterBus function needs to know if the InterBus board is a system coupler (IBS PCI SC/RI/I-T or IBS PCI SC/RI-LK), or a master-only controller board by the following system variable.

Table A.2 The setting for InterBus board type

System variable	DESCRIPTION
$IBPX_HW.$HW_TYPE	This system variable specifies the type of InterBus board. 0 : The InterBus board is a system coupler (IBS PCI SC/RI/I-T or IBS PCI SC/RI-LK) 1 : The InterBus board is a master-only controller board. The default value is 0. This value can be changed at controlled-start.

An error message is displayed and InterBus function stops the operation during start up when the type of installed InterBus board doesn't match the setting. Please refer to A.5 ALARM CODES for the details.

Chnage the system variable if IBS PCI SC-LK is used. In addition, the setting of "Use CMD" must be enabled to use IBS PCI SC-LK because it is supported only in CMD mode.

A.3 FUNCTION

InterBus master function can be used with IBS PCI SC-LK. The specification of CMD mode related to InterBus master is applied. Any slave functions and PCP functions are not available because IBS PCI SC-LK doesn't have slave interface.

On the other hand, there are the following differences:

- The diagnostic register of MASTER is always copied to the signals specified in "Output # status register" (c.f. If a system coupler is used, the register is copied only when the slave part is running).
- Config+ should be used because CMD tool doesn't support IBS PCI SC-LK. "Parameterize" will create "config.svc" somewhere under the project folder. It can be loaded to the robot controller.

NOTE
Unlike CMD tool, Config+ may use lower case character within a file name. For example, the extension of an SVC file may be ".svc". If lower case character is present within the SVC file name, please specify the whole file name exactly including the extension in order to load the SVC file in the CMD control setup screen.

A.4 HARDWARE

LEDs are the same as the master part of the system coupler. IBS PCI RI-LK must be installed to the same slot of the PCI motherboard as the master part of the system coupler. Please see the section 4.5 and 4.6 for more details.

A.5 BACKUP/RESTORE

A.5.1 SVC File

The current InterBus hardware type is recorded to an SVC file when it is loaded to the robot controller. The SVC file becomes invalid when the type of installed InterBus board doesn't match, for example, by restoring a backup to a robot controller with different InterBus hardware type, or by replacement of InterBus board. In this case, please load the SVC file from the InterBus board again.

A.5.2 IBBDFIL.IBA

The current InterBus hardware type is recorded to IBBDFIL.IBA when it is created. The hardware type is checked when IBBDFIL.IBA is restored, and it can only be restored when the hardware type matches. IBBDFIL.IBA from IBS PCI SC-LK can't be restored to the robot controller that doesn't support IBS PCI SC-LK.

A.6 ALARM CODES

Please refer to the subsection 11.1.3 Alarm for Master-only controller board.

B DDI SERVER FUNCTION

B.1 INTRODUCTION

InterBus DDI server function provides the Ethernet communication with Diag+, a PC software product of Phoenix Contact, working on a remote PC. This function uses a standard Ethernet port of the robot controller, transmits diagnostic request from Diag+ to the firmware of InterBus PCI board, and sends diagnostic information back to Diag+. Please refer to the manual of Diag+ available from Phoenix Contact for more information.

B.2 RESTRICTIONS

This function only supports Diag+.

B.3 SOFTWARE

InterBus DDI server function (J769) is necessary to use DDI server on robot.
This function is available on V7.63P08 (7DA6/P08) or later, or V7.70P24 (7DA7/P24) or later in R-30iA, or V8.10 (7DC1) or later in R-30iB.

Diag+ is necessary on PC. FANUC used Config+ V1.30.25 SP 3.73 and DIAG+ V2.30.06 for the test of the DDI server function.

B.4 HARDWARE

This function uses the standard Ethernet port of the robot controller.

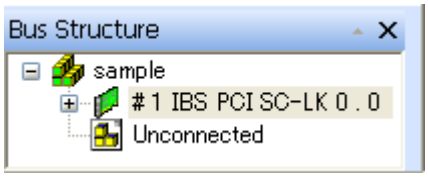
B.5 SETUP

Please set IP address on the Host Comm screen under SETUP. This function uses port 1962 of the IP address. Details on the Ethernet interface and TCP/IP configuration can be found in the Internet Options Setup and Operations Manual (B-82974).

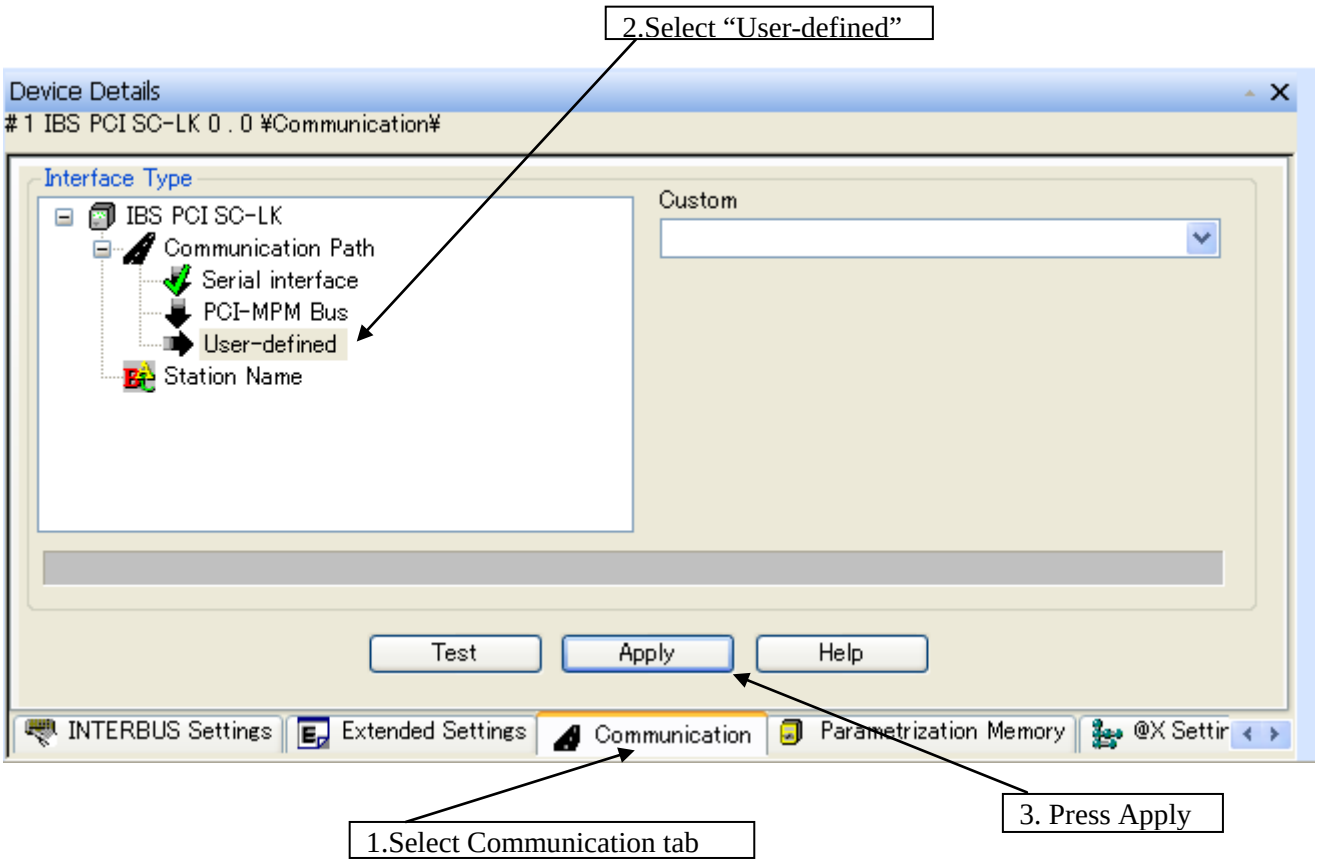
B.6 OPERATION ON DIAG+

Connect standard Ethernet port of the robot controller to the PC installed Diag+ by Ethernet.

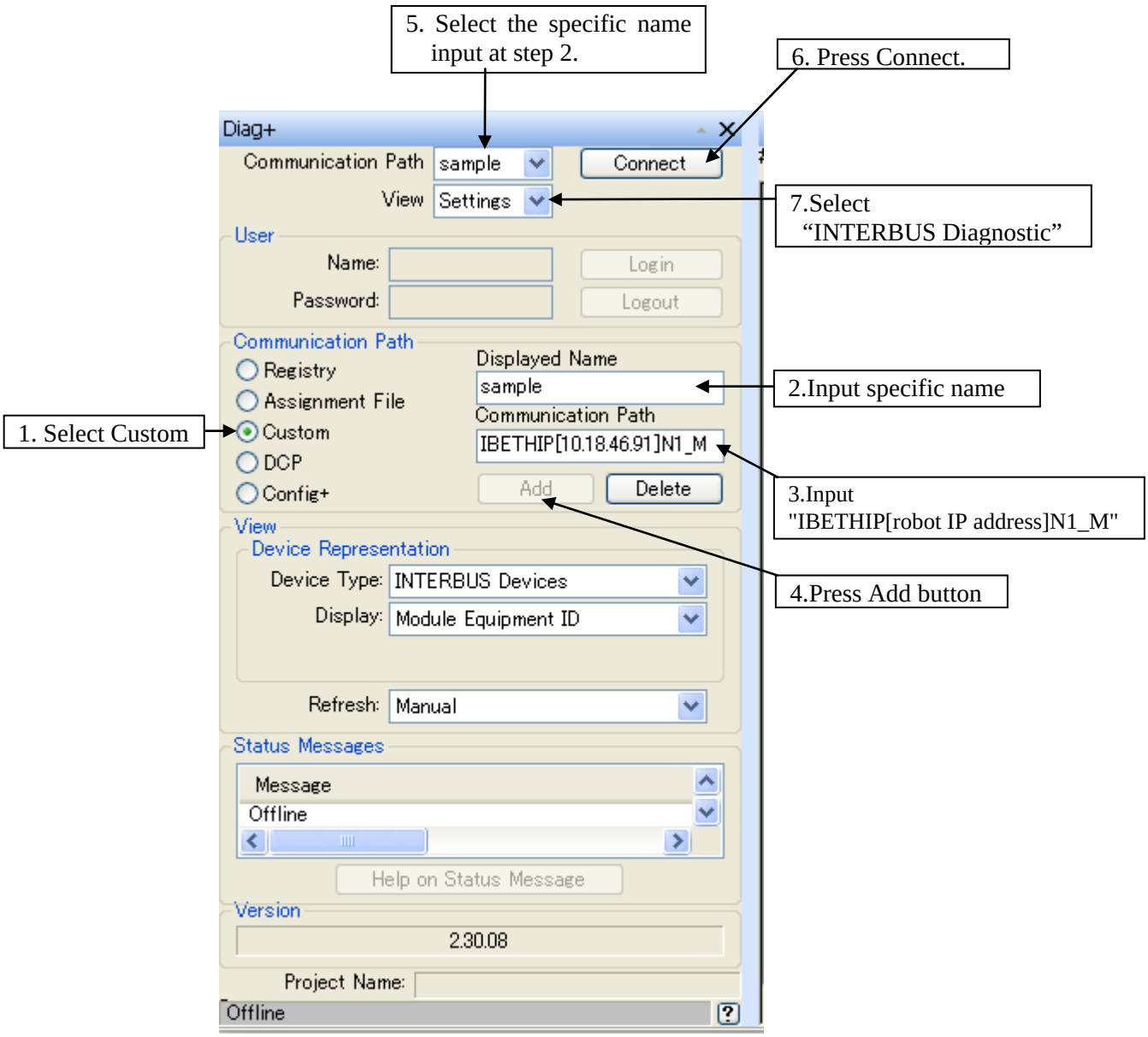
1 Please select the InterBus board. For example, on Config+, select "#1 IBS PCI SC-LK 0. 0" on “Bus Structure” window.



2 Please set the interface type by the following procedures (1-3) on “Device Details” window in order



3 Please run Diag+ or display Diag+ window from View menu in Config+, for example.
Do the following procedure (1-7) in order on “Diag+” window.
Then you can get information of InterBus on robot from the window.



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