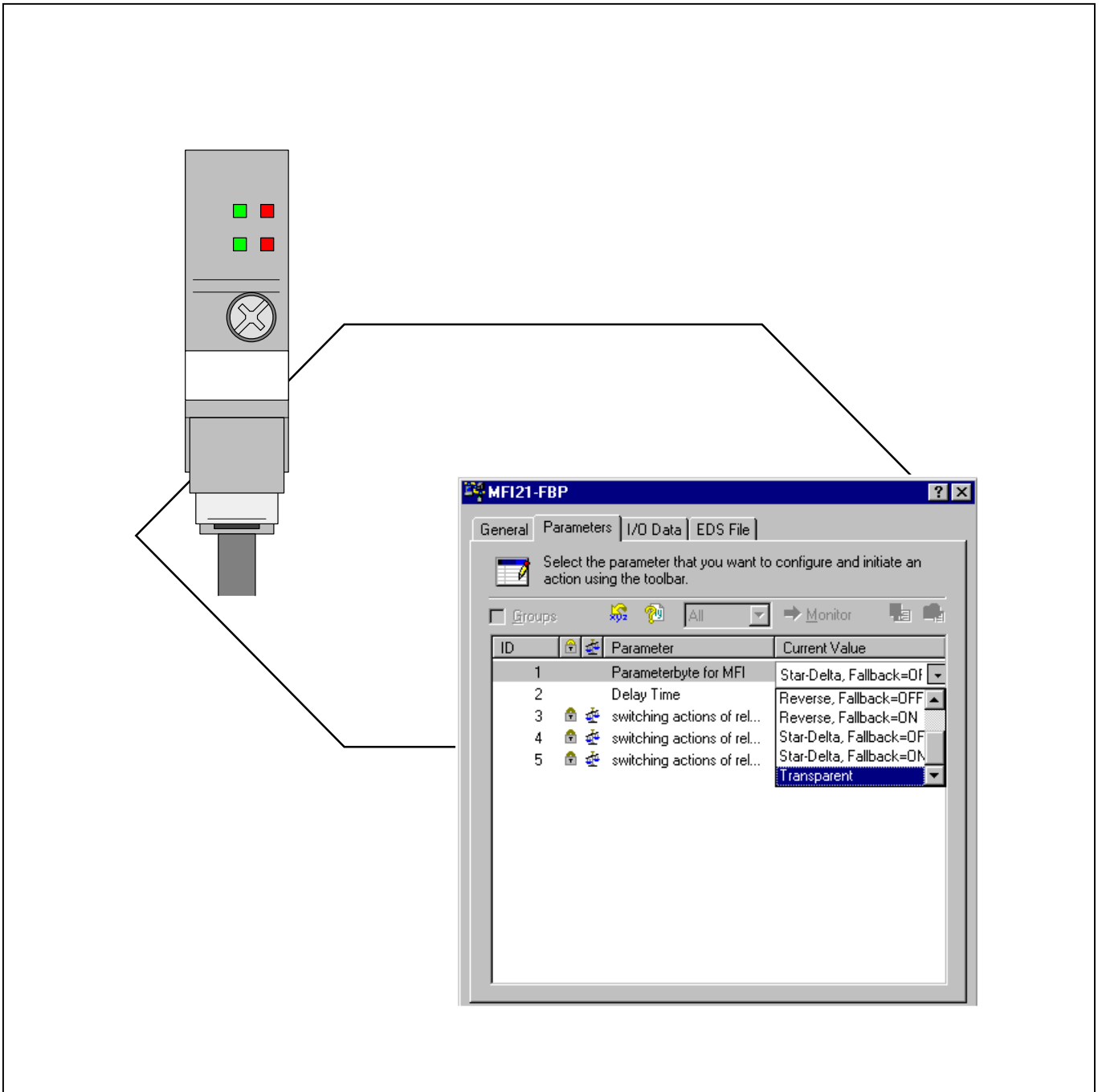




V7

DeviceNet Bus Software Help for Programming an Allen Bradley Control System





DeviceNet Software Help for Programming

an Allen Bradley Control System

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Purpose

DeviceNet is mainly used to transfer process data between central controller modules (such as PLC or PC) and decentralized peripheral modules such as I/O modules, drives, etc.

Connection of the field bus-neutral terminal devices developed by ABB to the DeviceNet bus is performed via a FieldBusPlug.

The FieldBusPlug provides "autobaud" ability that is permanently active. Therefore, new slaves (FieldBusPlugs) connected to the bus automatically match themselves to the baud rate set on the scanner. This feature cannot be deactivated.

DeviceNet supports transfer rates of 125 kbaud, 250 kbaud and 500 kbaud.

Connection types

Communication between master (scanner) and slave (FieldBusPlug + terminal device) can be performed using different methods.

The modes can be individually set for each slave using RSNetWorx. In order to save memory space in the limited I/O range of the scanner, the user should only set the modes he absolutely requires.

POLL mode

The master sends a polling command to a slave. Data of the master, which are intended for the slave, are also transferred. When receiving the data packages transferred by the master, the slave recombines the packages. If the slave contains data which are intended for the polling master, it transmits the data to the master. The response telegram of the slave alternatively or additionally contains status information. If the slave does not respond to polling requests of the master, a timeout occurs.

CHANGE OF STATE mode (COS)

For change of state connections (transfer in case of a state change) DeviceNet subscribers only transmit their data if the state has changed since the last transmission or after the heartbeat interval has elapsed at the latest. The heartbeat time can be set via the scanner. After the heartbeat time the data are transmitted even though no state change has occurred in the mean time. That way the receiver is informed that the sender is working correctly and did not fail. Hence, transmitting a request to the sender of the data is not required.

CYCLIC mode

The slave is an "I/O client" which cyclically sends its data (I/O process, error and status information) to the master in adjustable intervals. Cyclical connections are mainly used if a fixed time slot pattern is predetermined.



EDS files

The characteristic properties of the terminal devices for connecting them to a DeviceNet bus are documented in the form of electronic data sheets (EDS files).

The individual files completely and clearly describe the characteristics (objects) of a device type in a standardized defined and manufacturer-independent format.

Programs for configuring a DeviceNet network use the device type descriptions available in the EDS files. This strongly simplifies planning a DeviceNet system.

The files listed below can be copied from the following folder of the **ABB FBP System** CD-ROM:

Software -> Engineering Package-> DNE91-FBP.0101

- EDS files for connecting FBP terminal devices developed by ABB DESTO to the DeviceNet bus.
- Example program for application of FBP terminal devices in the user program of an Allen Bradley control.

Installing the EDS files

ALLEN BRADLEY, hardware system SLC 500, software RSNetWorx and RSLogix 500.

Start the RSNetWorx software:

- > TOOLS
 - > EDS_Wizard
 - > Register an EDS based device

The three EDS files on the floppy disk are named as follows:

- ABB_General.eds > For all devices with a parallel interface to the FBP (e.g. sensor or MSD11).
- ABB_MSR22.eds > For device MSR22.
- ABB_MFI21.eds > For device MFI21.

When following the instructions, you are requested to choose an icon for the device from a displayed selection. After you have finished the procedure correctly, you can find the device just registered with the corresponding icon in the library on the left-hand side of the monitor under

- Vendor > ABB Stotz Kontakt GmbH
 - > Communication Adapter
 - > e.g. MSR22-FBP

Proceed as described above for all three devices. After the EDS file has been added to the library it is available for the RSNetWorks system.

Communication types between FieldBusPlug and device

Terminal device	EDS file	Transmission FieldBusPlug - terminal device	Telegram mode 2a (short)	Telegram mode 2b (long)
Sensor	ABB_General.eds	parallel		
MSD11-FBP	ABB_General.eds	parallel		
MSR22-FBP	ABB_MSR22.eds	serial	X	
MFI21-FBP	ABB_MFI21.eds	serial	possible	X



Slave address (node address) on the DeviceNet bus

The slave address is stored non-volatile in the DNP21-FBP field bus plug. Addresses can be set via the RSNetWorx software, using the external addressing unit CAS21-FPB.0 (using FBP address programmer software) or directly via the address switches on the terminal device.

A maximum of 64 subscribers (nodes or slaves) can be connected to the DeviceNet bus.

The address range is 00 to 63. The addresses 00, 62 and 63 are reserved.

Address 00 is used by the scanner (e.g. 1747 SDN).

Address 62 is used by the connected PC on which the RSNetWorx software is installed.

Address 63 should not be assigned within the network. Address 63 is the default address of all brand-new devices (here: the field bus plug). This allows problem-free connection of a new device to the bus without any need of prior address setting. Final address setting is then performed by the RSNetWorx software.

Devices without an address switch (MSD11-FBP, sensors)

These devices announce themselves under the address stored in the DNP21-FBP field bus plug. For brand-new field bus plugs this is address 63. For a field bus plug which was already connected to a DeviceNet bus before, this is the address last stored.

Setting the desired address is performed via the external addressing unit CAS21-FPB.0 or via RSNetWorx.

Devices with address switch (MSR22-FBP, MFI21-FBP)

Address setting is done on the device. After the device has been connected to the DeviceNet bus, the address switch positions of the device is automatically read from the field bus plug after the supply voltage is switched on.

If the device was set to an address between 1 and 61 using the address switch, the address cannot be overwritten by RSNetWorx. The address set on the address switches has priority.

Addresses between 64 and 99 are invalid. If an address of this range was set, the device signalizes with the address last stored in the field bus plug.

For brand-new field bus plugs this is address 63. For a field bus plug which was already connected to a DeviceNet bus before, this is the address last stored.

Setting the desired address is performed via the external addressing unit CAS21-FPB.0 or via RSNetWorx.

Setting the slave address via an external programming unit

Refer to the description of the addressing unit CAS21-FPB.0 (2CDC190012D0101).



Application of terminal devices on the DeviceNet bus

MSD11-FBP

The terminal device MSD11-FBP "Motor Starter Direct" can be used to switch a single drive on and off.

MSR22-FBP

The terminal device MSR22-FBP "Motor Starter Reverse" is designed for reverse drives (e.g. right/left, up/down, back/forward etc).

MFI21-FBP

Using the Motor Starter Fieldbus Interface MFI21-FBP different application functions can be implemented:

Transparent		(MFI21 only used as I/O device)
Direct	Direct starter	(1 motor for one direction of rotation)
Reverse	Reversing starter	(1 motor for left or right)
Y/Delta	Star-delta starter	(1 motor with star-delta starting)

Setting the application function as well as setting the behavior of the terminal device MFI21 in case of a bus connection failure (fallback behavior) is done by means of parameters. Parameter input is performed separately for each slave via RSNetWorx.

On delivery, "without operating mode (application function)" is preset. The terminal device cannot be used without valid parameter assignments. No outputs will be switched and no feedback from the terminal device can be received.

In order to use the application functions of the terminal device, the corresponding parameters have to be transmitted to the terminal device **prior to** the initial start of the used application function.

A change of the application function is not effective until the supply voltage is switched off/on again.

The parameters are listed below. These parameters are included in the corresponding EDS files.



Parameters

Connection types

POLL mode

CHANGE OF STATE mode (COS)

CYCLIC mode

The modes can be set individually for each slave using RSNetWorx:

> Scanner

> Properties

> Scanlist

> Edit I/O Parameter

Parameter byte for MFI Application function (PARAM 1)

The following application functions can be set for the MFI21-FBP.

The data can be read and written by the PLC via "explicit message" or with the "RSNetWorx" software running on a connected PC (refer to example program).

Direct ----- Fallback = ON or OFF

Reverse ----- Fallback = ON or OFF

Star-Delta ----- Fallback = ON or OFF

Transparent ----- without fallback

"Fallback" properties:

Fallback = ON

The relays in the terminal device remain in their previous state if the communication between FieldBusPlug and terminal device or between FieldBusPlug and DeviceNet master (scanner) fails.

Fallback = OFF

The relays in the terminal device are switched off (default setting) if the communication fails.

**Parameters (continued)****Delay Time** Change-over time (PARAM 2)

For the MFI21-FBP the change-over time for the application functions

REVERSE (change of the direction of rotation (e.g. left/right or back/forward))

STAR-DELTA (change-over from star to delta operation)

can be adjusted.

Time range: min. = 50 ms, max. = 260100 ms

The data can be read and written by the PLC via "explicit message" and with the "RSNetWorx" software running on a connected PC (refer to example program).

Switching actions of relay 1 Switching actions of relay 1 (PARAM 3)

Number of switching actions of relay 1.

The data can be read by the PLC via "explicit message" or with the "RSNetWorx" software running on a connected PC (refer to example program).

Calculation example:

Display in RSNetWorx (properties, module, parameter) = 15450 dec (3C5A hex)

"Explicit message" delivers a value divided by 10:

word n = 609 hex (1545 dec)

word n+1 = 0

This value has to be multiplied by A hex:

$609 * A_H = 3C5A_H (15450_D)$

Switching actions of relay 2 Switching actions of relay 2 (PARAM 4)

Number of switching actions of relay 2.

The data can be read by the PLC via "explicit message" or with the "RSNetWorx" software running on a connected PC (refer to example program).

For a calculation example please refer to "switching actions of relay 1".

Switching actions of relay 3 Switching actions of relay 3 (PARAM 5)

Number of switching actions of relay 3.

The data can be read by the PLC via "explicit message" or with the "RSNetWorx" software running on a connected PC (refer to example program).

For a calculation example please refer to "switching actions of relay 1".



Modifying the module parameters using the RSNNetWorx software

It is absolutely necessary to proceed as described below.

1. Select the desired terminal device.
 - > Properties
 - > Parameters
 - > Select "Parameterbyte for MFI"

Select the application function from the pull-down menu.



2. Download the parameter to the device. After the transfer is finished, continue with OK. The dialog is closed.

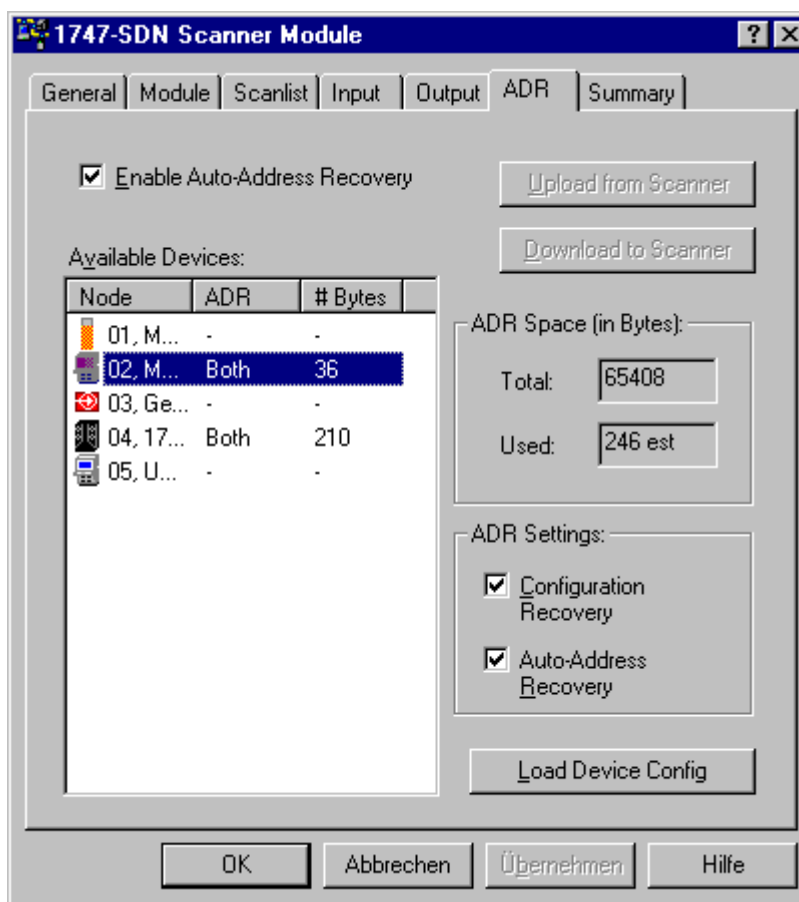


Modifying the module parameters using the RSNetWorx software (continued)

3. Select the scanner (e.g. 1747 SDN).
 - > Properties > ADR tab > select the corresponding device (from 1.)
 - > Click on the "Load Device Configuration" button:

Check the following checkboxes:
 Enable Auto Address Recovery,
 Configuration Recovery and
 Auto Address Recovery.

"Auto Address Recovery" has only to be checked if the new device (with address = 63 and identical product code) shall receive the old device address automatically after a device replacement.



4. Switch the processor to "stop".
 Click on the button "Download to Scanner". After the transfer, click on "Apply".
 After the transfer is finished, continue with OK. The dialog is closed.
5. Switch the supply voltage of the PLC system OFF and ON again.
 When the supply voltage is switched on, the new parameters are transferred from the scanner (e.g. 1747 SDN) to the terminal device via the field bus plug.



Configuring and mapping the I/O data using RSNetWorx

Input

1747-SDN Scanner Module-1 MSR22-FBP MFI21-FBP General 1792D-4BVT4D 4Input/4Output 1770-KFD RS232 Interface

00 01 02 03 04 62

Node	Type	Size	Map
01, MSR22-...	Polled	3	I:1.1.0
02, MFI21-F...	Polled	3	I:1.2.8
03, General	Polled	1	I:1.5.0
04, 1792D-...	COS	2	I:1.4.0

Bits 15-0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
I:1.0	Read-Only															
I:1.1	01, MSR22-FBP															
I:1.2	02, MFI21-FBP										01, MSR22-FBP					
I:1.3	02, MFI21-FBP															
I:1.4	04, 1792D-4BVT4D 4Input/4Output															
I:1.5	03, General															
I:1.6																
I:1.7																
I:1.8																

Memory: Discrete Start Word: 0

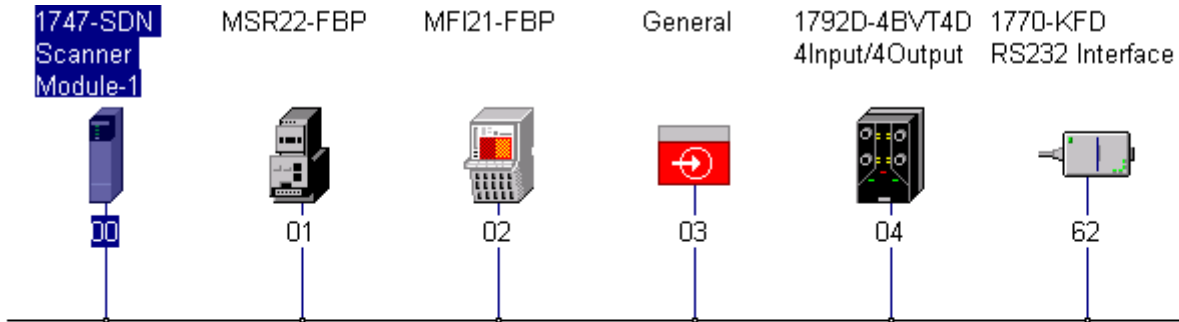
Graph Spreadsheet

OK Abbrechen Übernehmen Hilfe



Configuring and mapping the I/O data using RSNetWorx

Output



1747-SDN Scanner Module-1

General | Module | Scanlist | Input | **Output** | ADR | Summary

Node	Type	Size	Map
01, MSR22...	Polled	1	0:1.1.0
02, MFI21-F...	Polled	1	0:1.1.8
03, General	Polled	1	0:1.2.8
04, 1792D-...	COS	1	0:1.2.0

Memory: Discrete Start Word: 0

Bits 15 - 0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0:1.0	Read-Only															
0:1.1																01, MSR22-FBP
0:1.2																03, General
0:1.3																
0:1.4																
0:1.5																
0:1.6																
0:1.7																
0:1.8																

Graph | Spreadsheet

OK Abbrechen Übernehmen Hilfe



Connecting the ABB terminal devices to the DeviceNet bus via the FieldBusPlug

The following terminal devices for the connection to a DeviceNet bus are available from ABB:

Standard sensor e.g. SIF10-M30N-C1-P0	inductive position sensor from the ABB product range
MSD11-FBP Motor Starter Direct	
MSR22-FBP Motor Starter Reverse	
MFI21-FBP Motor Starter Fieldbus Interface	
Application function " Direct "	Direct starter, with / without fallback functionality
Application function " Reverse "	Reverse starter, with / without fallback functionality
Application function " Y/Delta "	Star-delta starter, with / without fallback functionality
Application function " Transparent "	MFI21-FBP only used as I/O device



DeviceNet, connecting a standard sensor

In RSNetWorx the slave logs in to the scanner (DeviceNet master) under the name GENERAL.

The device cannot be configured. No parameters can be set.

Description of inputs and outputs

Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	X	X	X	I0

X = Bit not used

I = Input

O = Output

Byte	Bit	Explanation
Produces 0	0	Input signal from sensor, signal 1 = sensor is damped
"	1...7	Bits not used

The device does not generate diagnostic data.

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	not used	1 byte
Change of state	not used	1 byte
Cyclic	not used	1 byte

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave

Produces (inputs): Slave produces data for the master -> Signal from slave to master



DeviceNet, connecting the MSD11-FBP

MSD11-FBP, Motor Starter Direct

Description

The terminal device MSD11-FBP "Motor Starter Direct" can be used to switch a single drive on and off. There is no time check between the control signal driving the contactor and the feedback message from the contactor.

In RSNetWorx the slave logs in to the scanner (DeviceNet master) under the name GENERAL.

The device cannot be configured. No parameters can be set.

Output O1 is switched off if the motor protecting switch MS 116 has tripped (TRIP=0) or was switched off (I1 = 0) manually.

Description of inputs and outputs

Byte \ Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	X	X	I1	TRIP
Consumes 0 Output byte 0	X	X	X	X	X	X	X	O1

X = Bit not used

I = Input

O = Output

Byte	Bit	Explanation
Produces 0	0	TRIP, MS 116 has tripped or was switched off manually, signal 0 = tripped
"	1	Feedback signal from MSD11-FBP, signal 1 = contactor is activated
"	2...7	Bits not used
Consumes 0	0	Control signal to MSD11-FBP, signal 1 = contactor is activated
"	1...7	Bits not used

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	not used	1 byte
Change of state	not used	1 byte
Cyclic	not used	1 byte

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave

Produces (inputs): Slave produces data for the master -> Signal from slave to master



DeviceNet, error diagnosis MSD11-FBP

MSD11-FBP, Motor Starter Direct

Action / Error	Reaction / Remote situation
MS 116 has tripped or was switched off manually	<p>Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = off FBP plug active TRIP signal in PLC = 0</p> <p>After switching on the MS 116: TRIP signal in PLC = 1 Contactor is switched according to PLC activation.</p>
Control voltage failure 24...230 V AC/DC (motor contactors) at external power supply	<p>Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = on, LED SUPPLY = off FBP plug active TRIP signal in PLC = 1</p> <p>After voltage recovery: Contactor is switched according to PLC activation.</p>
24 V DC voltage failure in DeviceNet cable	<p>MSD11: Slide switch for contactor voltage in position "INTERNAL" Contactor switches off MSD11-FBP all MSD11 LEDs are off (no power supply) FBP plug inactive TRIP signal in PLC = 1 (previous state)</p> <p>MSD11: Slide switch for contactor voltage in position "EXTERNAL" Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = off, LED SUPPLY = on FBP plug inactive TRIP signal in PLC = 1 (previous state)</p> <p>After voltage recovery: TRIP signal in PLC = 1 Contactor is switched according to PLC activation.</p>
Data traffic between scanner and MSD11-FBP interrupted	<p>Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = on, LED SUPPLY = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on TRIP signal in PLC = 1 (previous state)</p> <p>After voltage / data traffic recovery: Contactor is switched according to PLC activation.</p>
Disconnection between FieldBusPlug and MSD11-FBP (e.g. plug disconnected)	<p>Contactor switches off MSD11-FBP all MSD11 LEDs are off (no power supply) FBP plug activ TRIP signal in PLC = 0 (no data traffic)</p> <p>No "missing slave" message is sent to the DN scanner in case of an error.</p> <p>Plug connected again: Contactor is switched according to PLC activation.</p>
DeviceNet scanner failure (e.g. PLC supply voltage failure)	<p>Contactor switches off MSD11-FBP LED: RUN 1 = off , LED: /TRIP = on, LED SUPPLY = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on TRIP signal in PLC = 1 (previous state)</p> <p>After voltage recovery: Contactor is switched according to PLC activation.</p>



DeviceNet, connecting the MSR22-FBP

MSR22-FBP, Motor Starter Reverse

Description

The terminal device MSR22-FBP "Motor Starter Reverse" is designed for reverse drives (e.g. right/left, up/down, back/forward etc). The rotational directions are mutually locked, i.e. if one direction is switched on, the other direction is locked.

For changing the direction, one direction must be first switched off before the other direction can be switched on.

If both directions are switched on simultaneously, an error message is output:

The contactors are switched off and the red error LED of the MSR22 lights up.

If an error trip event occurred, both control signals must be first set to zero before a new switching event can be initiated. Only after this the error LED goes off.

Resetting the 1st direction and setting the 2nd direction can be executed within the same PLC cycle. It **must** be guaranteed that the reset command is placed **before** the set command in the PLC program.

In RSNetWorx the slave logs in to the scanner (DeviceNet master) under the name MSR22-FBP.

The first activation of a rotational direction for the motor after switching on the supply voltage is performed **instantaneously**. The following changes of the rotational direction are executed with a time delay of 50 ms.

If the slide switch position for the power supply is changed (INTERNAL / EXTERNAL) while a contactor is switched on, the contactor switches off. Re-closing is only possible after setting the control signals to ZERO.

When the supply voltage is switched on, the two address switches on the MSR22-FBP are read by the FieldBusPlug and stored in the FieldBusPlug voltage breakdown-safe.

The device cannot be configured. No parameters can be set.

The outputs O1 and O2 are switched off if the motor protecting switch MS 116 has tripped (Trip = 0) or was switched off manually (I1 = 0).



DeviceNet, connecting the MSR22-FBP

MSR22-FBP, Motor Starter Reverse

Description of inputs and outputs

Byte \ Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	X	I2	I1	TRIP
Produces 1 Input byte 1	generally high	generally high	generally low	generally low	In 2	In 2	In 1	In 1
Produces 2 Input byte 2	not used							
Consumes 0 Output byte 0	X	X	X	X	X	X	O2	O1

X = Bit not used

I = Input

O = Output

Byte	Bit	Explanation
Produces 0	0	TRIP, MS 116 has tripped or was switched off manually, signal 0 = tripped
"	1	Feedback signal of the relay (contactor) driven by O1
"	2	Feedback signal of the relay (contactor) driven by O2
"	3..7	Bits not used
Produces 1	0..1	Diagnosis for input I1 and output O1 (definition on the next page)
"	2..3	Diagnosis for input I2 and output O2 (definition on the next page)
"	4..5	General diagnosis (definition on the next page)
"	6..7	General diagnosis (definition on the next page)
Produces 2	0..7	not used
Consumes 0	0	Drive direction 1 (e.g. right) Start = 1 / Stop = 0
"	1	Drive direction 2 (e.g. left) Start = 1 / Stop = 0
"	2..7	Bits not used

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	not used	1 byte
Change of state	not used	1 byte
Cyclic	not used	1 byte

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave

Produces (inputs): Slave produces data for the master -> Signal from slave to master



DeviceNet, connecting the MSR22-FBP

MSR22-FBP, Motor Starter Reverse

Meaning of bits for Produces 1 (Input byte 1)

Produces 1
Input byte 1

Bit	1	0	
	In 1	In 1	
Bit	3	2	
	In 2	In 2	
	0	0	Normal operation without error
	1	0	Error: Relay is activated but feedback is missing
	0	1	Error: Relay is not activated but feedback signal is present
	x	x	not yet defined

Bit	7	6	5	4	
	generally high	generally high	generally low	generally low	
	0	0	0	0	Normal operation without error
	0	0	1	1	Error: Both directions activated at the same time
	0	0	0	1	Error: Communication FieldBusPlug/device failed
	x	x	x	x	Other combinations are not yet defined



DeviceNet, error diagnosis MSR22-FBP

MSR22-FBP, Motor Starter Reverse

Action / Error	Reaction / Remote situation
MS 116 has tripped or was switched off manually	<p>Contactor 1/2 switches off, TRIP signal in PLC = 0 MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = off FBP plug active</p> <p>After switching on the MS 116: TRIP signal in PLC = 1 MSR22-FBP start only possible after setting the PLC control signals to ZERO.</p>
Control voltage failure 24...230 V AC/DC (motor contactors) at external power supply	<p>Contactor 1/2 switches off, TRIP signal in PLC = 0 MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = off FBP plug active</p> <p>After voltage recovery: TRIP signal in PLC = 1 MSR22-FBP start only possible after setting the PLC control signals to ZERO.</p>
24 V DC voltage failure in DeviceNet cable	<p>Contactor 1/2 switches off, TRIP signal in PLC = 1 MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = off, LED: ERROR = off FBP plug inactive</p> <p>After voltage recovery: TRIP signal in PLC = 1 Contactor 1/2 is switched according to PLC activation.</p>
Data traffic between scanner and MSR22-FBP interrupted	<p>Contactor 1/2 switches off, TRIP signal in PLC = 1 (previous state) MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = on FBP plug active</p> <p>LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>After data traffic recovery: Contactor 1/2 is switched according to PLC activation.</p>
Disconnection between FieldBusPlug and MSR22-FBP (e.g. plug disconnected)	<p>Contactor 1/2 switches off, TRIP signal in PLC = 1 (previous state) MSR22-FBP all LEDs are off (no power supply) FBP plug active</p> <p>LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>Scanner displays missing slave address.</p> <p>Plug re-connected again: Scanner detects connection of the missing slave Contactor 1/2 is switched according to PLC activation.</p>
DeviceNet scanner failure (e.g. no voltage supply)	<p>Contactor 1/2 switches off MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = off FBP plug active</p> <p>LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>After voltage recovery: Contactor 1/2 is switched according to PLC activation.</p>
MSR22-FBP detects communication error to FieldBusPlug	<p>Contactor 1/2 switches off, TRIP signal in PLC = 1 (previous state) MSR22-FBP LED: RUN 1/2 = off , LED: SUPPLY = on, LED: ERROR = on FBP plug active</p> <p>LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes</p> <p>After error removal: Contactor 1/2 is switched according to PLC activation.</p>



DeviceNet, connecting the MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

In RSNetWorx the slave logs in to the scanner (DeviceNet master) under the name MFI21-FBP.

Possible application functions of the MFI21-FBP are:

MFI_Transparent		(MFI21-FBP only used as I/O device)
MFI_Direct	Direct starter	(1 motor for one direction of rotation)
MFI_Reverse	Reversing starter	(1 motor for left or right)
MFI_Y/Delta	Star-delta starter	(1 motor with star-delta starting)

Setting the application function as well as setting the behavior of the MFI21-FBP in case of a bus connection failure (fallback behavior) is done by means of parameters. These parameters are included in the corresponding EDS file for the terminal device MFI21-FBP. Parameter input is performed separately for each slave via RSNetWorx (refer to modification of the module parameters).

On delivery, the MFI21-FBP is preset to "without operating mode (application function)".

The MFI21-FBP cannot be used without valid parameter assignments. No outputs are switched and no feedback from the MFI21-FBP can be received.

In order to use the application functions of the MFI21-FBP it is required that the corresponding parameters of the application function are transmitted to the MFI21-FBP **prior to** the initial start of the used application function.

In the scanner (DeviceNet master), the value is stored non-volatile as configured value. The master **does not** immediately send the parameter value to the slave.

The parameter value is sent when activating the slave after the power supply of the automation system is switched on.

The data are only stored volatile in the MFI21-FBP and will be lost in case of a power supply failure of the MFI21-FBP.

After switching on the MFI21-FBP to the bus once more, the bus master automatically sends the parameter values to the slave.

The device has to be configured. The following parameters can be set using the RSNetWorx software:

- Parameter byte for MFI	Application function (mode)
- Delay Time	Change-over time
- switching actions of relay 1	Number of switching actions of relay 1
- switching actions of relay 2	Number of switching actions of relay 2
- switching actions of relay 3	Number of switching actions of relay 3



DeviceNet, connecting the MFI21-FBP, application function "Transparent"

MFI21-FBP Motor Starter Fieldbus Interface
 Application function "Transparent" with Allen Bradley control

Description

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

All three outputs O0, O1 and O2 are simultaneously switched off, if the motor protecting switch MS 325 has tripped or was switched off manually.

The application function "Transparent" allows to use the MFI21-FBP as normal I/O device. There are no dependencies and no checks between the inputs (I0, I1, I2) and the outputs (O0, O1, O2) of the MFI21-FBP. Input TRIP (= 0) indicates that the motor protecting switch MS325 has tripped or was switched off manually.

In this operating mode the MFI21-FBP potentiometer is without any function.

The two address switches of the MFI21-FBP are used to set the DeviceNet bus node address of the terminal device (refer to section "Slave address (node address) on the DeviceNet bus").

The parameters can be set via RSNNetWorx.

Description of inputs and outputs

Byte \ Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	TRIP	I2	I1	I0
Produces 1 Input byte 1	Diagnosis, 8 bit channel number							
Produces 2 Input byte 2	Diagnosis, 8 bit error code							
Consumes 0 Output byte 0	X	X	X	X	X	O2	O1	O0

X = Bit not used

I = Input

O = Output

Byte	Bit	Explanation
Produces 0	0	Input, can be used for any signal
"	1	Input, can be used for any signal
"	2	Input, can be used for any signal
"	3	TRIP, MS 325 has tripped or was switched off manually, signal 0 = tripped
"	4...7	Bits not used
Produces 1	0..7	Diagnosis, 8 bit channel number (see next page)
Produces 2	0..7	Diagnosis, 8 bit error code (see next page)
Consumes 0	0	Output, can be used for any signal
"	1	Output, can be used for any signal
"	2	Output, can be used for any signal
"	3...7	Bits not used



DeviceNet, connecting the MFI21-FBP, application function "Transparent"

MFI21-FBP, Motor Starter Fieldbus Interface
Application function "Transparent"

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	1 byte	3 bytes
Change of state	1 byte	3 bytes
Cyclic	1 byte	3 bytes

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave
 Produces (inputs): Slave produces data for the master -> Signal from slave to master

Meanig of Input byte 1 and 2

Diagnosis, 8 bit channel number

Bit	7	6	5	4	3	2	1	0	Hex
	1	0	0	0	0	0	0	0	80

General device error, no channel errors

Diagnosis, 8 bit error code, channel number = "General device errors"

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

Normal operation without error

Error: Communication malfunction FieldBusPlug/device

Error: Invalid parameter



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Transparent"

Action / Error	Reaction / Remote situation
MS 325 has tripped or was switched off manually	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = off FBP plug active TRIP signal in PLC = 0</p> <p>After switching on the MS 325: Starting the function is only possible after setting the PLC control signals to ZERO.</p>
Input power supply failure at external power supply	<p>The relay outputs OUTPUT 0/1/2 remain activated, the input signals INPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = off FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: The input signals show the real state again (ON/OFF).</p>
24 V DC voltage failure in DeviceNet cable	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug inactive TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Relay outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug active</p> <p>LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>Plug connected again: Relay outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR = on FBP plug active</p> <p>LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: Relay outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
Data traffic between scanner and MFI21-FBP	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = on FBP plug active</p> <p>LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Relay outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>



DeviceNet, connecting the MFI21-FBP, application function "Direct"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Direct Starter"

Description

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

All three outputs O0, O1 and O2 are switched off simultaneously, if the motor protecting switch MS 325 has tripped or was switched off manually.

Output O0 can be used to switch on a drive. The input signal I0 is intended as feedback signal from the contactor or directly from the drive.

The function monitors whether the feedback signal I0 arrives within a checkout time of 50 ms after the control signal O0 was output. In this operating mode the MFI21-FBP potentiometer is without function.

The "fallback" behavior of output O0 can be specified by the user by means of parameters.

The inputs I1 and I2 and the outputs O1 and O2 are not monitored. They can be used independent from each other.

The two address switches of the MFI21-FBP are used to set the DeviceNet bus node address of the terminal device (refer to section "Slave address (node address) on the DeviceNet bus").

The parameters can be set via RSNWorx.

Description of inputs and outputs

Byte \ Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	TRIP	I2	I1	I0
Produces 1 Input byte 1	Diagnosis, 8 bit channel number							
Produces 2 Input byte 2	Diagnosis, 8 bit error code							
Consumes 0 Output byte 0	X	X	X	X	X	O2	O1	O0

X = Bit not used

I = Input

O = Output

Byte	Bit	Explanation
Produces 0	0	Feedback of the relay (contactor) driven by O0
"	1	Input, can be used for any signal
"	2	Input, can be used for any signal
"	3	TRIP, MS 325 has tripped or was switched off manually, signal 0 = tripped
"	4...7	Bits not used
Produces 1	0..7	Diagnosis, 8 bit channel number
Produces 2	0..7	Diagnosis, 8 bit error code
Consumes 0	0	Drive on = 1, drive off = 0
"	1	Output, can be used for any signal
"	2	Output, can be used for any signal
"	3...7	Bits not used



DeviceNet, connecting the MFI21-FBP, application function "Direct"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Direct Starter"

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	1 byte	3 bytes
Change of state	1 byte	3 bytes
Cyclic	1 byte	3 bytes

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave

Produces (inputs): Slave produces data for the master -> Signal from slave to master

Meanig of Input byte 1 and 2

Diagnosis, 8 bit channel number

Bit	7	6	5	4	3	2	1	0	Hex
	1	0	0	0	0	0	0	0	80

General device error, no channel errors

Diagnosis, 8 bit error code, channel number = "General device errors"

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

Normal operation without error

Error: Communication malfunction FieldBusPlug/device

Error: Invalid parameter

Diagnosis, 8 bit channel number

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

Channel error for I0 / O0

Diagnosis, 8 bit error code, channel number = "channel error"

Bit	7	6	5	4	3	2	1	0	Hex
	0	1	0	0	0	0	0	1	41
	0	1	0	0	0	0	1	0	42

Error: Relay O0 not activated but feedback signal I0 is present.

Error: Relay O0 activated but feedback signal I0 is missing.



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Direct Starter"

Action / Error	Reaction / Remote situation
MS 325 has tripped or was switched off manually	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = off FBP plug active TRIP signal in PLC = 0</p> <p>If only the outputs OUTPUT 1/2 are activated and the MS 325 trips, all relay outputs will be switched off. No error messages are generated at the MFI21-FBP or the FieldBusPlug as the outputs OUTPUT 1/2 are not monitored by the function.</p> <p>After switching on the MS 325: Starting the function is only possible after setting the PLC control output 0 (1/2) to ZERO.</p>
Input power supply failure (24 V DC) at external power supply	<p>The monitored relay output OUTPUT 0 is switched off. The inputs INPUT 0/1/2 do not send feedback. The outputs 1/2 remain in their switching state (switching is possible). MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: Outputs 1/2 are switched according to PLC activation. Starting the function is only possible after setting the PLC control output 0 to ZERO.</p>
24 V DC voltage failure in DeviceNet cable	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug inactive TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Outputs 0/1/2 are switched according to PLC activation.</p>
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>Plug connected again: Outputs 0/1/2 are switched according to PLC activation.</p>
MFI21-FBP detects an error at OUTPUT 0 / INPUT 0	<p>The monitored relay output 0 is switched off. The outputs 1/2 remain in their switching state (switching is possible). MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: Outputs 1/2 are switched according to PLC activation. Starting the function is only possible after setting the PLC control output 0 to ZERO.</p>



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Direct Starter"

Action / Error	Reaction / Remote situation without FALLBACK (relays are switched off)
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: OUTPUT 0/1/2 are switched according to PLC activation.</p>
Data traffic between scanner and MFI21-FBP interrupted	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After data traffic is re-established: OUTPUT 0/1/2 are switched according to PLC activation.</p>
Action / Error	Reaction / Remote situation with FALLBACK (relays are not switched off)
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: After communication recovery all relay outputs will be switched off and the MFI21 ERROR LED goes off. If control signal 0 from the PLC is still present, a restart of the direct mode function "Switch on drive" is performed after a short delay time. The relay outputs which are not monitored are switched according to PLC activation.</p>
Data traffic between scanner and MFI21-FBP interrupted	<p>The switching states of the relay outputs OUTPUT 0/1/2 are kept. MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After data traffic is re-established: After communication recovery all relay outputs will be switched off and the MFI21 ERROR LED goes off. If control signal 0 from the PLC is still present, a restart of the direct mode function "Switch on drive" is performed after a short delay time. The relay outputs which are not monitored are switched according to PLC activation.</p>



DeviceNet, connecting the MFI21-FBP, application function "Reverse"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Reverse Starter"

Description

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

All three outputs O0, O1 and O2 are switched off simultaneously, if the motor protecting switch MS 325 has tripped or was switched off manually.

This application function allows to use the device for reversing drives (right/left, up/down, forward/back, etc.). The rotational directions are mutually locked, i.e. if one direction is switched on, the other direction is locked. When the direction is changed, one direction must be first switched off before the other direction can be switched on.

If both directions are switched on at the same time, an error message appears on the MFI21-FBP. All relay outputs are switched off.

If an error trip event occurred, all control signals O0, O1 and O2 must be first set to zero before a new switching event can be initiated. Only after this the error LED goes off.

Resetting the 1st direction and setting the 2nd direction can be executed within the same PLC cycle. It **must** be guaranteed that the reset command is placed before the set command in the PLC program.

After switching on the supply voltage the initial switch on of the motor's direction of rotation is performed **undelayed**, i.e. the time set with the potentiometer or the value of the **Delay Time** parameter are not yet considered. The following changes of the rotational direction are executed with a time delay.

The time can be set in the RSNetWorx software or using the integrated potentiometer or it can be transmitted by the PLC in the form of a parameter. The sent time value is stored non-volatile in the MFI21-FBP.

If the integrated potentiometer is set to the left stop (lowest value), the time value transmitted as parameter is used. If the potentiometer is turned to the right (clockwise), the value set with the potentiometer is used. The delay time can be adjusted between 50 ms and 260100 ms.

The "fallback" behavior of output O0 or O1 can be specified by the user by means of parameters.

The device monitors whether the feedback signal I0 or I1 arrives within a checkout time of 50 ms after the control signal O0 or O1 was output.

Input I2 and output O2 are not monitored. They can be used independently.

The two address switches of the MFI21-FBP are used to set the DeviceNet bus node address of the terminal device (refer to section "Slave address (node address) on the DeviceNet bus").

The parameters can be set via RSNetWorx or via "explicit message" from the PLC.



DeviceNet, connecting the MFI21-FBP, application function "Reverse"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Reverse Starter"

Description of inputs and outputs

Byte \ Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	TRIP	I2	I1	I0
Produces 1 Input byte 1	Diagnosis, 8 bit channel number							
Produces 2 Input byte 2	Diagnosis, 8 bit error code							
Consumes 0 Output byte 0	X	X	X	X	X	O2	O1	O0

X = Bit not used

I = Input

O = Output

Byte	Bit	Explanation
Produces 0	0	Feedback of the relay (contactor) driven by O0
"	1	Feedback of the relay (contactor) driven by O1
"	2	Input, can be used for any signal
"	3	TRIP, MS 325 has tripped or was switched off manually, signal 0 = tripped
"	4...7	Bits not used
Produces 1	0..7	Diagnosis, 8 bit channel number
Produces 2	0..7	Diagnosis, 8 bit error code
Consumes 0	0	Drive on = 1; drive off = 0 e.g. right
"	1	Drive on = 1; drive off = 0 e.g. left
"	2	Output, can be used for any signal
"	3...7	Bits not used



DeviceNet, connecting the MFI21-FBP, application function "Reverse"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Reverse Starter"

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	1 byte	3 bytes
Change of state	1 byte	3 bytes
Cyclic	1 byte	3 bytes

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave

Produces (inputs): Slave produces data for the master -> Signal from slave to master

Meanig of Input byte 1 and 2

Diagnosis, 8 bit channel number

Bit	7	6	5	4	3	2	1	0	Hex
	1	0	0	0	0	0	0	0	80

General device error, no channel errors

Diagnosis, 8 bit error code, channel number = "General device errors"

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

Normal operation, no error

Error: Communication malfunction FieldBusPlug/device

Error: Both directions activated at the same time

Error: Delay time out of permitted range

Error: Invalid parameter

Diagnosis, 8 bit channel number

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

Channel error for I0 / O0

Channel error for I1 / O1

Diagnosis, 8 bit error code, channel number = "channel error"

Bit	7	6	5	4	3	2	1	0	Hex
	0	1	0	0	0	0	0	1	41
	0	1	0	0	0	0	1	0	42

Error: Relay O0 or O1 is not activated but feedback signal I0 / I1 is present.

Error: Relay O0 or O1 is activated but feedback signal I0 / I1 is missing.



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Reverse Starter"

Action / Error	Reaction / Remote situation
MS 325 has tripped or was switched off manually	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = off FBP plug active TRIP signal in PLC = 0</p> <p>After switching on the MS 325: Starting the function is only possible after setting the PLC control outputs 0/1/2 to ZERO.</p>
Input power supply failure at external power supply	<p>The monitored relay outputs OUTPUT 0/1 are switched off. The inputs INPUT 0/1/2 do not send feedback. OUTPUT 2 remains in its switching state (switching is possible). MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: OUTPUT 2 is switched according to PLC activation. Starting the function is only possible after setting the PLC control outputs 0/1 to ZERO.</p>
24 V DC voltage failure in DeviceNet cable	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug inactive TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Outputs 0/1/2 are switched according to PLC activation.</p>
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	<p>All relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>Plug connected again: Outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
MFI21-FBP detects an error at OUTPUT 0 / INPUT 0 or OUTPUT 1 / INPUT 1	<p>The monitored relay outputs OUTPUT 0/1 are switched off. OUTPUT 2 remains in its switching state (switching is possible). MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: OUTPUT 2 is switched according to PLC activation. Starting the function is only possible after setting the PLC control outputs 0/1 to ZERO.</p>



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Reverse Starter"

Action / Error	Reaction / Remote situation without FALLBACK (relays are switched off)
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>All relay outputs OUTPUT 0/1/2 are switched off.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: Outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
Data traffic between scanner and MFI21-FBP interrupted	<p>All relay outputs OUTPUT 0/1/2 are switched off.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
Action / Error	Reaction / Remote situation with FALLBACK (relays are not switched off)
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>The switching states of the relay outputs OUTPUT 0/1/2 are kept.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: After communication recovery all relay outputs will be switched off and the MFI21 ERROR LED goes off. If control signal 1/2 from the PLC is still present, a restart of the reverse mode function "Switch on drive" is performed after a short delay time. The relay outputs which are not monitored are switched according to PLC activation.</p>
Data traffic between scanner and MFI21-FBP interrupted	<p>The switching states of the relay outputs OUTPUT 0/1/2 are kept.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: After communication recovery all relay outputs will be switched off and the MFI21 ERROR LED goes off. If control signal 1/2 from the PLC is still present, a restart of the reverse mode function "Switch on drive" is performed after a short delay time. The relay outputs which are not monitored are switched according to PLC activation.</p>



DeviceNet, connecting the MFI21-FBP, application function "Y/Delta"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Star-Delta Starter"

Description

The MFI21-FBP can only be used together with the ABB motor protecting switch MS 325.

All three outputs O0, O1 and O2 are switched off simultaneously, if the motor protecting switch MS 325 has tripped or was switched off manually.

This application function allows to use the device for drives with star/delta operation. The change-over time from star to delta operation can be adjusted.

The time can be set in the RSNetWorx software or using the integrated potentiometer or it can be transmitted by the PLC in the form of a parameter. The sent time value is stored non-volatile in the MFI21-FBP.

If the integrated potentiometer is set to the left stop (lowest value), the time value transmitted as parameter is used. If the potentiometer is turned to the right (clockwise), the value set with the potentiometer is used. The delay time can be adjusted between 50 ms and 260100 ms.

The "fallback" behavior of output O0 (O1, O2) can be specified by the user by means of parameters. If an error trip event occurred, control signal O0 must be first set to zero before a new switching event can be initiated after the error was cleared.

The device monitors whether the feedback signals I0, I1 and I2 arrive within a checkout time of 50 ms after activating the corresponding contactor.

The two address switches of the MFI21-FBP are used to set the DeviceNet bus node address of the terminal device (refer to section "Slave address (node address) on the DeviceNet bus").

The parameters can be set via RSNetWorx or via "explicit message" from the PLC.



DeviceNet, connecting the MFI21-FBP, application function "Y/Delta"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Star-Delta Starter"

Description of inputs and outputs

Byte \ Bit	7	6	5	4	3	2	1	0
Produces 0 Input byte 0	X	X	X	X	TRIP	I2	I1	I0
Produces 1 Input byte 1	Diagnosis, 8 bit channel number							
Produces 2 Input byte 2	Diagnosis, 8 bit error code							
Consumes 0 Output byte 0	X	X	X	X	X	O2 internal	O1 internal	O0

X = Bit not used

I = Input

O = Output

internal = Outputs are switched by MFI21

Byte	Bit	Explanation
Produces 0	0	Feedback of the relay (contactor) driven by O0
"	1	Feedback of the relay (contactor) driven by O1
"	2	Feedback of the relay (contactor) driven by O2
"	3	TRIP, MS 325 has tripped or was switched off manually, signal 0 = tripped
"	4...7	Bits not used
Produces 1	0..7	Diagnosis, 8 bit channel number
Produces 2	0..7	Diagnosis, 8 bit error code
Consumes 0	0	Drive on = 1, drive off = 0
"	1...7	Bits not used



DeviceNet, connecting the MFI21-FBP, application function "Y/Delta"

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Star-Delta Starter"

Communication master <—> slave	Consumes outputs	Produces inputs
Polled	1 byte	3 bytes
Change of state	1 byte	3 bytes
Cyclic	1 byte	3 bytes

Signal directions:

Consumes (outputs): Slave consumes data from master -> Signal from master to slave

Produces (inputs): Slave produces data for the master -> Signal from slave to master

Meaning of Input byte 1 and 2

Diagnosis, 8 bit channel number

Bit	7	6	5	4	3	2	1	0	Hex
	1	0	0	0	0	0	0	0	80

General device error, no channel errors

Diagnosis, 8 bit error code, channel number = "General device errors"

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

Normal operation, no error

Error: Communication malfunction FieldBusPlug/device

Error: Delay time out of permitted range

Error: Invalid parameter

Diagnosis, 8 bit channel number

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

Channel error for I0 / O0

Channel error for I1 / O1

Channel error for I2 / O2

Diagnosis, 8 bit error code, channel number = "channel error"

Bit	7	6	5	4	3	2	1	0	Hex
	0	1	0	0	0	0	0	1	41
	0	1	0	0	0	0	1	0	42

Error: Relay is not activated but feedback signal is present

Error: Relay is activated but feedback is missing



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Star-Delta Starter"

Action / Error	Reaction / Remote situation
MS 325 has tripped or was switched off manually	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 0</p> <p>After switching on the MS 325: Starting the function is only possible after setting the PLC control RUN_1 to ZERO.</p>
Input power supply failure at external power supply	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: Starting the function is only possible after setting the PLC control RUN_1 to ZERO.</p>
24 V DC voltage failure in DeviceNet cable	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug inactive TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
Disconnection between FieldBusPlug and MFI21-FBP (plug disconnected)	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP all LEDs are off, no power supply FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>Plug connected again: Outputs OUTPUT 0/1/2 are switched according to PLC activation.</p>
MFI21-FBP detects an error at OUTPUT 0 / INPUT 0	<p>The relay outputs OUTPUT 0/1/2 are switched off. MFI21-FBP LED: ERR. = on FBP plug active TRIP signal in PLC = 1</p> <p>After error removal: Starting the function is only possible after setting the PLC control output 0 to ZERO.</p>



DeviceNet, error diagnosis MFI21-FBP

MFI21-FBP, Motor Starter Fieldbus Interface, application function "Star-Delta Starter"

Action / Error	Reaction / Remote situation without FALLBACK (relays are switched off)
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>The relay outputs OUTPUT 0/1/2 are switched off.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: Outputs OUTPUT 0/1/2 are switched according to PLC activation output 0.</p>
Data traffic between scanner and MFI21-FBP interrupted	<p>The relay outputs OUTPUT 0/1/2 are switched off.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: Outputs OUTPUT 0/1/2 are switched according to PLC activation output 0.</p>
Action / Error	Reaction / Remote situation with FALLBACK (relays are not switched off)
Data line disconnection between FieldBusPlug and MFI21-FBP	<p>The switching states of the relay outputs OUTPUT 0/1/2 are kept.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = on, LED: H4 red (MODULE status) = flashes red</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After error removal: After communication recovery all relay outputs will be switched off and the MFI21 ERROR LED goes off. If control signal 0 from the PLC is still present, a restart of the start-delta function "Switch on drive" in star operation mode is performed after a short delay time. In case of an error (missing feedback), the user has to configure the desired reaction (e.g. restart) in the PLC program.</p>
Data traffic between scanner and MFI21-FBP interrupted	<p>The switching states of the relay outputs OUTPUT 0/1/2 are kept.</p> <p>MFI21-FBP LED: ERR. = on FBP plug LED: H1 green (NETWORK status) = flashes, LED: H3 green (MODULE status) = on</p> <p>TRIP signal in PLC = 1 (previous state) / DN scanner detects missing slave #x</p> <p>After voltage recovery: After communication recovery all relay outputs will be switched off and the MFI21 ERROR LED goes off. If control signal 0 from the PLC is still present, a restart of the start-delta function "Switch on drive" in star operation mode is performed after a short delay time. In case of an error (missing feedback), the user has to configure the desired reaction (e.g. restart) in the PLC program.</p>



LED displays on the front side of the FieldBusPlug DNP21-FBP

H1 and H2 indicate the network status
H3 and H4 indicate the module status

Box nut (provided on delivery)

Label for writing down the address setting

2CDC 342 044 F0003

H1 H2
■ ■
 Network status

H3 H4
■ ■
 Module status

2CDC 342 045 F0003

Meanings of the LEDs

Network status		Module status		Status / Cause
green LED H1	red LED H2	green LED H3	red LED H4	
off	off			No supply voltage, not online.
flashes	off			Online, but not yet listed in scan list.
on	off			Online and listed in scan list.
off	flashes			I/O connection in timeout state.
off	on			Critical connection error, no communication e.g. address is used twice, bus switched off.
flashes	flashes			Special communication error.
		off	off	No supply voltage connected to the device.
		on	off	Device is working without any errors.
		flashes	off	Device switched to standby mode or missing parameterization.
		off	flashes	Error which can be acknowledged
		off	on	Error which cannot be acknowledged. Replace the device, if necessary.
		flashes	flashes	Device is running a self-test.

LED displays on the front side of the FieldBusPlug DNP21-FBP



DeviceNet example program

Hard- and software requirements

The program was tested with the following configuration:

System:	SLC 500
CPU:	SLC 5/03
Scanner:	1747-SDN
Input module:	1746 IB 16
Output module:	1746 OB 8
Power supply:	PS 307 / 2A

Programming software: RSLogix 500, version 5.20.00
RSNetWorx, version 3.21.00

The example program consists of two parts:

- Bsp_RSNetworx.dnt

Hardware configuration and monitoring program RSNetWorx

The following slaves and addresses are defined:

0	=	DN Scanner
1	=	MSR22-FBP
2	=	MFI21-FBP
3	=	MSD21-FBP
4	=	Amor Block 4I / 4O
62	=	RS232 interface

Devices (slaves) which are not required can be removed from the configuration.

- Bsp_SLC500.rss

PLC program RSLogix 500

For a short description of this program, please refer to section "Program functions".



The EDS file (Electronic Data Sheet)

For each device used on the DeviceNet bus a corresponding EDS file has to be available from the manufacturer.

In this file the device properties are defined in a standardized format.
The use of EDS files facilitates project planning for the master and the slave.

Without this file, connection of a device to the DeviceNet bus is not possible.

If this file is not already available in the programming software, it has to be copied into the EDS library of the corresponding PLC manufacturer.

Usually for each PLC programming system of each manufacturer a software tool is available to integrate this EDS file into the system.

Allen Bradley company uses the EDS Wizard in the "RSNetWorx" software for this.

The following EDS files are required for the FBP modules developed by ABB DESTO:

ABB_General.eds	for the device MSD11-FBP
ABB_MSR22.eds	for the device MSR22-FBP
ABB_MFI21.eds	for the device MFI21-FBP

Installation notes

A ZIP file containing the EDS files and an example program can be downloaded from the

ABB FBP System CD-ROM under
Software -> Engineering Package-> DNE91-FBP.0101

Select the file "DNE91-FBP.0101". You can download the ZIP file into any directory on your PC. The file is stored on your PC under the file name "1SAJ923091R0101.ZIP". Extract this file.

Two program files with the following names will be generated:

Bsp_RSNetworx.dnt
Bsp_SLC500.rss

Copy these files into your RSLogix project directory.

Furthermore the EDS files mentioned above are generated.

Use these files as laid down by the manufacturer of the PLC system.



Program functions

The program Bsp_RSNetworx.dnt has to be opened with the "RSNetWorx" software.

It contains the following modules:

- Address 0: Scanner
- Address 1: MSR22
- Address 2: MFI21
- Address 3: General (MSD11)
- Address 4: Amor block 1792D
- Address62: 1770-KFD RS232 interface

The arrangement of the input and output bits can be found in the scanner "Properties" on the "Input" or "Output" tab. They have all been arranged in the discrete I/O area.

The PLC program has to be opened with the "RSLogix 500" software.

It contains 30 rungs of a ladder diagram.

Rung 00

The scanner 1747 SDN is switched to RUN mode.

Rungs 01...02

2 x 128 words (M1 file) are copied from the scanner (all slave data) into the word area of the PLC.

Rungs 03...04

2 x 128 words are copied from the PLC area into the scanner (M0 file).

The rungs 01...04 are only required if the user transmits data within this area, e.g. if he arranged input and output data in this area due to limitations of space or if he wants to use the "explicit message" function.

The word arrangement in the "input and output image table" for the M1 and M0 files can be found in the documentation delivered with the device.



Program functions (continued)

Rungs 05...07

These rungs deal with one complete cycle of the "EXPLICIT MESSAGE" function including the success surveillance and the subsequent deletion of the response buffer (#M0:1.224...M0:1.255).

The "explicit message" function can be used to

- * transmit configuration data from the scanner to the connected slaves,
- * receive diagnostic data of the slaves,
- * read and write parameter data during the PLC cycle.

In the example program mentioned above the data for the command and the response from the slave are stored in data file N20. The important words are the words N20:10 to N20:16 for the request and N20:50 to N20:52 for the response.

The data have the following meaning:

SET_ATTRIBUTE_SINGLE, node (slave) 02, class 69, instance 03, attribute 03, data 05 (operating mode star-delta for the MFI). The user gets the data for class, instance and attribute from the EDS file; here it is PARAM1 for setting the operating modes "Direct, Reverse and Star/Delta".

The slave function resulting from the data is as follows:

Slave 02 (the MFI in the example) is configured via the PLC program to the operating mode Star/Delta without fallback.

The number of data words (request and response) required for the "explicit message" function can vary for the individual command types.

Using the index word "Explicit messaging" in the help system of the RSNetWorx software opens an example of a circuit as well as two different command code examples.

Rungs 08...10

Feedback signals of an MSR22-FBP to the PLC (trip, left, right).

Rungs 11 and 12

Control signals (switches) from the PLC to the MSR22-FBP (left, right).

Rungs 13...16

Feedback signals of an MFI21-FBP (contact 1, 2 and 3, trip).

Rungs 17...19

Control signals (switches) from the PLC to the MFI21-FBP, the meaning depends on the operating mode.

Rungs 20 and 21

Feedback signals of an MSD11-FBP (trip, contact 1).

Rung 22

Control signal (switch) from the PLC to the MSD11-FBP.

Rung 23

Program end.



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