UR20-FBC-EIP (all variants)

Quick Start Guide - Commissioning with Allen-Bradley MicroLogix 1400

Abstract:
All variants of the u-remote EtherNet/IP coupler UR20-FBC-EIP are not only suitable for connection to EtherNet/IP scanners (Implicit Messaging). They also support communication with EtherNet/IP controllers that can only access external devices acyclically via the fieldbus (Explicit Messaging). This Quick Start Guide shows the necessary steps to access I/O and parameter data using an Allen-Bradley MicroLogix 1400 with MSG Instructions programmed in Rockwell Automation RSLogix 500 configuration software as an example.

Hardware reference

No.	Component name	Article No.	Hardware / Firmware version
1	UR20-FBC-EIP	1334920000	HW 01.xx.xx / FW 01.05.00 (or higher) HW 02.xx.xx / FW 02.05.00 (or higher)
2	Allen-Bradley 1766-L32BXB Micrologix 1400	-	Ser.C / FW 21

Software reference

No.	Software name	Article No.	Software version
1	Rockwell Automation RSLogix 500	-	v. 11.00.00

File reference

No.	Name	Description	Version
1	-	-	-

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Content

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Controls may fail in unsafe operating conditions, causing uncontrolled operation of the controlled devices. Such hazardous events can result in death and / or serious injury and / or property damage. Therefore, there must be safety equipment provided / electrical safety design or other redundant safety features that are independent from the automation system.

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2 Related Manuals and requirements

Manuals:

- Weidmüller UR20-FBC-EIP download at www.weidmueller.com:
  - Weidmüller “Remote-I/O-System u-remote Manual” (1432790000)[1].
- MicroLogix 1400 Programmable Controller downloads at www.rockwellautomation.com:
  - Rockwell Automation Publication “MicroLogix 1400 Programmable Controllers Installation Instructions” (1766-IN001).
  - Rockwell Automation Publication “MicroLogix 1400 Programmable Controllers User Manual” (1766-UM001).
  - Rockwell Automation Publication “MicroLogix 1400 Programmable Controllers Instruction Set Reference Manual” (1766-RM001).

Requirements:

- The MicroLogix controller and the UR20 coupler should,
  - have a power supply connected.
  - be connected to the same Ethernet network.
  - have an IP address set on the same subnet.
  - be fault-free (except for bus failure).
- A computer with RSLogix 500 should be connected to the MicroLogix controller.
- The installation of a device description file (EDS) is not necessary.

[1] Referred to in this document as u-remote manual

3 Acyclic access to UR20-FBC-EIP

The procedure described below is only necessary for EtherNet/IP nodes which establish only explicit connections such as the MicroLogix 1400. If explicit messaging is carried out from a controller which already has an Exclusive Owner connection (implicit) then no additional parameters need to be activated.

- The UR20-FBC-EIP supports unconnected (UCMM) and connected (Class 3) Explicit Messaging.
- The maximum supported data size of class 3 connection is 1516 Byte.
- By default, each explicit connection has full read permissions and partial write permissions to all available data objects except Process Data Outputs.
- To enable full write permissions, two parameter objects “Timeout in seconds” and “Start Explicit Process Data Exchange “ must be set (details shown in chapter 3.1).
- The UR20-FBC-EIP accepts multiple connections at a time with restrictions in write permissions:
    - If an Exclusive Owner connection (implicit) is active, explicit connections can’t get full write permissions.
    - If an explicit connection has activated full write permissions an Exclusive Owner connection (implicit) will be rejected.
    - The coupler can’t distinct between several explicit connections, hence if the “Start Explicit Process Data Exchange” parameter is activated all explicit connections have full write permissions.
- The UR20-FBC-EIP Object Index offers the choice of 3 classes to access Process Data Inputs and Outputs which differ in their data structure as described in chapters 3.2 - 3.4.
- In addition to Process Data also Parameter Data of coupler and modules can be accessed acyclically as briefly described in chapters 3.5 - 3.6.
- Numbers with the prefix “0x” are given in hexadecimal format, followed by the decimal equivalent in brackets.

3.1 Enabling full write permissions for Explicit Messaging

Table 1: Required objects in the Process Data class to enable full write permissions

Class	Inst.	Attribute	Get	Set	Data type	Name
0x66 (102)	0x01	0x6B (107)	x	x	WORD	Timeout in seconds
		0x6C (108)	x	x	BOOL	Start Explicit Process Data Exchange

- **Timeout in seconds**: This parameter sets the time within which an explicit read or write access must occur to retain full write permissions for Explicit Messaging. If it is set to “0” full write permissions can only be relinquished by termination of all explicit connections. It is recommended to always set a timeout greater than 0 before activating full write permissions.

- **Start Explicit Process Data Exchange**: To obtain write permissions to Process Data Outputs (full write permissions), this parameter must be set to “1”. Such access is only accepted by the u-remote coupler if no Exclusive Owner connection (implicit) has been established already. The parameter value remains at “1” if explicit read or write access is made within the time set in the parameter “Timeout in seconds”. If the timeout is triggered or all explicit connections are closed, this attribute automatically falls back to “0” and full write permissions must be requested again. On u-remote EIP coupler variants equipped with a BF LED, it goes off when this parameter is activated while the explicit connection is fault-free.

3.2 Process Data Objects of Assembly Class

Table 2: Process Data Objects of UR20-FBC-EIP Assembly Class

Class	Instance	Attr.	Get	Set	Data type	Name
0x04	0x65 (101)	0x03	x		ARRAY OF BYTE	Input Process Data
	0x66 (102)		x	x		Output Process Data
	0x67 (103)		x			Input Process Data, Diagnosis Interface
	0x68 (104)		x	x		Output Process Data, Diagnosis Interface
	0x6F (111)		x			Input Process Data Unpacked
	0x70 (112)		x	x		Output Process Data Unpacked
	0x71 (113)		x			Input Process Data, Diag. Interface, Unp.
	0x72 (114)		x	x		Output Process Data, Diag. Interface, Unp.

- The Assembly Class contains Process Data Objects of the entire u-remote station in pairs of data type “ARRAY OF BYTE” with several additional options.
- Assembly 101/102: 2 Byte header + packed Process Data (DI/DO packed one after the other – critical with 4-Bit-wide modules! – all other modules sorted Byte granularly).
- Assembly 103/104: 2 Byte header + packed Process Data + 8 Byte for module diagnostics or process alarms.
- Assembly 111/112: 2 Byte header + unpacked Process Data (all module data sorted byte-granularly – 4-Bit-wide modules get mapped with 4 I/O and 4 dummy bits).
- Assembly 113/114: 2 Byte header + unpacked Process Data + 8 Byte for module diagnostics or process alarms.

3.3 Process Data Objects of Slot Class

Table 3:Process Data Objects of UR20-FBC-EIP Slot Class

Class	Instance	Attribute	Get	Set	Data type	Name
0x65 (101)	0x01…0x40 (1…64) [Slot number of the module]	0x71 (113)	x		ARRAY OF BYTE	Process Data In
		0x72 (114)	x	x		Process Data Out

- The Slot Class contains separated instances for each module, first module at Instance 1.

3.4 Process Data Class

Table 4:Process Data Objects of UR20-FBC-EIP Process Data Class

Class	Instance	Attribute	Get	Set	Data type	Name
0x66 (102)	0x01	0x65 (101)	x		ARRAY OF BYTE	Process Data In
		0x67 (103)	x	x		Process Data Out

- In addition to Process Data Objects the Process Data Class also contains the required parameters to enable full write permissions (see chapter 3.1).
- The Process Data Objects are sorted like in Assembly Class, Instances 101/102 but without the 2 Byte header.

3.5 Access to Coupler Parameters via Gateway Class

The Gateway Class 0x64 (100), Instance 0x01 offers read access (Get) to Status and Identity Objects of the u-remote coupler and read/write access (Get/Set) to several coupler parameters. For details please refer to the u-remote manual.

Table 5: Coupler Identity, Status and Parameter Objects in the Gateway Class

Class	Instance	Attribute	Get	Set	Data type	Name
0x64 (100)	0x01	0x65 (101)	x		STRING	Hardware Version
		… and following …	x	various	various	various
		0x76 (118)	x	x	ARRAY OF BYTE [0...7]	Unacknowledged Diagnosis

3.6 Access to Module Parameters

- Module parameters can be accessed in several data objects in two different data structures: raw data and sorted data.
- Parameter raw data is unsorted, discontinuous and undocumented.
- If the usage of parameter raw data is required, it is recommended to first parameterize using the u-remote web server and then copy and save the changes from the respective data objects to use them for later explicit access.
- Parameter raw data can be found in the Assembly Class, Gateway Class and Slot Class.
- A more convenient data structure of module parameters can be found in the Module Parameter Class 0x67 (103)
    - Instance 0x01 … 0x40 (1 … 64) representing each module slot.
    - Beginning from Attribute 0x65 (101) each available parameter of the module in this slot has its own Attribute.

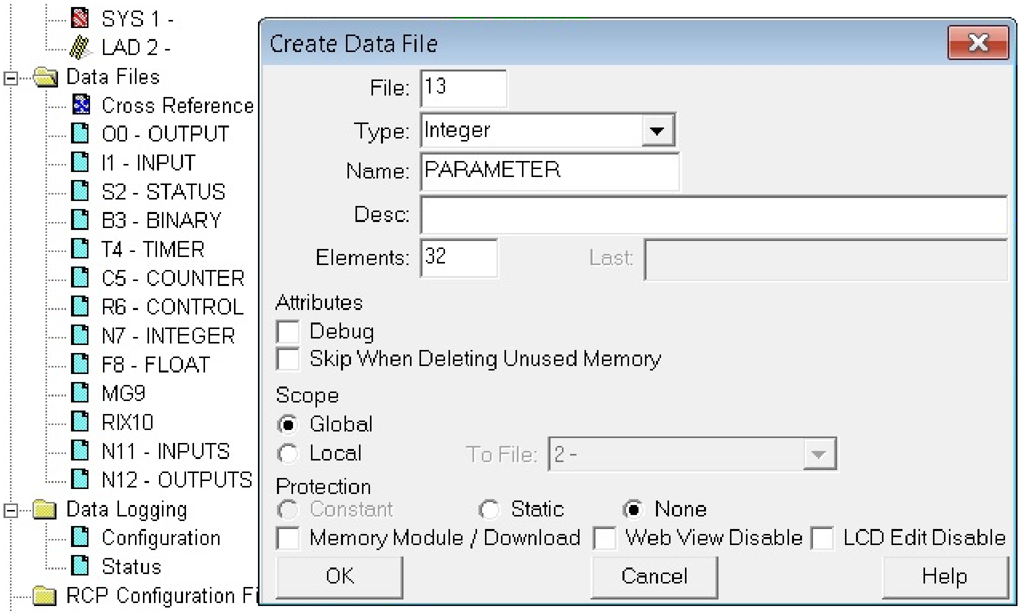
- Module Parameter Attributes are created dynamically depending on the available parameters of the detected module type.
- The order of the parameter objects is like the order of the parameters display in the u-remote webserver and their order in the respective module parameter table in the u-remote manual.
- Parameter option values:
  - can be counted from the respective parameter option drop-down menu in the u-remote webserver, starting from top with value “0”.
  - can be found in the respective module parameter table in the u-remote manual listed in brackets behind the respective option.

Table 6: Overview of Module Parameter Class

Class	Instance	Attribute	Get	Set	Data type	Name
0x67 (103)	0x01 … 0x40 (1 … 64)	0x65 (101)	x	x	various	First Module Parameter (if applicable)
		0x66 (102)	x	x	various	Second Module Parameter (if applicable)
		… and following …	x	x	various	Following Module Parameter (if applicable)

- Example: UR20-4AI-UI-16 in first slot, setting parameter “Channel 0 Measurement range” to “0 … 10 V”
  - Instance = 1 (Module is in first slot).
  - Attribute = 103 (“Channel 0 Measurement range” is the third parameter).
  - Value = 2 (Option “0 … 10 V” is the third option).
  - Data Type = SINT (Parameter with less than 256 options).

4 RSLogix 500 MSG Instructions



SYS 1 -
LAD 2 -
Data Files
Cross Reference
O0 - OUTPUT
I1 - INPUT
S2 - STATUS
B3 - BINARY
T4 - TIMER
C5 - COUNTER
R6 - CONTROL
N7 - INTEGER
F8 - FLOAT
MG9
RIX10
N11 - INPUTS
N12 - OUTPUTS
Data Logging
Configuration
Status
RCP Configuration Fi

Create Data File

File: 13
Type: Integer
Name: PARAMETER
Desc:
Elements: 32 Last:

Attributes
□ Debug
□ Skip When Deleting Unused Memory

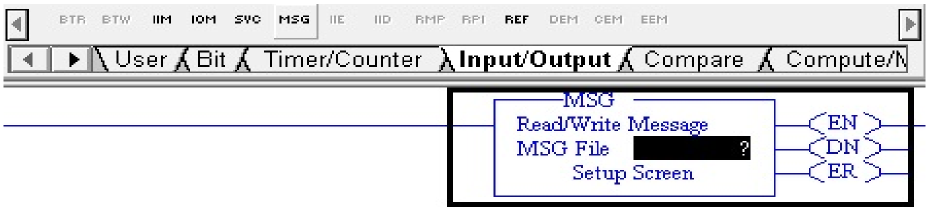
Scope
● Global
○ Local To File: 2 -

Protection
○ Constant ○ Static ● None
□ Memory Module / Download □ Web View Disable □ LCD Edit Disable

OK Cancel Help

Figure 1: Creating user defined Data Files

- Create new data files to reserve controller memory for the MSG instructions (check your controllers manual for maximum supported number of MSG instructions and maximum supported size of data files).
    - One Message file (MG) with as many elements as MSG instructions are needed.
    - One Extended Routing Information file (RIX) with as many elements as MSG instructions are needed.
    - One or several Integer file/s (N) for all the data to be written to and read from the UR20-FBC-EIP.
- Insert the MSG instructions into a Program File of choice (can be found at the “Input/Output” tab).

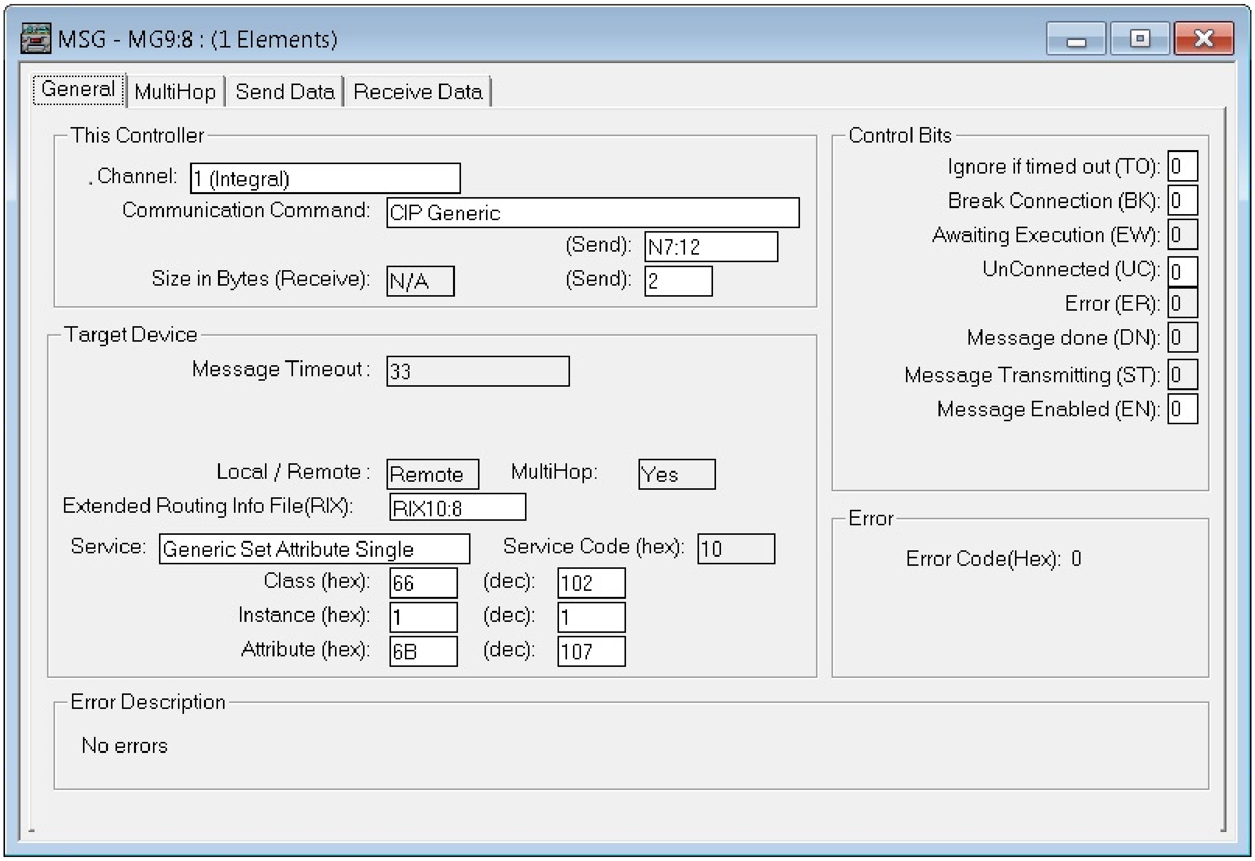


MSG File ?

Figure 2:New implemented MSG instruction, still unparameterized

- Double click on the question mark and assign an unused MG file element.

- Double click on “Setup Screen” to edit the instruction parameters.
- “General” tab:
  - Channel: “1 (Integral)” (selects the Ethernet port).
  - Communication Command: “CIP Generic”.
  - Extended Routing Info File (RIX): Select an unused element of the “RIX” file.



MSG - MG9:8 : (1 Elements)

This Controller

Channel: 1 (Integral)

Communication Command: CIP Generic

(Send): N7:12

Size in Bytes (Receive): N/A (Send): 2

Target Device

Message Timeout : 33

Local / Remote : Remote MultiHop: Yes

Extended Routing Info File(RIX): RIX10:8

Service: Generic Set Attribute Single Service Code (hex): 10

Class (hex): 66 (dec): 102

Instance (hex): 1 (dec): 1

Attribute (hex): 6B (dec): 107

Control Bits

Ignore if timed out (TO): 0

Break Connection (BK): 0

Awaiting Execution (EW): 0

UnConnected (UC): 0

Error (ER): 0

Message done (DN): 0

Message Transmitting (ST): 0

Message Enabled (EN): 0

Error

Error Code(Hex): 0

Error Description

No errors

Figure 3: MSG instruction setup example to set the Timeout for Explicit Messaging as described in Chapter 3.1

- For read access:
  - Service: “Get attribute single”.
  - Data Table Address (Receive): Select an unused element of “N” file.
  - Size in Bytes (Receive): Value given in the u-remote manual (Parameters) or the u-remote web server (Inputs and Outputs)
- For write access:
  - Service: “Set attribute single”.
  - Data Table Address (Send): Select an unused element of “N” file.
  - Size in Bytes (Send): value given in the u-remote manual (Parameters) or the u-remote web server (Inputs and Outputs).
- Class: Class number given in the u-remote manual.

○ Instance:	Instance number given in the u-remote manual.
○ Attribute:	Attribute number given in the u-remote manual.
○ Control Bits:	It is recommended to keep default values.

- “MultiHop” tab:

○ “From Device”:	not editable, should be set to “This MicroLogix”
○ “From Port”:	not editable, should be set to “Channel 1”
○ “To Address Type”:	not editable, should be set to “EtherNet/IP Device…”
○ “To Address”:	Enter the IP address of the UR20-FBC-EIP.

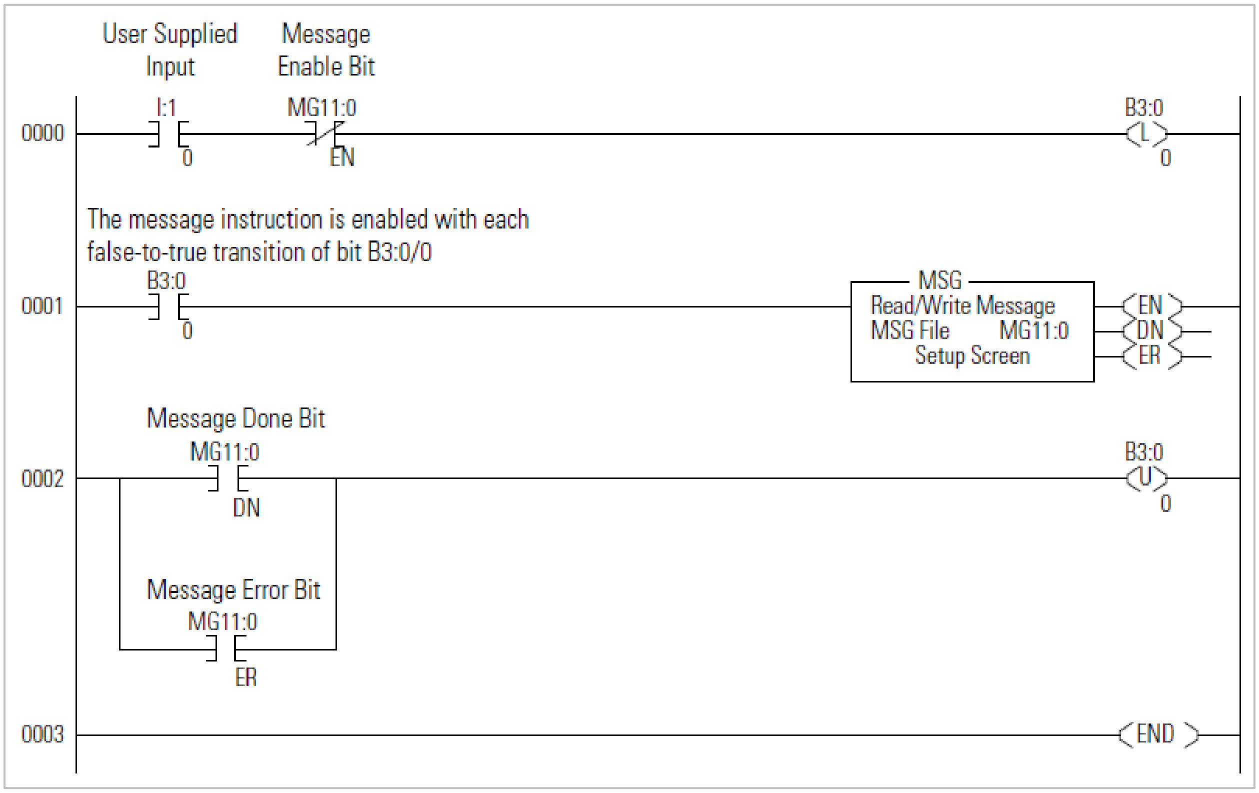


Figure 4: Implementation example of an MSG instruction (Source: Rockwell Automation Publication 1766-RM001)