

Advant Controller 31

Intelligent Decentralized Automation System

Example program for 907 AC 1131 MODBUS communication

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1. Which components are required?

Hardware components:

- 1 x basic unit (07 KT 95, 07 KT 96, **07 KT 97**, 07 KT 98)
or
2 x basic unit (07 KT 95, 07 KT 96, **07 KT 97**, 07 KT 98)
- 1 x power supply unit 24 V DC (e.g. **07 NG 34**)
- 1 x programming cable for the basic unit (**07 SK 90**)
or
1 x ARCNET cable incl. two terminating resistors
- 1 x MODBUS cable between MODBUS master and MODBUS slave

Software:

- 1 x programming software for the basic unit 907 AC 1131
- 1 x example program for the basic unit (BSP_MODBUS_MASTER_SLAVE)
or
1 x example program for the basic unit (BSP_MODBUS_MASTER_SLAVE) and
1 x example program for the basic unit (BSP_MODBUS_SLAVE)

Miscellaneous equipment for programming:

- 1 x PC (see 907 AC 1131 part 2, programming and block library, installation)
- 1 x documentation:
 - 907 AC 1131 part 1 (hardware and system technology)
 - 907 AC 1131 part 2 (programming and libraries)

In the following description you will find several references to the documentation.

2. Possible configurations

2.1. General

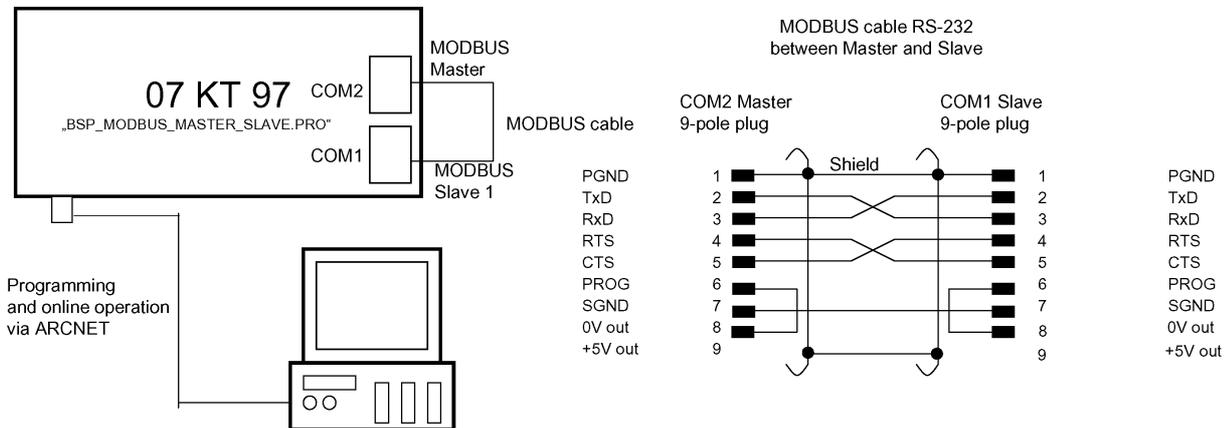
All MODBUS programs are developed in a way that the master programs are able to communicate with the slave programs. Therefore, only the essential configurations are mentioned.

If MODBUS is implemented on COM1 or COM2 of a series 90 basic unit, an RS232 connection can be used. In this case, no RS485 connection is possible.

2.2. MODBUS master-slave communication with one basic unit

In this configuration both serial interfaces of one basic unit are operated simultaneously as MODBUS interfaces. While the application program is running, no free serial interface is available for online operation. Consequently, online operation is only possible via ARCNET. If this possibility is not available, select the second configuration type (see section 2.2).

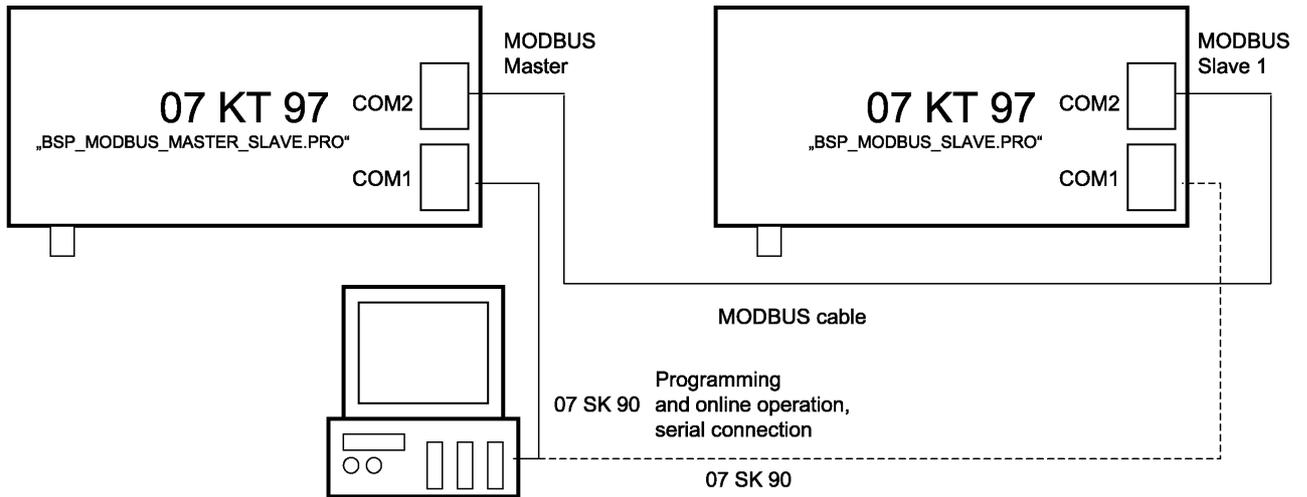
For configuration 1 you only need one of the above mentioned basic units and the example program "BSP_MODBUS_MASTER_SLAVE.PRO". In this example program COM2 of the basic unit serves as the master and COM1 is the slave.



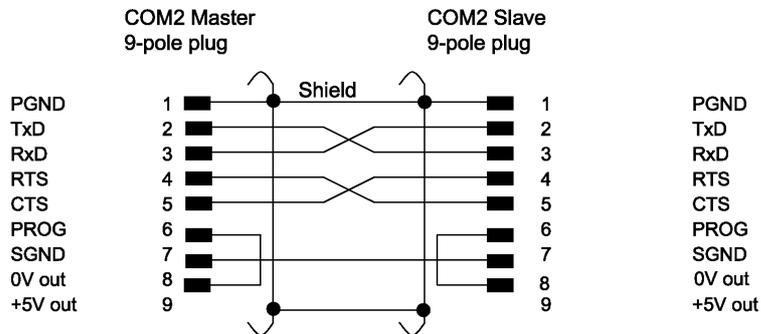
Configuration with one PLC

2.3. MODBUS master-slave communication with two basic units

In this configuration one PLC represents the MODBUS master and the second PLC the MODBUS slave. At both PLCs, COM2 is initialized as a MODBUS interface which allows online operation via COM1 at any time. It is also possible to establish the online operation via the ARCNET connection as described for the first method. For configuration 2 you need two devices of the above mentioned basic unit and the example programs "BSP_MODBUS_MASTER_SLAVE.PRO" and "BSP_MODBUS_SLAVE.PRO".



MODBUS cable RS-232
between Master and Slave



Configuration with two PLCs

2.4. MODBUS master-slave communication between 07KT9x and 07 KP 93 (RS232)

In this configuration one PLC represents the MODBUS master and the second PLC the MODBUS slave. You can use the 07 KP 93 as master or as slave device and accordingly the COM1 or COM2 interface of the other PLC as slave or as master.

For this configuration you need two devices of the above mentioned basic unit, a communication processor and the example programs:

Master program 07 KT 9x (COM2):

"BSP_MODBUS_MASTER_SLAVE.PRO"

Slave programs 07 KT 9x:

"BSP_MODBUS_MASTER_SLAVE.PRO" (COM1)

"BSP_MODBUS_SLAVE.PRO" (COM2)

Master programs 07 KP 93:

"BSP_MODBUS_MASTERCOM3_SLAVECOM4.PRO" or

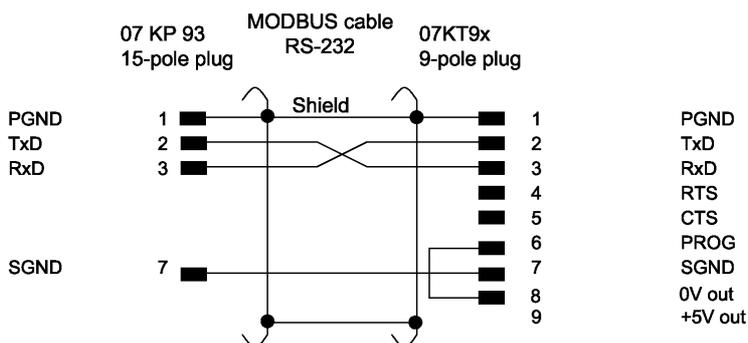
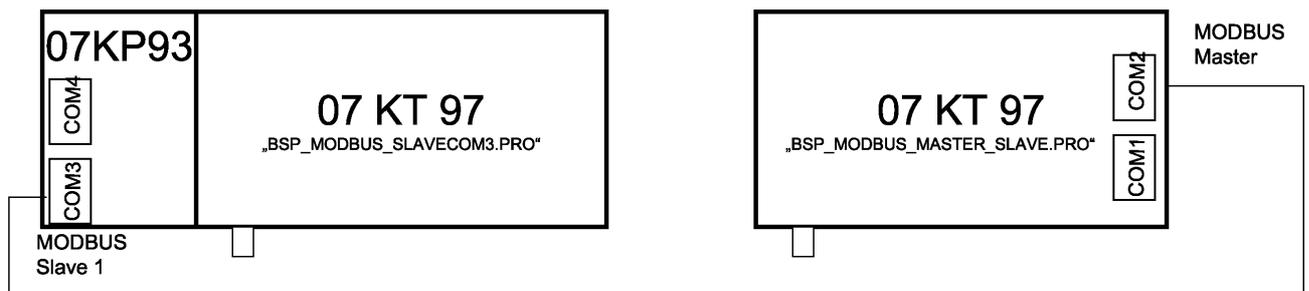
"BSP_MODBUS_MASTERCOM4_SLAVECOM3.PRO"

Slave programs 07 KP 93:

"BSP_MODBUS_SLAVECOM3.PRO" or

"BSP_MODBUS_SLAVECOM4.PRO"

This configuration is not mentioned in the following descriptions. Select the basic units, the communication cables and the example programs according to your application.



Configuration with one 07 KP 93 and one 07 KT 9x

2.5. MODBUS master-slave communication between 07KT9x and S40 COM1 (RS232)

In this configuration one PLC represents the MODBUS master and the second PLC the MODBUS slave. You can use the series 40 basic unit as master or as slave device and accordingly the COM1 or COM2 interface of the series 90 PLC as slave or as master.

For this configuration one of the above mentioned series 90 basic units and one series 40 basic unit (07 KT 51, 07 KR 51) are required as well as the example programs:

Master program 07 KT 9x (COM2):

"BSP_MODBUS_MASTER_SLAVE.PRO"

Slave programs 07 KT 9x:

"BSP_MODBUS_MASTER_SLAVE.PRO" (COM1)

"BSP_MODBUS_SLAVE.PRO" (COM2)

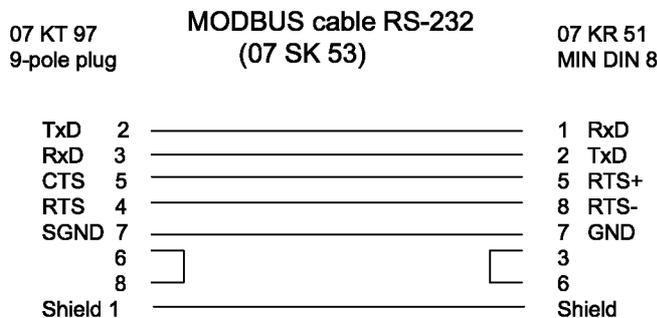
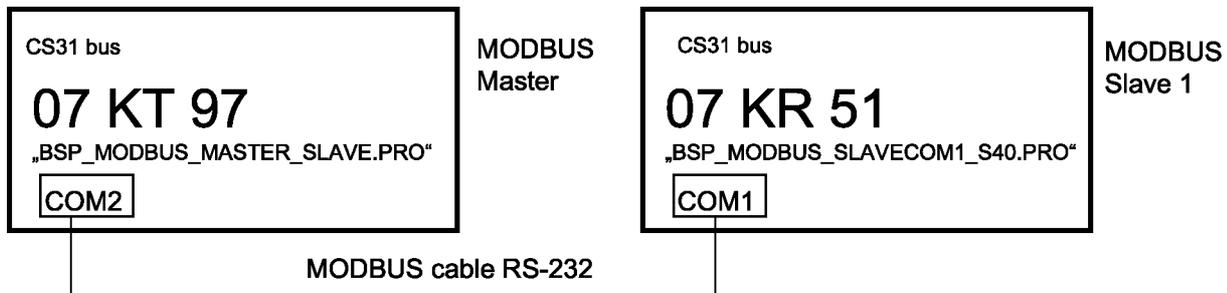
Series 40 master program:

"BSP_MODBUS_MASTERCOM1_S40.PRO"

Series 40 slave program:

"BSP_MODBUS_SLAVECOM1.PRO"

This configuration is not mentioned in the following descriptions. Select the basic units, the communication cables and the example programs according to your application.



Configuration MODBUS S50 and S90

3. Short description for commissioning

3.1. Configuration 1 (one basic unit)

1. Connect the PLC to 24 V DC.
2. Copy and start the example program "BSP_MODBUS_MASTER_SLAVE.PRO" using the programming software 907 AC 1131.
3. Connect the MODBUS cable to COM1 and COM2 of the basic unit.
4. Test the program.

3.2. Configuration 2 (two basic units)

1. Connect the PLC to 24 V DC.
2. Copy the example program "BSP_MODBUS_MASTER_SLAVE.PRO" to the master basic unit and the example program "BSP_MODBUS_SLAVE.PRO" to the slave basic unit using the programming software 907 AC 1131 and start them.
3. Connect the MODBUS cable to COM2 of the master basic unit and COM2 of the slave basic unit.
4. Test the program.

4. The following steps have to be carried out

4.1. Connecting the programming cable to the basic unit and the PC

There are two possibilities for programming. You can either perform programming via a serial connection or via an ARCNET connection.

Serial connection:

The programming cable 07 SK 90 connects the PLC to the PC. The 9-pole plug of this cable has to be connected to COM1 of the 07 KT 9x. The other cable end has to be connected to the PC's serial interface (e.g. COM1). (See documentation 907 AC 1131 part 1, interface cable 07 SK 90.)

ARCNET connection:

First, the node addresses of the PLC and PC have to be set. The basic unit is designated for example as NODE number 1. For this, set DIL switch 8 to ON; all other switches remain in the OFF position. The ARCNET card now has to be installed in the PC (see documentation 907 AC 1131 part 2, Installing the ARCNET card). For the connection between the PLC and the PC use a corresponding coaxial cable with a characteristic impedance of 93Ω. At both cable ends a terminating resistor of 93Ω has to be installed (refer to documentation 907 AC 1131 part 1, ARCNET descriptions). Connect this cable to the corresponding connectors.

4.2. Supplying the basic unit with 24 V DC (power supply unit) and switching it on

Now the devices have to be supplied by 24 V DC.

Basic unit: At the basic unit 0 V has to be connected to terminal (M) and 24 V DC to terminal (L+). (See documentation 907 AC 1131 part 1, basic units, connection of supply voltage.)

4.3. Copying the example program for the basic unit

Before copying the example program you have to make sure that the PLC is supplied with voltage, that the programming cable is connected and that the PC is running. First, start the 907 AC 1131 programming software on the PC. Then, continue as follows:

- Start the example program "BSP_MODBUS_MASTER_SLAVE" by selecting the menu item <File> <Open>.
- Prior to sending the example program to the basic unit, it has to be compiled. For that purpose press <F11>.
- Now the communication parameters have to be installed. Using the menu item <Online> <Communication parameters> the corresponding interface parameters can be set. Now define whether the communication with the PLC is done using a serial connection or an ARCNET connection. In our example the driver ABB RS232 was installed on COM1 (19200 baud, no parity, 1 stop bit).
- In the menu <Online> <Login> you have to activate the sending process. Confirm the information about the existing program stored on the PLC with OK.
- Now you are asked "The program was changed! Do you want to load the new program?". Answer this question with Yes to load the entire program.
- Finally, start the program by pressing <F5>. The program is running.
- If you want to use configuration 2 (with two basic units), repeat all steps and load the example program "BSP_MODBUS_SLAVE" to the second PLC.

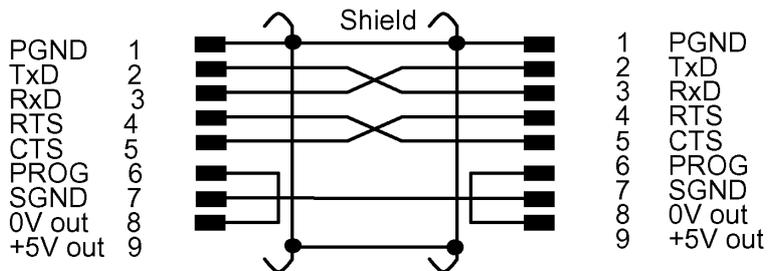
(See documentation 907 AC 1131 part 2, software description, project management and general online functions.)

4.4. Connecting the MODBUS cable

The MODBUS cable has to be prepared according to the following description.

COM2 Master
9-pole plug

COM1/2 Slave1
9-pole plug



MODBUS cable between Master and Slave

In configuration 1 (one basic unit) the cable connects COM2 (master) and COM1 (slave 1) of the basic unit. If configuration 2 is used, the cable is connected between COM2 (master) of the first basic unit and COM2 (slave 1) of the second basic unit.

5. Functional description

The example program shows a MODBUS communication between a MODBUS master and a MODBUS slave with the address 1.

The programs are divided into two parts: the main program "PLC_PRG", in which the actual communication is implemented, and the subroutine "Write_outputs", which routes certain messages to the basic unit outputs for indication purposes.

5.1. BSP_MODBUS_MASTER_SLAVE

This program contains the complete communication of the master program and the slave program. It can run completely on one basic unit (configuration 1, one basic unit), but it can also be used as master program for configuration 2 (two basic units).

COM2 of the basic unit is initialized as *master interface* using the MODINIT block. Using the MODMAST block the binary data %MX1.0...%MX1.7 are continuously read from slave No. 1. This data package is received on %MX2.0..%MX2.7. The received data package is written to the outputs A62_08..A62_15 for signaling purposes. During running operation you can see the telegram counter read by the slave. If no new telegram is received the counter stops. If this state is held for a minimum of 10 seconds, the reception memory (%MX2.0..%MX2.7) is deleted. If the connection is re-established, the communication between master and slave starts automatically after a short time. At output A63_02 it is signaled by steady light, whether the initialization of COM2 as MODBUS master was successful. At output A63_03 it is signaled by flashing light, that the communication is disturbed (e.g. since the cable is not connected to COM2 anymore).

COM1 of the basic unit is initialized as *slave interface* using the MODINIT block. The master controls the communication. It sends telegrams with a corresponding function code (e.g. function code 1: read n bits of slave) to the slave and the slave replies to these telegrams. The slave program evaluates whether a new telegram was received from the master. In that case, a telegram counter is incremented by one. This telegram counter (%MX1.0...%MX1.7) is read by the master. It is also written to the outputs A62_00..A62_07 for signaling purposes. During running operation you can see the telegram counter. If no new telegram is received the counter stops. If this state is held for a minimum of 10 seconds, the counter (%MX1.0..%MX1.7) is deleted. If the connection is re-established, the communication between master and slave starts automatically after a short time. At output A63_00 it is signaled by steady light, whether the initialization of COM1 as MODBUS slave was successful. At output A63_01 it is signaled by flashing light, that the communication is disturbed (e.g. since the cable is not connected to COM1 anymore).

5.2. BSP_MODBUS_SLAVE

This program contains the slave program. It is intended for configuration 2 (two basic units). The program runs only in combination with a master PLC.

COM2 of the basic unit is initialized as *slave interface* using the MODINIT block. The master controls the communication. It sends telegrams with a corresponding function code (e.g. function code 1: read n bits of slave) to the slave and the slave replies to these telegrams. The slave program evaluates whether a new telegram was received from the master. In that case, a telegram counter is incremented by one. This telegram counter (%MX1.0...%MX1.7) is read by the master. It is also written to the outputs A62_00..A62_07 for signaling purposes. During running operation you can see the telegram counter. If no new telegram is received the counter stops. If this state is held for a minimum of 10 seconds, the counter (%MX1.0..%MX1.7) is deleted. If the connection is re-established, the communication between master and slave starts automatically after a short time. At output A63_00 it is signaled by steady light, whether the initialization of COM2 as MODBUS slave was successful. At output A63_01 it is signaled by flashing light, that the communication is disturbed (e.g. since the cable is not connected to COM2 anymore).