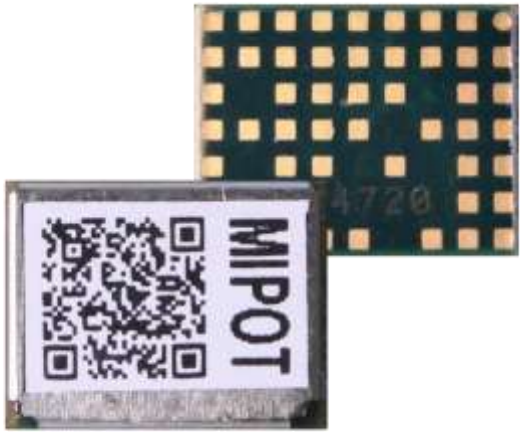
Wireless Protocol Modules MiP Series 32001505AEU

Host based Wireless M-Bus Module

Command Reference



Description

The document provides the list of commands that the 32001505AEU implements and the description of their use.

The 32001505AEU is based on STM32WLE5 single core Arm® Cortex-M4 microcontroller.

Contents

1. Communication interface

The **32001505AEU** is a host based module needing an external microcontroller to configure and operate it. The communication interface between the module and the external microcontroller can be one among available SPI, I²C or UART, depending on user application needs.

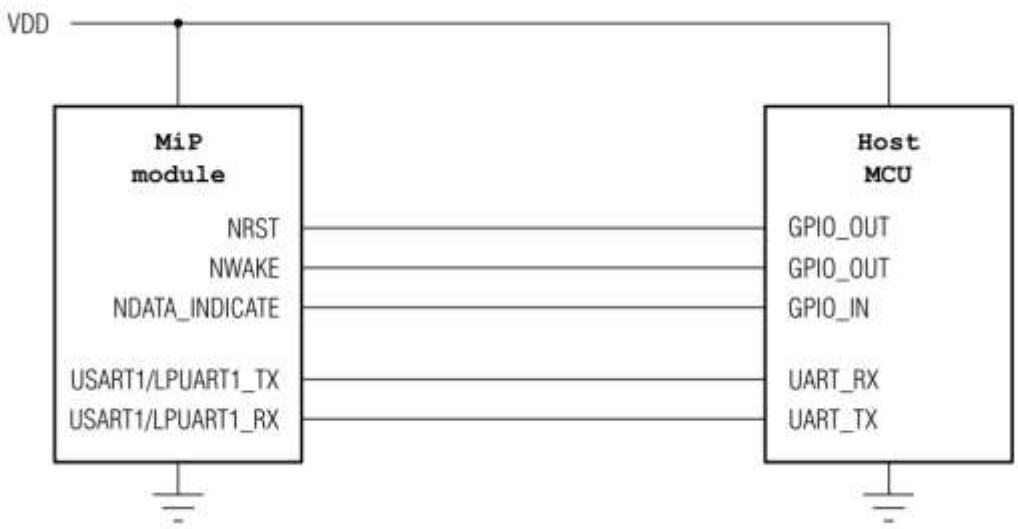
1.1. SPI/I²C/UART interface

SPI/I²C/UART interface allows Host both to configure the module and to exchange Wireless M-Bus radio frame data messages.

One among available SPI, I²C or UART interfaces can be chosen. There is no need to preliminary configure the interface to use. After reset the module listens for messages on each of the available ports and automatically elects as communication interface the channel where the first valid message is received.

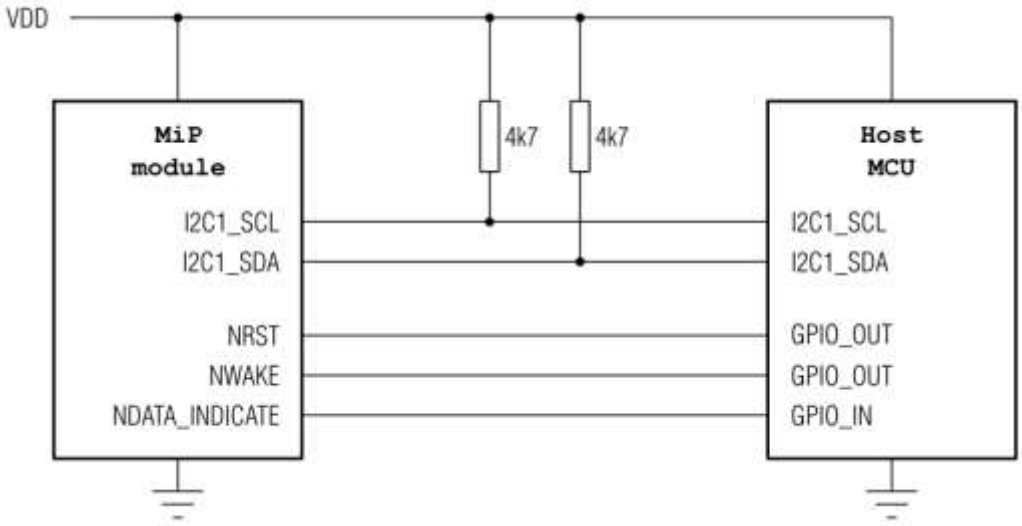
1.2. Connection with USART1 or LPUART1

The serial port uses the DTE terminology and direction



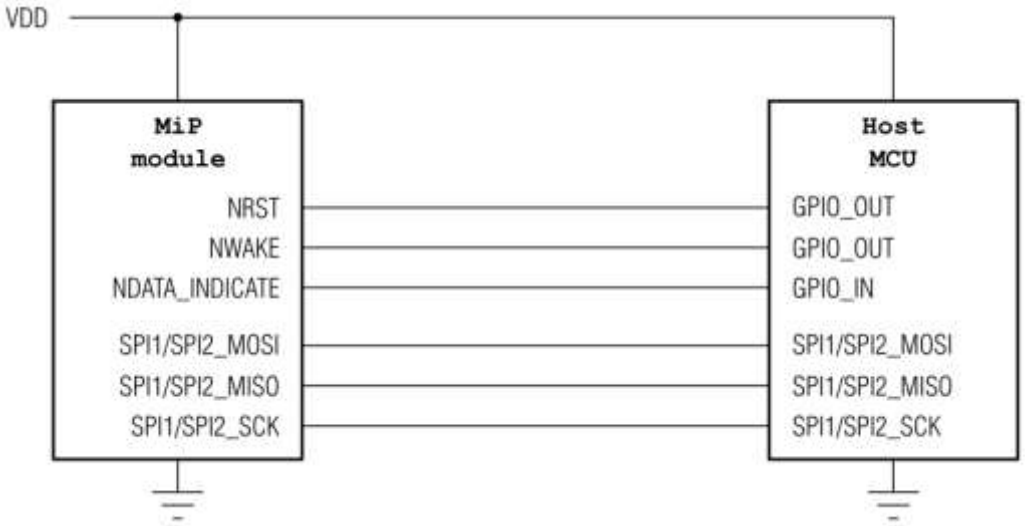
1.3. Connection with I2C1

The I2C interface requires an external pullup on the communication lines.



1.4. Connection with SPI1 or SPI2

The NWAKE pin can be used as the SPI's NSS signal.



2. Communication protocol

2.1. Byte Order

Multiple byte values are transmitted in little endian order with least significant byte first (LSB).

2.2. Message Structure

The structure of the messages is the following:

HEADER	CMD	LENGTH	PAYLOAD (n Bytes)	CHECKSUM

Where:

HEADER = 0xAA
CMD = Command code to the module, see the following table
LENGTH = Payload length
CHECKSUM = 2's complement on one byte of the sum of all preceding bytes

Each command from the host invokes an answer from the module in the same format.
The answer to the host has the CMD field equal to host request OR 0x80.

2.3. Message Types

There are three types of messages:

Commands: sent from the host to the module to request an information or an action.

Replies: sent from the module to the host as direct reply to a command, their command code is equal to the host request OR 0x80.

Indications: messages sent from the module to the host that are sent without prior action from the host, triggered by events on the radio interface. (e.g.: a received transmission).

2.4. Detailed Signal Flow

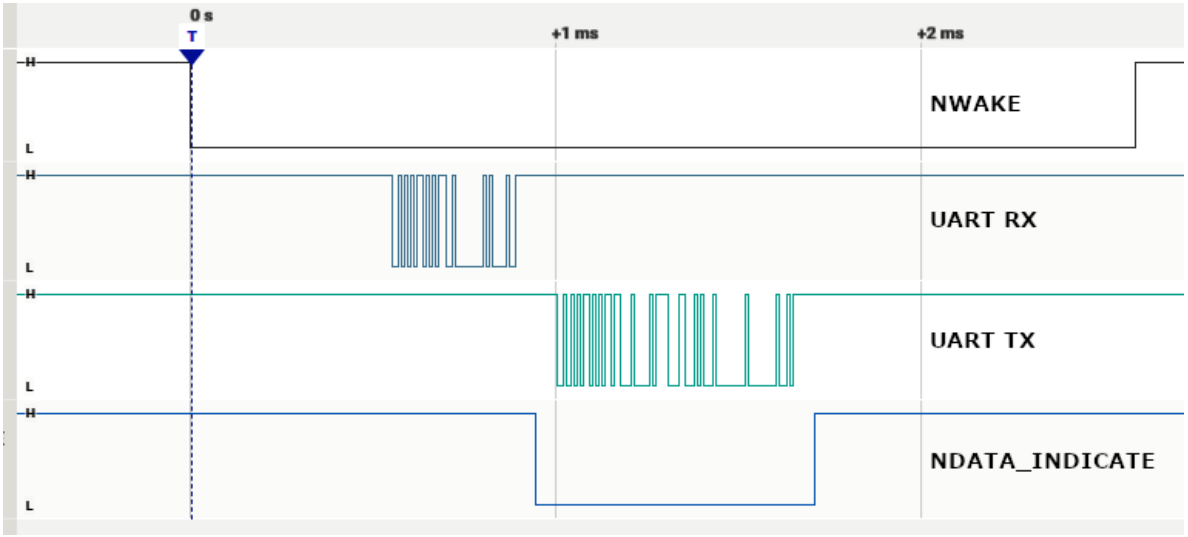
The module enters sleep mode as soon as possible therefore, before initiating a UART session, the host shall wake it up by setting the NWAKE pin LOW and then setting it back HIGH at the end of the session.

When the module receives a valid command and the checksum is correct, the module sets NDATA_INDICATE LOW, transmits the answer through UART TX pin and then sets NDATA_INDICATE HIGH.

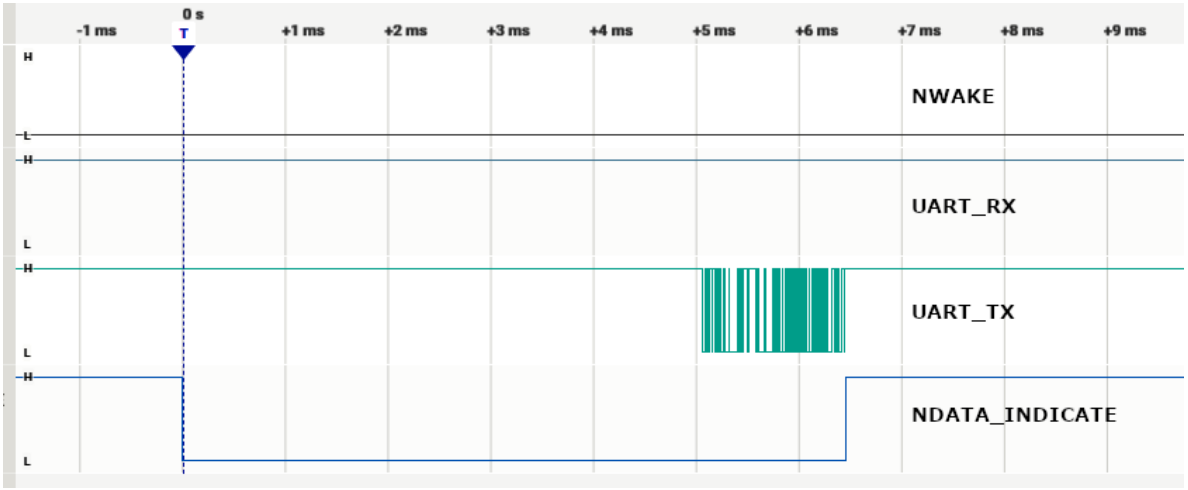
When transferring a received radio frame to the host microcontroller, the module sets NDATA_INDICATE LOW, waits for NDATA_INDICATE_TIMEOUT expiration, and then sends the message on UART TX pin. NDATA_INDICATE_TIMEOUT represents the time (in ms) between

the instant when NDATA_INDICATE pin goes LOW and the start of transmission on UART TX pin.

Example of UART command session (Host -> Module):



Example of UART RX indicate message session (NDATA_INDICATE_TIMEOUT = 5ms) (Module -> Host):



3. Command Set Description

List of the implemented command:

Command (CMD)	Value	Description
RESET_CMD	0x30	Module Software Reset
FACTORY_RESET_CMD	0x31	Restore EEPROM to factory default values
EEPROM_WRITE_CMD	0x32	Write EEPROM parameter
EEPROM_READ_CMD	0x33	Read EEPROM parameter
GET_FW_VERSION_CMD	0x34	Get Firmware Version
GET_SERIALNO_CMD	0x35	Get Serial Number stored in module
GET_RSSI_CMD	0x39	Get last RSSI value
SET_MODE_CMD	0x40	Change WM-Bus mode
SET_C_FIELD_CMD	0x41	Set C-Field WM-Bus value
TX_MSG_CMD	0x50	Transmission of WM-Bus message
RX_MSG_IND	0x53	Indicate reception of WM-Bus message

3.1. RESET_CMD (0x30)

This command performs a module Reset.

When a valid reset request is received, the module replies immediately to the host microcontroller.

All communication interfaces will be disabled during the reset procedure.

Host: 0xAA, 0x30, 0x00, 0x26

Reply: 0xAA, 0xB0, 0x00, 0xA6

Status: 0x00: success

0xFF: failure

3.2. FACTORY_RESET_CMD (0x31)

This command performs the recovery of EEPROM default values. This command is allowed only when the module is in idle state.

Host: 0xAA, 0x31, 0x00, 0x25

Reply: 0xAA, 0xB1, 0x01, Status, cks

Status: 0x00: success

0xFF: failure

3.3. EEPROM_WRITE_CMD (0x32)

Host: 0xAA, 0x32, Length, Start Address, <Data>, cks

Reply: 0xAA, 0xB2, 0x01, Status, cks

Status: 0x00: success

0xFF: failure

Note: Invalid data will not be stored in EEPROM.

3.4. EEPROM_READ_CMD (0x33)

Host: 0xAA, 0x33, 0x02, Start Address, Number of Bytes, cks

Reply: 0xAA, 0xB3, Length, Status, Data, cks

Status: 0x00: success, Data contains EEPROM values

0xFF: failure, Data is empty and Lengths is equal to 1

3.5. GET_FW_VERSION_CMD (0x34)

Host: 0xAA, 0x34, 0x00, 0x22

Reply: 0xAA, 0xB4, 0x04, FWV0, FWV1, FWV2, FWV3, cks

FWV0, FWV1, FWV2, FWV3: FW version

3.6. GET_SERIALNO_CMD (0x35)

Host: 0xAA, 0x35, 0x00, 0x21

Reply: 0xAA, 0xB5, 0x04, SN0, SN1, SN2, SN3, cks

3.7. GET_RSSI_CMD (0x39)

Host: 0xAA, 0x39, 0x00, 0x1D

Reply: 0xAA, 0xB9, 0x01, RSSI, cks

3.8. SET_MODE_CMD (0x40)

Host: 0xAA, 0x40, 0x02, Mem_Type, mode, cks

Reply: 0xAA, 0xC0, 0x01, status, cks

Status: 0x00: success

0xFF: failure

Mode: WM-Bus mode

Mem_Type: 0x00 Set value in RAM memory

0xFF Set value in EEPROM memory

3.9. SET_C_FIELD_CMD (0x41)

Host: 0xAA, 0x41, 0x02, Mem_Type, C-field, cks
Reply: 0xAA, 0xC1, 0x01, status, cks
Status: 0x00: success
0xFF: failure
C-field: C-Field value
Mem_Type: 0x00 Set value in RAM memory
0xFF Set value in EEPROM memory

3.10. TX_MSG_CMD (0x50)

Host: 0xAA, 0x50, Length, <Payload>, cks
Reply: 0xAA, 0xD0, 0x01, status, cks
Status: 0x00: success
0xFF: failure

The content of Payload depends on Block1_From_Module_Enable parameter field as follows:

If Block1_From_Module_Enable = 0:

Block1 (9 Bytes)	CI Field (1 Byte)	Payload (n Bytes)

If Block1_From_Module_Enable = 1:

CI Field (1 Byte)	Payload (n Bytes)

3.11. RX_MSG_IND (0x53)

When module receives a valid WM-Bus frame, then it sets NDATA_INDICATE pin low and then sends one of the following frames, based on the RSSI_Enable parameter:

If RSSI_Enable = 0:

0xAA	0x53	Length (n+10)	Block1 (9 Bytes)	CI Field (1 Byte)	Payload (n Bytes)	CheckSum (1 Byte)

If RSSI_Enable = 1:

0xAA	0x53	Length (n+11)	Block1 (9 Bytes)	CI Field (1 Byte)	Payload (n Bytes)	RSSI (1 Byte)	CheckSum (1 Byte)

4. Module Configuration

4.1. WM-Bus Radio Parameters

Parameter	Description	Address	Value range	Default	Notes
WM_BUS_Mode	WM-Bus Mode	0x00	0x00 – 0x0E	0 = S2 Short preamble	0x00 = S2 Short preamble 0x01 = S2 Long preamble 0x02 = S1 0x03 = S1-m 0x04 = T1 meter 0x05 = T2 meter 0x06 = T2 other 0x07 = R2 meter 0x08 = R2 other 0x09 = C1 meter Frame A 0x0A = C1 meter Frame B 0x0B = C2 meter Frame A 0x0C = C2 meter Frame B 0x0D = C2 other Frame A 0x0E = C2 other Frame B 0x0F = T2-C2 other
RF_Channel	RF Channel (Used only in R2 mode)	0x01	0 – 9	0	0 = 868.03 MHz 1 = 868.09 MHz 2 = 868.15 MHz 3 = 868.21 MHz 4 = 868.27 MHz 5 = 868.33 MHz 6 = 868.39 MHz 7 = 868.45 MHz 8 = 868.51 MHz 9 = 868.57 MHz
RF_Power	RF power	0x02	0 – 4	4	0 = 0 dBm 1 = +5 dBm 2 = +7 dBm 3 = +10 dBm 4 = +12 dBm
RF_AutoSleep	Configure sleep	0x03	0 – 1	0	0 = Sleep disable 1 = Sleep enable
Rx_Window	RX Window (ms)	0x04	0x00 - 0xFF	0x00	

4.2. WM-Bus Medium Access Parameters

Parameter	Description	Address	Values range	Default	Notes
WM-Bus C Field	C Field	0x10	0x00 - 0xFF	0x44	
WM-Bus Man ID0	Manufacturer ID	0x11	0x00 - 0xFF	0x00	
WM-Bus Man ID1	Manufacturer ID	0x12	0x00 - 0xFF	0x00	
WM-Bus Device ID0	Device ID	0x13	0x00 - 0xFF	0x00	
WM-Bus Device ID1	Device ID	0x14	0x00 - 0xFF	0x00	
WM-Bus Device ID2	Device ID	0x15	0x00 - 0xFF	0x00	
WM-Bus Device ID3	Device ID	0x16	0x00 - 0xFF	0x00	
WM-Bus Version	Version	0x17	0x00 - 0xFF	0x00	
WM-Bus Device Type	Device Type	0x18	0x00 - 0xFF	0x00	

4.3. Module Parameters

Parameter	Description	Address	Values range	Default	Notes
Block1_From_Module_ Enable	Enable management of WM-Bus from Module	0x20	0 - 1	0	
RSSI_Enable	Enable RSSI Indication in communication frame	0x21	0 - 1	0	
NDATA_INDICATE_ TIMEOUT	LSB Timeout in ms	0x22	1 - 255	5	
UART BAUDRATE	UART Baudrate selection	0x24	0 - 5	4	0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 115200

Note #: NDATA_INDICATE_TIMEOUT range from 1 to 255 ms

4.4. Internal DATA (Read Only)

Parameter	Description	Notes
SerialNumber0	LSB SN	Serialization at 32 bit
SerialNumber1	Byte 1 SN	Serialization at 32 bit
SerialNumber2	Byte 2 SN	Serialization at 32 bit
SerialNumber3	MSB SN	Serialization at 32 bit
FwVersion0	LSB FW Version	
FwVersion1		
FwVersion2		
FwVersion3	MSB FW Version	

5. Revision History

Revision	Date	Description
0.0	14/10/2024	Preliminary
0.1	07/01/2025	Added R2 modes and channels Added T2-C2 other mode Reduced NDATA_INDICATE_TIMEOUT to max 255 ms