Industrial Control Modem GSM 900/1800MHz:
MDU20G-918

Magnetic Aerial:
MDU21-MAG

Roofmount Antenna:
MDU21-ROOF

Standard Antenna:
MDU21-STD

# Industrial Control Modem GSM


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# 1. Product description

## 1.1 Introduction

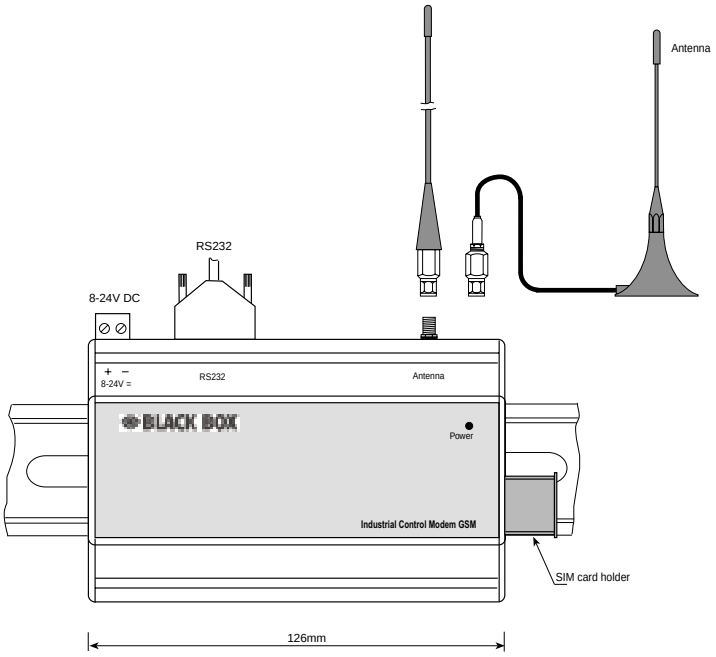
The MDU20G-918 is an dual-band Industrial Control GSM module for fax and data transmission, and short message service (SMS). Designed for industrial telemetry applications. The Industrial Control Modem GSM is fully type approved after the GSM Phase 2 specifications. The GSM module has an serial RS232 interface with remote control by AT commands for dedicated applications.

The Industrial Control Modem GSM is designed in an aluminium housing for DIN rail mounting. Supply voltage is 8-24VDC. A LED on the front indicates the operating mode.

An extractible holder on the side of the module is used to insert the SIM card (Micro-SIM type).

The Industrial Control Modem GSM is a GSM dualband type supporting both 900 and 1800 MHz.

## 1.2 Physical characteristics




| | |
|---|---|
| Protection: | IP20 |
| Mounting: | 35mm DIN-rail, EN50022. |
| Housing: | Anodized aluminium with plastic ends. According to DIN 43880 |
| Dimensions: | HxWxD: 80 (+connectors)x126x62mm. |

## 2.0 Technical Data

### 2.1 Standards

GSM 1800/1900: 1800MHz/1900MHz, Class1(1W),GSM phase2.

### 2.2 Serial Interface

**Signals**

RS232 V.24/V.28, Auto-bauding function between 2400 bits/s and 19200 bits/s.
AT command set based on V.25ter and GSM 07.05 & 07.07.
No auto-framing available.

| | | |
|---|---|---|
| Character framing: | Data bits: | 8 |
| (Default settings) | Parity: | none |
| | Stop bits: | 1 |

**Hardware handshake**

DCD, DTR, DSR, CTS, RES, RI

**Connector**

15 pole or 9 pole, sub-D, female. See seperate section.

| | |
|---|---|
| Audio link: | Microphone (+/-) |
| | Speaker (+/-) |
| Boot: | Boot |
| Reset: | Reset |

### 2.3 SMS

Mobile Originated (MO) and Mobile Terminated (MT).
Mode Text & PDU point to point. Cell broadcast. In accordance with GSM 07.05.

### 2.4 Data mode

Asynchronous 2400, 4800, 9600 bits/s.
Transparent and Non Transparent mode. In Non Transparent Mode: 300, 1200, 1200/75 baud.
Mode 3.1 KHz (PSTN) and V110 (ISDN).

### 2.5 Fax

2400/4800/7200/9600 bits/s, GSM tele service 62 in Transparent Mode.
Automatic facimile group 3 (Class I).

### 2.6 Antenna

External antenna via SMA connector.

### 2.7 SIM Card

Card holder; Drawer with ejector button placed on the side of the GSM module.
Voltages: 3 and 5V supported. For dual band modems 5V only supported for single band.

### 2.8 Power supply

| Parameters | GSM 1800/1900 | | | Unit |
|---|---|---|---|---|
| | Min. | Typ. | Max. | |
| **Power supply :** | | | | |
| - Input supply voltage | 6 | | 32 | V |
| - Input peak supply current | | | 1 | A |
| - Input average supply current in communication mode | | 200 | | mA |
| - Input average supply current in idle mode | | 35 | mA | |
| **Serial link :** = RS232 | | | | |
| **Audio (head set) :** | | | | |
| - Microphone input current @2V/2KW | | 0.5 | | mA |
| - Absolute microphone input voltage | | | 100 | mVp |
| - Speaker output current 150W/1nF | | 16 | | mA |
| - Absolute speaker impedance | | 32 | | W |
| **SIM** | | | | |
| | | 3 or 5 | | V |

### 2.9 Environmental conditions

| | | |
|---|---|---|
| Ambient temperature: | Operating conditions: | -20 - +55°C |
| | Storage conditions: | -25 - +70°C |
| Dry heat: | IEC 68-2.2, Bb test. | |
| Cold: | IEC 68-2.1, Ab test. | |
| Change of temp.: | IEC 68-2.14, Na/Nb test. | |
| Damp heat cyclic: | IEC 68-2.30, Db test. | |
| Damp test: | IEC 68-2.56, Cb test. | |
| Sinusoidal vibration: | IEC 68-2.6, Fc test. | |
| random vibration: | IEC 68-3.36, Fdb test. | |

### 2.10 Approvals

CTR19 and CTR20

### 2.11 Temperature range

| | |
|---|---|
| Operating conditions : | From -20°C to +55°C |
| Storage conditions : | From -25°C to +70°C |

## 3. Description of the interfaces

The modem comprises several interfaces:
- LED function indicating operating status
- External antenna (via SMA, FME adapter enclosed)
- Serial and control link (via 15 pins HD SUB D)
- Power supply (via screw connector)
- SIM card holder

### 3.1 LED Function
- LED off Device switched off - Not ready
- LED on Device switched on - Connecting to network
- LED flashing slowly Device switched on - Idle mode
- LED flashing rapidly Device switched on - Transmission mode

### 3.2 Connectors
The GSM modem have 4 connectors / interfaces:

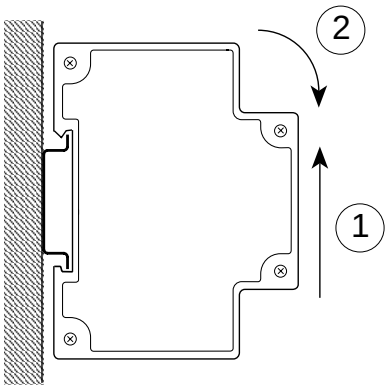
| **Connector** | **Function** |
|---|---|
| SMA: | RF antenna connector |
| 15 pins SUB-D (high density): | RS232 link, AUDIO link, BOOT and RESET |
| or | |
| 9 pins SUB-D | RS232 link only. |
| 3 pole screw connector: | Power supply connector |
| « SIM »connector: | SIM card connection |

#### 3.2.1 Pin assignments - serial interface

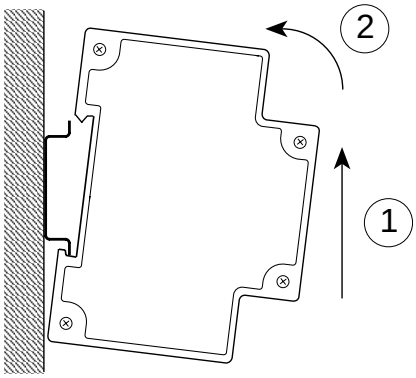
| Pin | Signal label | IO type | Interface |
|---|---|---|---|
| 1 | DCD | DCD | Data Carrier Detect |
| 2 | TXD | In | Transmit Data. The DTE uses the TX line to send data to the interface |
| 3 | | | BOOT |
| 4 | | | Microphone (+) |
| 5 | | | Microphone (-) |
| 6 | RXD | Out | Receive Data. The interface uses the RX to send data received from the telco line to the DTE |
| 7 | DSR | Out | Data Set Ready. OFF (high) indicates that the DTE is to disregard all signals |
| 8 | DTR | In | Data Terminal Ready. Turned On when DTE is ready to transmit or receive data |
| 9 | GND | Gnd | Signal ground |
| 10 | | | Speaker (+) |
| 11 | CTS | Out | Clear To Send. Indicates whether or not the interface (modem) is ready to transmit data. CTS is a response to DTR and RTS |
| 12 | RTS | In | Request To Send. RTS is used to condition the interface for data transmission |
| 13 | RI | Out | Ring indication |
| 14 | | | RESET |
| 15 | | | Speaker (-) |

## 4 Installation / Start-up

### 4.1 Mounting the modem




**De-mounting a modem module**
Lift the module (1) and twist it out from the top (2) and the module is released from the DIN rail.




**Mounting a modem module**
Fix the module at the bottom of the DIN rail and lift it (1) while pressing slightly on the top of the module (2).

### 4.2 Installing the modem

To install the modem, plug the device on a DC power supply and insert the SIM card in the holder. In order to extract or to insert the Micro SIM card, it is necessary to press the SIM holder ejector with a sharp element (a pen for example). Make sure that an antenna is connected.

#### 4.2.1 SIM card

A SIM card is needed to operate on a GSM network.
To install the card:

- Press the yellow button to eject the holder.
- Insert the SIM card.
- Check that it fits into place correctly.

If this sequence is not respected, the SIM holder could be damaged.

#### 4.2.2 Switching the GSM modem on/off

The device is permanently powered (when connected to the power supply).

#### 4.2.3 Voltage range

Voltage range : 8 to 32V DC, GND : 0V

Correct operation of the Industrial Control Modem GSM in communication mode is not guaranteed if input voltage fall below 8V. The modem is protected against voltage over 32V. When input voltages exceed 32V, the supply voltage is disconnected in order to protect the electronic components from an overvoltage.

TWO CASES ARE POSSIBLE:

- IF THE OVERVOLTAGE IS CONTINUOUS, THE PROTECTION IS GUARANTEED BY THE FUSE.
- IN THE CASE OF TRANSIENT PEAKS, THE MODEM GUARANTEES ITS OWN PROTECTION.

#### 4.2.4 Power supply connection

The power supply is applied via the screw terminal. Minimum cable section is 0.75 $mm^2$ and maximum is 1,5$mm^2$

#### 4.2.5 Fuse

The modem is protected by an internal fuse.

### 4.2.6 Antennas

If you have direct coverage where the modem is mounted, an antenna can be mounted directly in the modem connector.

If required an external antenne can be mounted some distance from the GSM module. Length and type of cable and choice of antenna has influence on the signal strength. It must be recommended in applications not to use combinations of antennas and cables giving a damping of more than 10dB. It is however recommended to set up a trial to measure the actual signal strength etc.

Length of cable can have tremendous influence on the damping;

| **Typical damping[dB] per meter cable:** | | |
|---|---|---|
| Cables | 900MHz | 1800MHz |
| RG174 | 1,00 | 1,50 |
| RG213 | 0,22 | 0,37 |
| RG58 | 0,50 | 1,10 |

## 5. Basic modem functionallity

| **AT commands** | **Module response** | **Comments** |
|---|---|---|
| **Module synchro checking:** | | |
| AT+CREG ? | CREG=<mode>,1 | Modem synchronized on the network |
| | CREG=<mode>, 2 | Synchronization lost, re-synchronization attempt |
| | CREG=<mode>, 0 | Network synchronization attempt |
| **Receiving an incoming call:** | | |
| | RING | |
| ATA | | Answer the call |
| | OK | |
| **Initiate a call;** | | |
| ATD1234; | | Don’t forget the « ; »at the end for « voice »call |
| | OK | Communication established |
| | CME ERROR : 11 | PIN code not entered (with +CMEE : 1 mode) |
| | CME ERROR : 3 | AOC credit exceeded or a communication is already established |
| **Initiate an emergency call;** | | |
| ATD112; | | Don’t forget the « ; »at the end for « voice »call |
| | OK | |
| **Communication loss;** | NO CARRIER | |
| **Hang up;** | | |
| ATH | OK | |
| **Enter PIN Code;** | | |
| AT+CPIN=1234 | OK | PIN Code accepted |
| | +CME ERROR : 16 | Incorrect PIN Code |
| | +CME ERROR : 3 | PIN already entered (with +CMEE : 1 mode) |
| **Store the parameters in E2P;** | | |
| AT&W | OK | The configuration settings are stored in E2P |

More details about AT commands and features in the **AT commands** document and in the **Getting Started** document.

## 6. Troubleshooting: Specific defaults possibly encountered

### 6.1 The modem does not answer through the serial link

A) Is the modem correctly powered on?
If not, the correct power supply is 8 to 32VDC.

B) Is the serial cable suitable and adjusted in the modem and PC sockets?
A suitable cable must follow pin assignment described in section 3.2.1.
Check in particular, that Rx et Tx are properly connected.

C) Check that your communication program is properly configured:
Modem factory setting for the character framing are:
- Data Bits : 8
- Parity : None
- Stop Bits : 1

The factory setting for baud rate is autobauding mode.

D) Does any other program interfere with your communication program (conflict on communication port access)?
If yes, close any application likely to interfere (e.g. mouse or printer driver).

### 6.2 The modem always returns «Error» when trying to issue a communication

A) Issue AT+CMEE=1 to have extended error cause and retry

| Cause value | Diagnostic | Hint |
|---|---|---|
| 0 | Phone failure | Call your technical support |
| 3 | Operation not allowed | |
| 4 | Operation not supported | |
| 10 | SIM not inserted | Insert the SIM card in the SIM holder of the modem, If SIM card is inserted, insure that it is properly inserted. |
| 11 | SIM PIN required | Enter PIN code |
| 12 | SIM PUK required | Enter PUK code (call your network provider if you don’ t know this code) |
| 13 | SIM Failure | Check validity of your SIM card. If SIM damaged, call your network provider |
| 16 | Incorrect password | Check the code you entered |
| 17 | SIM PIN2 required | Enter PIN2 code |
| 18 | SIM PUK2 required | Enter PUK2 code (call your network provider if you don’ t know this code) |
| 26 | Dial string too long | Check your phone number (max 20 digits) |
| 30 | No network service | |

For all other codes, and/or details, see AT commands manual.
B) Additional hints
Is the modem registered on the network?
Does the AT-Command AT + CREG? answers 0,1 (registered) or 0,5 (registered roaming)?
If not, check that the received signal is strong enough to synchronize on the Network (use AT+CSQ).
Is the modem receiving an incoming call or already in communication?
- With some software versions, you must release any incoming or active call (with ATH) before being able to make an outgoing call.

### 6.3 The modem always returns «No carrier» when trying to issue a communication

A) After a failed attempt ("no carrier"), issue AT+CEER to have extended error cause

| Cause value | Diagnostic | Hint |
|---|---|---|
| 1 | Unallocated phone number | |
| 16 | Normal call clearing | |
| 17 | User busy | |
| 18 | No user responding | |
| 19 | User alerting, no answer | |
| 21 | Call rejected | |
| 22 | Number changed | |
| 31 | Normal, unspecified | |
| 50 | Requested facility not subscribed | Check you r subscription (data subscription avaiable?) |
| 68 | | ACM equal or greater than ACMmax Credit of your pre-paid SIM card expired |
| 252 | Call baring on outgoing calls | |
| 253 | Call baring on incoming calls | |
| 3, 6, 8, 29, 34, 38, 41, 42, 43, 44, 47, 49, 57, 58, 63, 65, 69, 70, 79, 254 | Network causes | See AT commands manual for further details or call network provider |

For all other codes, and/or details, see AT commands manual.

B) Additional hints
Is the antenna properly connected?
Use a GSM 900/1800MHz dual-band / 50 Ohms antenna.

Is the received signal strong enough?
- With the AT-Command AT+CSQ check that the received signal (1 st parameter of the response) is strong enough to be able to establish a call.

| AT+CSQ response | Signal quality |
|---|---|
| 11 to 31 | Should be sufficient* |
| 0 to 10 and +99 | Could be sufficient* |

* based on general observations.

The modem always returns «No carrier» when trying to issue a voice communication?
- Insure the character «semicolon» is present straight after the phone number on the AT-Command **ATD**######;
The modem always returns «No carrier» when trying to issue a data communication?
- Insure the selected bearer type is supported by the called party.
- Then, insure the selected bearer type is supported by the Network.
- If no success, try bearer selection type: AT+CBST=0,0,3.
- Insure the SIM Card is available for Data/Fax calls.

## 7. Notes about safety, etc.

### 7.1 General Safety

It is important to follow any special regulations regarding the use of radio equipment due in particular to the possibility of radio frequency, RF, interference. Please follow the safety advice given below carefully.

- Switch OFF your GSM Modem when in an aircraft. The use of cellular telephones in an aircraft may endan ger the operation of the aircraft, disrupt the cellular network and is illegal. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.
- Switch OFF your GSM Modem when at a refueling point.
- Switch OFF your GSM Modem in hospitals and any other place where medical equipment may be in use.
- Respect restrictions on the use of radio equipment in fuel depots, chemical plants or where blasting opera tions are in progress.
- There may be a hazard associated with the operation of your GSM Modem close to an adequately protected personal medical devices such as hearing aids and pacemakers. Consult the manufactures of the medical device to determine if it is adequately protected.
- Operation of your GSM Modem close to other electronic equipment may also cause interference if the equip-ment is inadequately protected. Observe any warning signs and manufacturers recommendations.

### 7.2 Vehicle Safety

- Do not use your GSM Modem while driving, unless equipped with a correctly installed vehicle kit allowing ‘Hands-Free’ Operation.
- Respect national regulations on the use of cellular telephones in vehicles. Road safety always comes first.
- If incorrectly installed in a vehicle, the operation of GSM Modem telephone could interfere with the correct functioning of vehicle electronics. To avoid such problems, ensure that the installation has been performed by a qualified personnel.
  Verification of the protection of vehicle electronics should form part of the installation.
- The use of an alert device to operate a vehicle’s lights or horn on public roads is not permitted.

### 7.3 General notes

Your GSM Modem is the product of advanced engineering, design and craftsmanship and should be treated with care. The suggestion below will help you to enjoy this product for many years.

- Do not expose the GSM Modem to any extreme environment where the temperature or humidity is high.
- Do not attempt to disassemble the GSM Modem. There are no user service able parts inside.
- Do not expose the GSM Modem to water, rain or spilt beverages, It is not waterproof.
- Do not abuse your GSM Modem by dropping, knocking, or violent shaking. Very rough handling can dam age it.
- Do not place the GSM Modem alongside computer discs, credit or travel cards or other magnetic media. The information contained on discs or cards may be affected by the phone.
- Do contact an authorized Service Center in the unlikely event of a fault.

### 7.4 Your Responsibility

This GSM Modem is under your responsibility. Please treat it with care respecting all local regulations. It is not a toy therefore keep it in a safe place at all times and out of the reach of children.
Try to remember your Unlock and PIN codes. Become familiar with and use the security features to block unauthorized use and theft.

## 8. General Informations

GSM reference documents :
GSM 03.40, GSM 03.45, GSM 04.11,
GSM 04.21, GSM 05.08, GSM 07.01,
GSM 07.02, GSM 07.05, GSM 07.07.

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## 9. Accessories

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MDU21-MAG

Roofmount Antenna:
MDU21-ROOF

Standard Antenna:
MDU21-STD