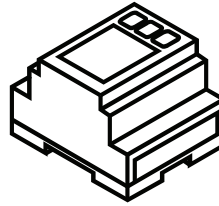


INDUSTRUINO



GSM / GPRS Expansion Module

USER MANUAL

Description

1

The Industruino GSM / GPRS expansion module adds remote internet connectivity and SMS control to any Industruino IND.I/O or Industruino PROTO.

The features include:

- Connect to the internet via GPRS
- Send/Receive SMS messages
- Micro-SD card slot (up to 2GB)
- RS-232 port + 14P IDC port
- DIN-rail mountable
- Fully enclosed

The module supports three installation modes:

- Power+Data via IDC connector. Primary UART connected to GSM functions, secondary UART connected to RS232 interface.
- Power+Data via IDC connector. Secondary UART connected to GSM functions, primary UART connected to RS232 interface.
- Power via external 2-pin connector, data via RS232 interface. In this mode the module functions as a standard GSM/GPRS modem, allowing you to test commands via a PC.

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CE

A vibrant community of users contribute to the Industruino Github page. Please find latest libraries, code examples and get involved on:

github.com/Industruino



www.industruino.com

Email: connect@industruino.com

Follow on Twitter: @industruino

INDUSTRUINO
Industrial / Arduino Compatible

Manufacturer:

ES Gear Limited
9B, Amtel Building, 148 Des
Voeux Road, Central, Hong Kong

EU Importer:

BTL cvba
Jan Mioenstraat 13
8610 Kortemark
Belgium

Operation instructions

Before using the Industruino kit, please read the manual carefully and pay full attention to safety to handle the product correctly.

For the latest instructions regarding installation, usage and operation of the Industruino kit please visit:

www.industruino.com/support

Safety instructions

WARNINGS

- Do not connect any part of the device to voltages higher than 32V.
- Always switch off power before you connect or disconnect an external device or accessory.
- Avoid circuit or wire exposure. Do not touch exposed connections or components when the device is powered on or when devices connected to it are powered on.
- Use only with cables and accessories that are approved or recommended by Industruino.
- Do not operate with suspected failures. If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.
- Do not operate in an explosive atmosphere.
- Do not use in wet/damp conditions.
- Keep device surfaces clean and dry.
- Use only for applications described in the catalog and the manual, and only with third party devices or components if they have been approved or recommended by Industruino.
- The device can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.
- The device must be installed and wired by a trained technician following the applicable local safety standards and regulations.

Regulatory

CE COMPLIANCE



This product meets the essential requirements of applicable European Directives as follows:

Directive 2014/53/EU; Radio Equipment Directive (RED)
2011/65/EU; Restriction of Hazardous Substances Directive (RoHS).

Conditions of use

2

(1) Industruino IND.I/O programmable controller ("the PRODUCT") shall be used in conditions;

- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
- ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

ES GEAR LTD. OR ITS DISTRIBUTORS SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY THE PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN ES GEAR LTD. OR ITS DISTRIBUTORS' USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR THE PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.

Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.

Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions ES Gear Ltd. may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by ES Gear Ltd. and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact an ES Gear Ltd. representative.

WEEE COMPLIANCE

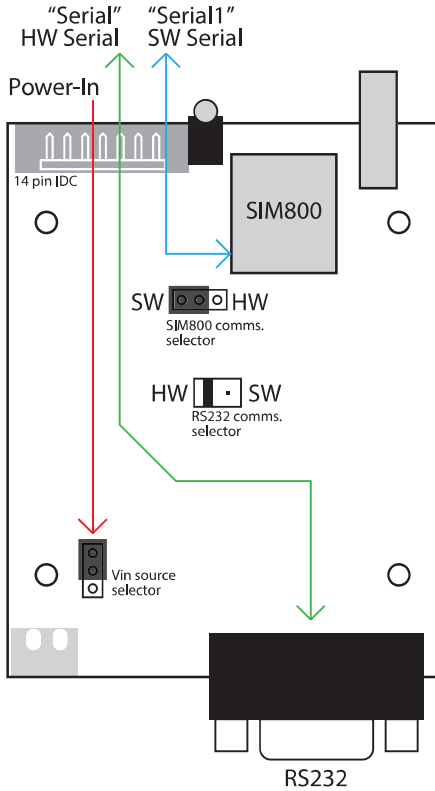


All Industruino products that are subject to the WEEE directive shipped from September 1, 2014 are compliant with the WEEE marking requirement.

Such products are marked with the "crossed-out wheeled bin" WEEE symbol (shown, above) in accordance with European Standard EN50419.

Mode Selection Guidance

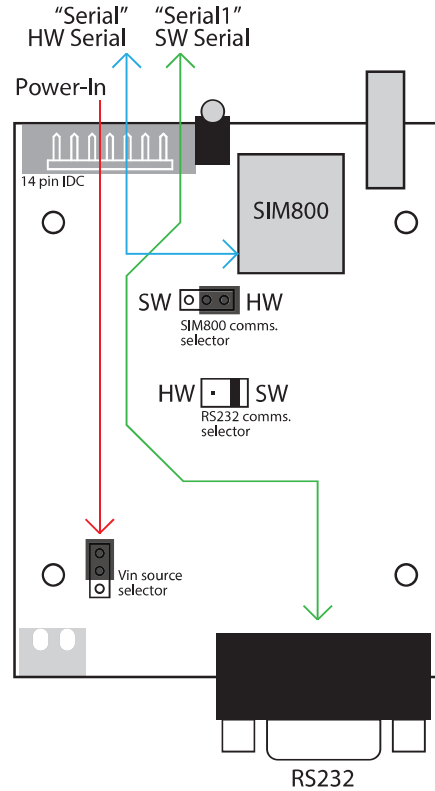
IDC mode 1:



IDC mode 1:

- SIM800 module connected to second UART ("Serial1" on D21G, Software serial D5/D10 on 32u4).
- SIM800 power on/off controlled using pin "D6".
- SIM800 "ring indicator" connected to pin "D7".
- RS232 interface connected to first UART ("Serial" on D21G, "Serial1" on 32u4/1286).
- Module powered from IDC connector.

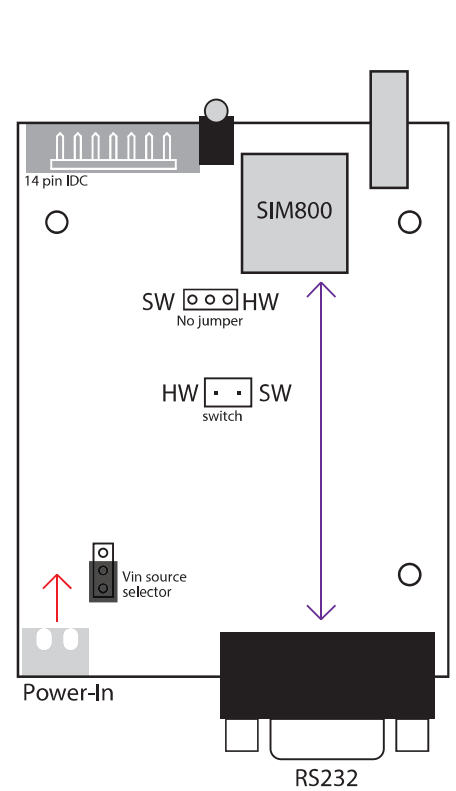
IDC mode 2:



IDC mode 2:

- SIM800 module connected to first UART ("Serial" on D21G, "Serial1" on 32u4/1286).
- SIM800 power on/off controlled using pin "D6".
- SIM800 "ring indicator" connected to pin "D7".
- RS232 interface connected to second UART ("Serial1" on D21G, Software serial D5/D10 on 32u4).
- Module powered from IDC connector.

External mode:



External mode:

- RS232 interface connector to SIM800.
- SIM800 power on/off controlled using RS232 "RTS" line.
- SIM800 "ring indicator" connected to RS232 "RI" line.
- Module powered from external power supply.

14 Pin IDC Connector Pinout

14P IDC Expansion Port

+5V	MOSI/D16	GND	S-RX/D5	PWR/D6	H-RX/D1	SCL/D3
MISO/D14	SCLK/D15	S-TX/D10	SD/D4	RI/D7	H-TX/D0	SDA/D2

The IDC connector provides power and exchanges data at TTL levels with the expansion module. Two Serial ports from the MCU are provided, primary port on pins D0/D1, secondary port on pins D10/D5). SPI signals are connected the Micro-SD card slot, with pin D4 acting as chip select line.

UART Combination Chart

The table on the right shows current compatibility of combining multiple UART functions with the GSM/GPRS expansion module.

***All combinations of current and old products (PROTO, IND.I/O, 32u4, 1286 variants) support communications with the SIM800 module out of the box, apart from the IND.I/O 1286 variant combination, as unfortunately this combination has the hardware UART connected to the onboard RS485 transceiver, and 1286 topboard doesn't support second UART via software serial.

This can be remedied via a small hardware mod (disabling RS485) as shown below, or the IND.I/O unit can be upgraded to a D21G or 32u4 topboard which have dual serial support.

	GSM/GPRS	GSM/GPRS + RS232	GSM/GPRS + RS485	GSM/GPRS + TTL UART	Serial (D0/D1)	Serial1 / SW-serial (D10/D5)
PROTO 32u4	V	V	-	MOD 2	V	V
PROTO 1286	V	X	-	X	V	X
PROTO D21G	V	V	-	MOD 2	V	V
IND.I/O 32u4	V	MOD 1	MOD 2	-	V	V
IND.I/O 1286	MOD 1	X	X	-	V	X
IND.I/O D21G	V	MOD 1	MOD 2	-	V	V

Legend V = Supported
X = Not supported
- = Not applicable

MOD = requires small modification / hack of the board.

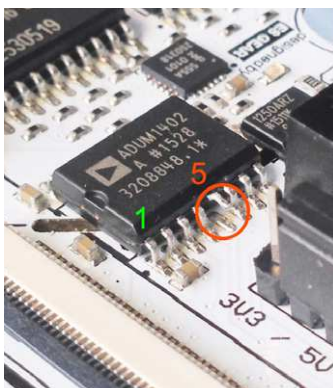
These modifications will be replaced by easy jumpers on future batches of IND.I/O

For all possible UART interface combinations and possible required mods please see the table above.

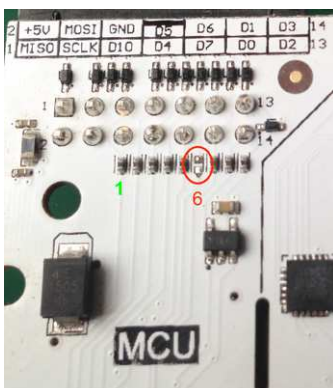
MOD 1 instructions

Disconnect the RS485 transceiver from the MCU UART RX line by lifting up pin 5 of the digital isolator, or alternatively cut the trace leading to the pad (the former is easy to restore, the latter is more difficult to restore).

Note: New revisions of the IND.I/O board will not require this modification as they will have a jumper to select on-board or off-board UART peripheral.



Top side of IND.I/O baseboard



Bottom side of IND.I/O baseboard

MOD 2 instructions

On the back of the IND.I/O board, disconnect the 14p IDC RX line from the MCU UART RX line by removing the 6th ferrite bead counting from the left, or alternatively cut the trace leading to the pad (the former is easy to restore, the latter is more difficult to restore).

Note: New revisions of the IND.I/O board will not require this modification as they will have a jumper to select on-board or off-board UART peripheral.

Programming Guide

The module is based on the ubiquitous SIMCOM SIM800H module, below is a list of Arduino libraries which can be used with the module:

- TinyGSM library
- Adafruit FONA library
- Freematics SIM800 library

Depending on your Topboard you will have to define the correct serial port in your Arduino sketch.

1. The first serial port is called "Serial" for D21G Topboard. It is called "Serial1" in sketches for 32u4 and 1286 Topboard.
2. The second serial port is called "Serial1" for D21G Topboard. On 32u4 and 1286 Topboard this is implemented as a software serial port (TX MCU -> RX SIM800: D5. RX MCU <- TX SIM800: D10).

Please refer to the UART selection guide on page 3 for correct jumper settings to connect each Serial port to the required hardware functions of the GSM / GPRS expansion module.

The module can be powered on via the external pushbutton or via a >1s positive pulse signal on pin D6.

The RI (ring indicator) pin, signalling an incoming SMS message is connected to pin D7.

Note:

For debugging / feedback on USB serial terminal use port "Serial" on 32u4 and 1286, use "SerialUSB" on D21G. "SerialUSB" is the new Arduino standard notation for M0+ boards. Adafruit FONA library needs modification of the debug output port for D21G as it is currently hardcoded in "FONAPlatStd.h" to "Serial":

At line #44 please change

```
"#define DebugStream Serial"
```

to

```
"#define DebugStream SerialUSB"
```

Packing List

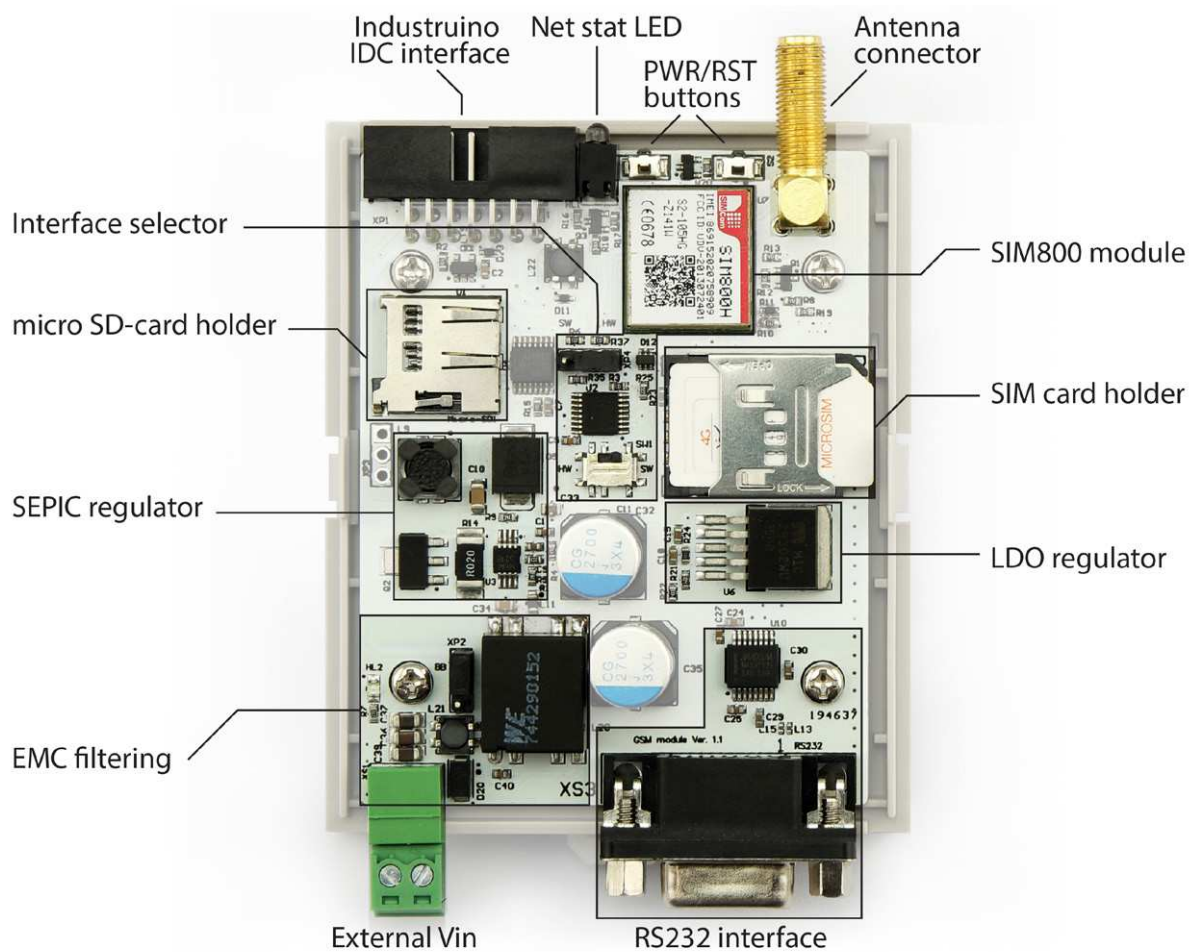
The following items are included :

- | | |
|--------------------------------|----|
| 1. Thermoplastic enclosure | 1x |
| 2. GSM Board | 1x |
| 3. Antenna | 1x |
| 4. Cable to Industruino, 14pin | 1x |
| 5. 2pin connector for power | 1x |
| 6. Cardboard box | 1x |

The product comes with a cable to connect to Industruino control. Power is supplied either from 14 pin IDC cable or separately as external Vin.

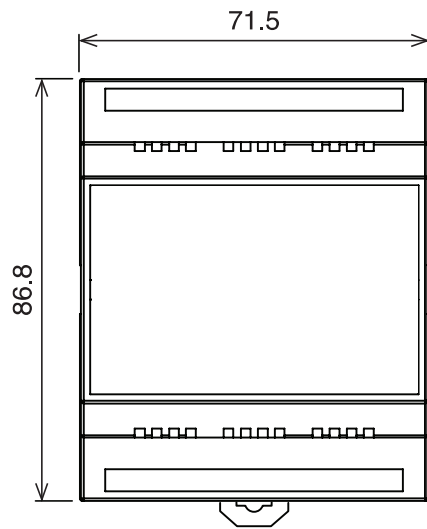
Micro SD and SIM card holders are accessed by opening the top shell of the enclosure.

See below the general architecture and functional blocks of the GSM / GPRS expansion module.

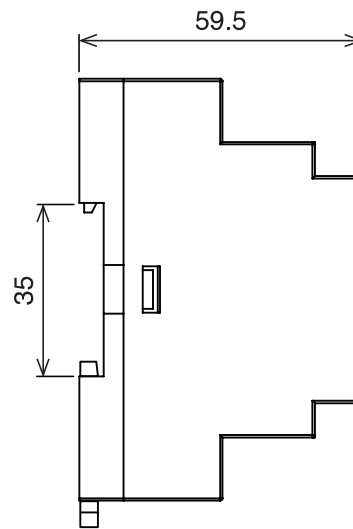


Dimensions

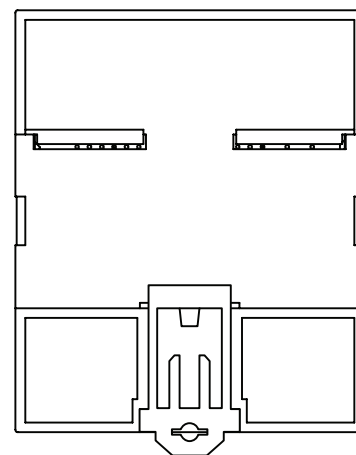
Front View



Side View



Back View



GPRS Enclosure

Models: GSM / GPRS Expansion Module

Size: 72 x 87 x 60mm

Description: DIN-rail mount, click-on mechanism

Material: PPO polymer

Units: mm