Badger Meter Europa GmbH

iSonic 2000

Intelligent ultrasonic meter and controller

Connections and wiring

June 2006

Version iSonic 2000 Connections and wiring 06/06-e

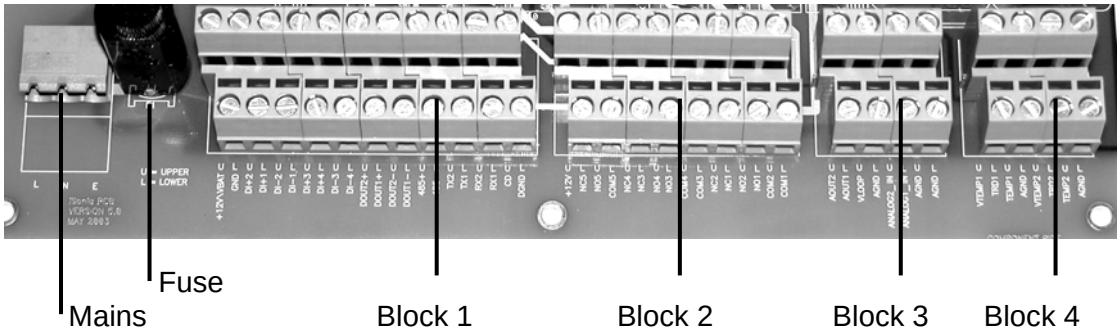
1. Basics

This document solely describes the connections and wirings of the iSonic 2000. For further instructions see the other manuals.

The lid from the iSonic can be removed to allow access to the wiring connections.

To route wiring into the unit, knock out one of the areas which are designed to hold the supplied cable-glands. Route the wire through the cable-gland, and once the connection is made, ensure a good sealed fit by turning the cable-gland tightly clock wise.

Once the unit is opened, the entire connection block looks as follows:



From left to right:

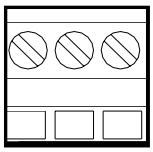
- Mains power connector: 95 VAC – 240 VAC, 50/60Hz
- Fuse holder
- Connector block 1 containing:
  - External battery connection
  - Digital inputs 1 thru 4
  - Digital outputs 1 & 2 (Pulse)
  - RS485 connections
  - RS232 – Port 1 & 2 Connections
- Connector block 2 containing:
  - +12V supply for powering external devices (GSM Modem)
  - All normally open / closed & common connections for relay 1 thru 5
- Connector Block 3 containing:
  - Analogue inputs 1 & 2 (ANALOG1_IN, ANALOG2_IN)
  - Current outputs 1 & 2 (AOUT 1 & 2)
- Connector block 4 containing:
  - Transducer 1 connections
  - Transducer 2 connections

Please note:
All connection names are followed by a “U” or a “L”, signifying the Upper or Lower connector row. All names are exactly aligned with the centre of the connection.

2. Mains power

The mains power connections are made on the “Mains Power Connector”, situated on the left most side of the connector panel. The connector is a plug-able type, connections can be made on the plug before inserting the connector.

The proper connections are shown in the pictures below :



Connection cable: 3 x 0,75 mm²
The unit will accept from: 95 VAC – 240 VAC, 50/60Hz

3. Transducer connections

3.1 Transducer cables

Only use the delivered cables for transducer connections. If you should need longer cables, please contact your dealer. Do not use other cables.

Picture 3.1 shows the partially stripped transducer cable.

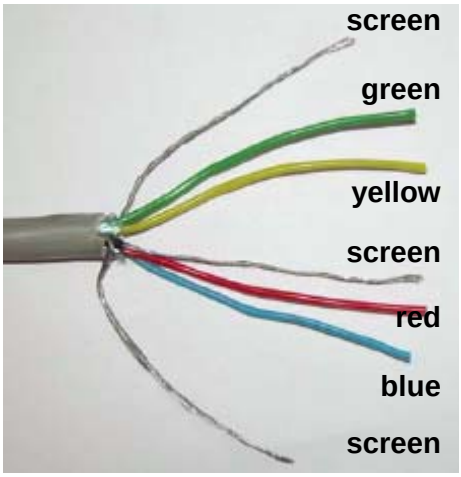


Illustration 3.1

The cable is organised as a dual twisted pair cable with internal shields for each pair, as well as an external shield encompassing both twisted pairs. In the cable, each screen is isolated from each other.

For a connection to the iSonic, please ensure that **all screens** are connected together and to the blue wire, as shown below:

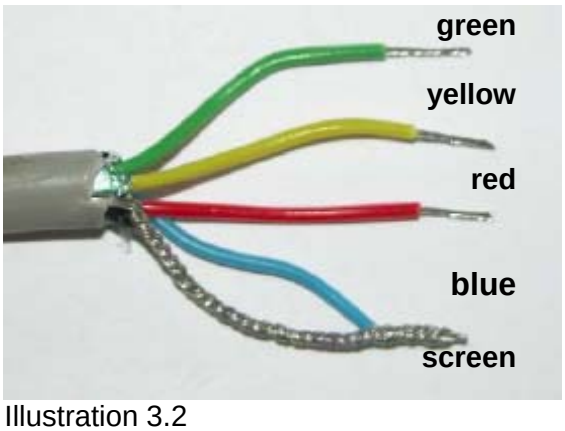


Illustration 3.2

Wiring:

- Red = Transducer +, connects to TRD1 or TRD2
- Blue = Transducer –, connects to AGND
- Green = Temperature +, connects to VTEMP1
- Yellow = Temperature -, connects to TEMP1
- All screens are tied together, connect to AGND

Should you wish to extend the transducer cable to reach a further away point, the specifications for the cable are:

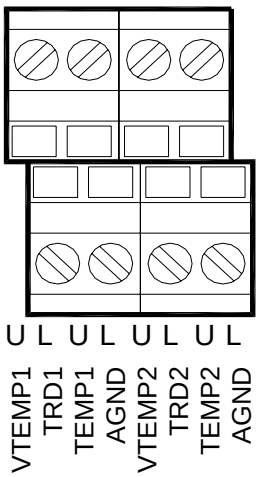
Datacable “Unitronic” LiYCY
Pair twisted with copper outside shielded
2 x 2 x 0,5 mm²

Transducers have been tested on 1000 meter cable runs under laboratory conditions. However, in practice, noise conditions can influence usable cable lengths.

3.2 Transducer connection

The transducer connections are made in block 4.

Block 4



key:

VTEMP*	joint for temperature sensor
TRD*	joint for transducer
AGND	joint for ground of analog ports
Upper joint terminal	
Lower joint terminal	

Wiring:

- Red = Transducer + -> TRD1 or 2
- Blue = Transducer - -> AGND
- Yellow = Temperature + -> VTEMP1 or 2
- Green = Temperature - -> TEMP1 or 2
- All screens = blue -> AGND

The left part of block 4 houses the joints for transducer 1, the right part the ones for transducer 2.

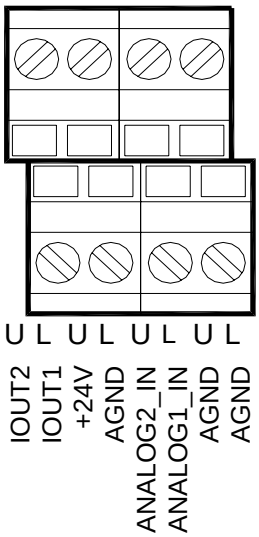
Hint:
Because of noise considerations, care should be taken to keep unshielded cable to as short as possible length.

4. Current loop outputs

Two current loop outputs are provided. They can be found on connector block 3 of the unit, they are marked as IOUT1 & 2. Each output can be fully programmed to react to a selected process value.

IOUT1 is Current Loop Output 1
IOUT2 is Current Loop Output 2
The AGND connections are intended to complete the loop.

Block 3



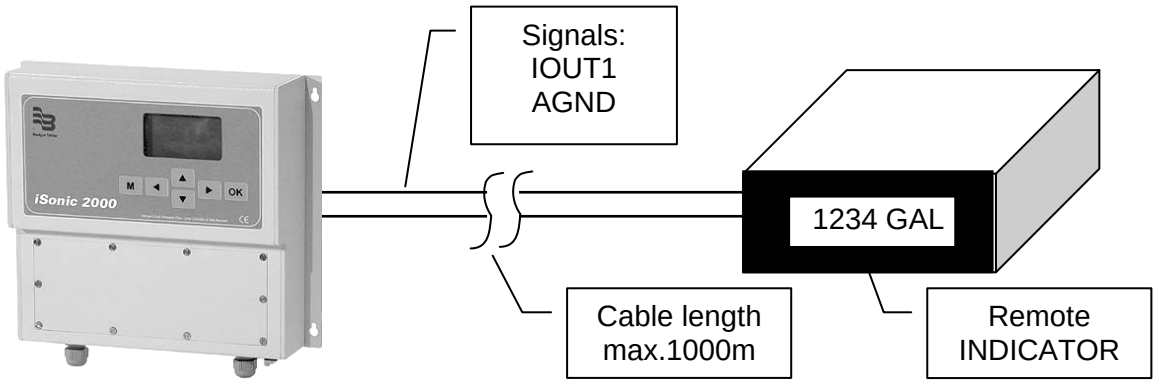
Key:

IOUT*	joint for analog output
+24V	joint for remote power supply
AGND	joint for ground of analog ports
ANALOG*_IN	joint for analog input
U	upper terminal
L	lower terminal

Hints:

- A length of up to 1000 meters / 3300 feet is attainable when using correct, low-ohm cabling
- The max. burden of the ouputs is 150 Ohms.

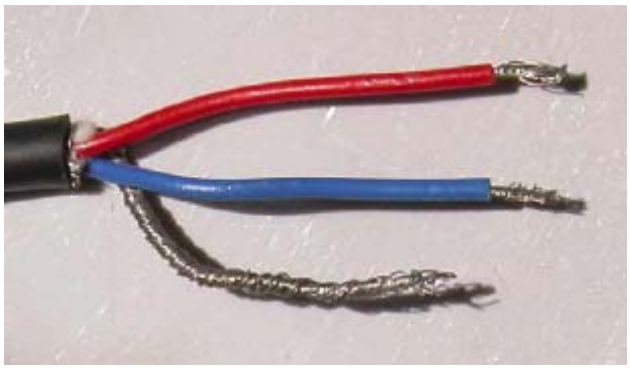
In our example we show a remotely installed iSonic 2000 with an indicator mounted in the control room:



5. Analog inputs

The analogue inputs of the iSonic can be found on connector block 3 and are marked as Analog1_IN and Analog2_IN. They can be used as voltage or current input.

In a typical example we want to connect up a loop-powered device. In this case one of our own ultrasonic level sensors. The device has a cable connection that looks as follows:



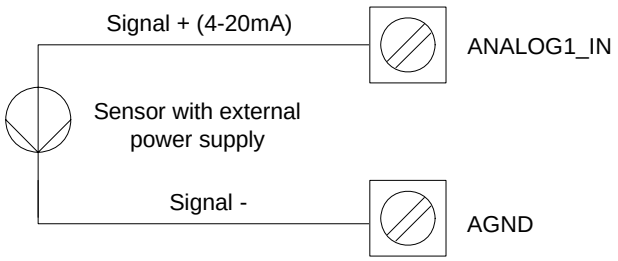
Where the red wire is the positive input to the device and the blue wire ist the negative. The shield is just that, a screen on the cable.

Connected into the unit, it looks as follows:

Where red is connected to VLOOP, a 24V supply intended for loop powered devices and the blue wire is connected together with the screen to Analog_IN1. In this configuration the current from the loop-powered device is measured by the iSonic whilst the same time the external unit is provided power by the iSonic.

at

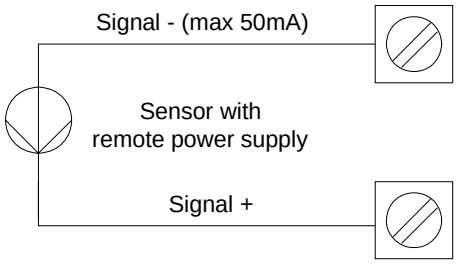
In cases where a mains powered external sensor is used which supplies a 4-20mA signal to the iSonic 2000, the analog_IN and GND connections are used.



Wiring:

Device + :	ANALOG*_IN
Device - :	AGND
Screen :	AGND

In addition (loop-powered) devices that need a remote power supply (24V) can be connected as follows:



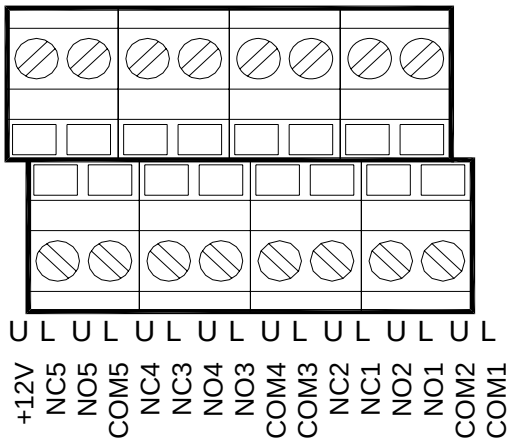
Wiring:
Device input : +24V
Device output: ANALOG*_IN
Screen : ANALOG*_IN

Hint:
The iSonic can interface to two such devices simultaneously, the +24V output can supply a total of 50mA, enough for two loop powered devices.

6. Relay connections

On the iSonic unit, five relays have been provided for to control external devices such as valves, pumps, motors and the like. The connections for these devices can be found on connector block 2.

Block 2



Key:

+12V	power supply for external devices
NC*	normally closed contact
NO*	normally open contact
COM*	common contact
U	upper terminal
L	lower terminal

Although in itself the relays have a good power rating, it is not advisable to connect them straight to the external device. Better would be to make use of an external contactor to switch the actual device, the relays are then used to control the contactor(s). Even though the relays are capable of switching high currents, the tracks on the PCB are limiting the switchable currents, we do not recommend currents higher than 1 Ampere.

Each relay is a single pole changeover type. All contacts have been brought out to connector block 3 with designations such as:

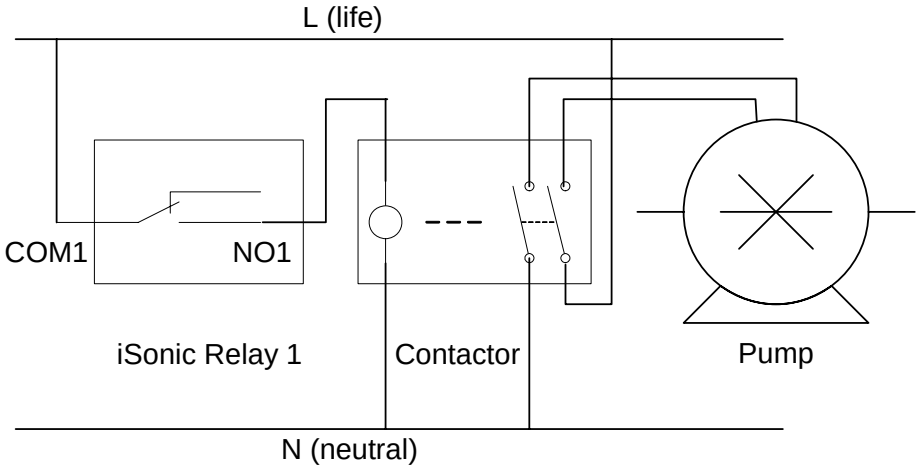
COM1 Relay 1, common
NO1 Relay 1, normally open contact
NC1 Relay 1, normally closed contact

Relay number 5 is reserved in the iSonic unit to be the alarm relay. This relay will activate as soon as any alarm condition exists. Typical use for this could be to connect a claxon for audible warning or use it as an emergency shutdown signal.

Relay ratings are:

10A / 240 VAC
Max. switching power: 336W 2400W
Max. switching voltage: 110VDC 240VAC
Max. switching current: 1A

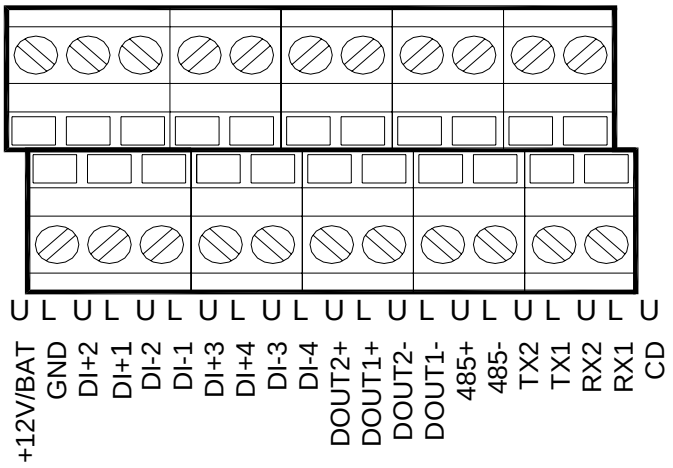
A typical connection for an external pump controlled by relay 1 could be:



7. Digital Inputs

The digital inputs and outputs can be found on block 1.

Block 1



Key:

+12V/BAT	input12V DC
GND	ground
DI+*	Digit. input (+)
DI-*	Digit. input (-)
DOUT*+	Digit. output (+)
DOUT*-	Digit. output (-)
485+	RS 485 interface (+)
485-	RS485 interface (-)
TX2	Port 2 Tx (transm.)
TX1	Port 1 Tx (transm.)
RX2	Port 2 Rx (receiver)
RX1	Port 1 Rx (receiver)
CD	Interface:carrier detect
DGND	digital connectors ground
U	upper terminal
L	lower terminal

Ratings:

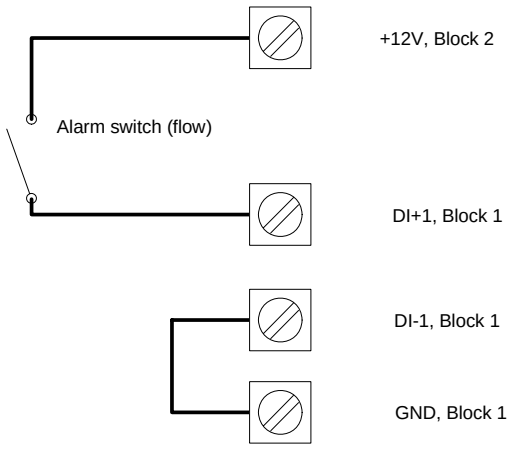
Input voltage min.:	3 VDC
Input voltage max.:	24 VDC
Reverse voltage:	5 VDC
Isolation voltage:	2500Vrms

For each input, the anode (positive) & cathode (negative) of the opto-isolator is brought out to the connector. They are designated as:

DI+1	Anode of sensor 1
DI-1	Cathode of sensor 2

To alert the input that something improtant has happened, apply a voltage of the correct polarity & rating between the DI+ and DI- inputs.

An example of an alarm switch wiring:

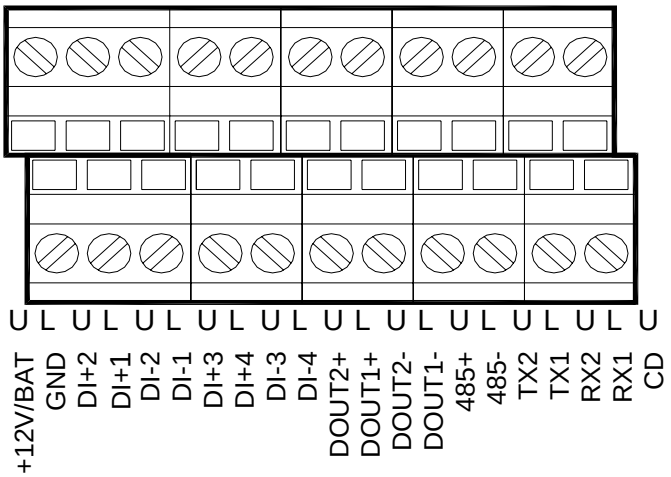


8. Communications connections RS 232 / RS 485

8.1 Overview

The iSonic 2000 provides two RS232 ports as well as one RS485 interface. The external DB9 connector is internally wired to connector block 1.

Block 1



Key:

+12V/BAT	input12V DC
GND	ground
DI+*	Digit. input (+)
DI-*	Digit. input (-)
DOUT*+	Digit. output (+)
DOUT*-	Digit. output (-)
485+	RS 485 interface (+)
485-	RS485 interface (-)
TX2	Port 2 Tx (transm.)
TX1	Port 1 Tx (transm.)
RX2	Port 2 Rx (receiver)
RX1	Port 1 Rx (receiver)
CD	Interface:carrier detect
DGND	digital connectors ground
U	upper terminal
L	lower terminal

8.2 RS232

The external DB9 connector is internally wired to connector block 1.

Pin assignment:

- 1 – Carrier Detect
- 2 – TX
- 3 – RX
- 5 – GND

Where:

- Yellow (TX), connections to DB9 - Pin 2
- Green (RX), connects to DB9 – Pin 3
- Grey (CD), connects to DB9 – Pin 1
- Black (ground), connects to DB9 – Pin

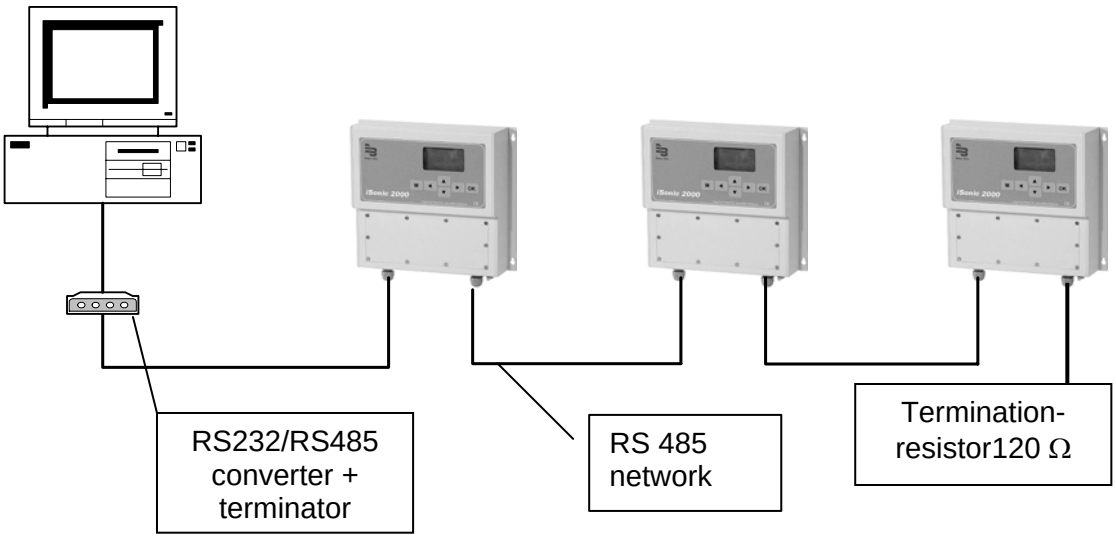
For external MODEM connections, please wire into Port2 as follows:

ISonic 2000		**MODEM**
CD	-	MODEM Carrier Detect
TX2	-	MODEM RX
RX2	-	MODEM TX
DGND	-	MODEM GND

8.3 RS485

Connections for a RS485 have been made available on connector block 1, designated 485+ and 485-. Using these connection points, a number of iSonic units can be connected on a network. Always ensure that RS485- is connected to RS485- and RS485+ is connected to RS485+ between units.

The following example shows a network with a PC, an RS232/RS485 interface converter and three iSonic 2000 devices.



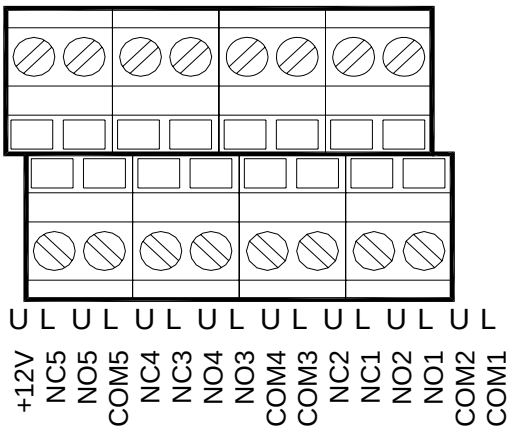
Hints:

- The total length of the network cannot reliably extend beyond 1000 meters / 3300 feet.
- The total number of units cannot be more than 32.
- The network cabling must preferably consist of a chain of devices, ‘T’ connections are inadvisable and may result in unexpected behaviour.
- iSonic units must be internally configured for RS485 (contact your dealer).
- Network termination is important and must occur at both end-points by means of a 120 ohms resistor.
- Especially on longer stretches, use proper, solid core, twisted pair networking cable.

9. Powering external devices

In certain cases, external devices such as MODEMS, GSM MODEMS, short range telemetry units and such can be powered from the iSonic unit. The 12V supply in connector block 2 is intended to power external devices such as these. Whilst mains powered, the iSonic can supply a constant current of up to 500mA to an external device.

Block 2

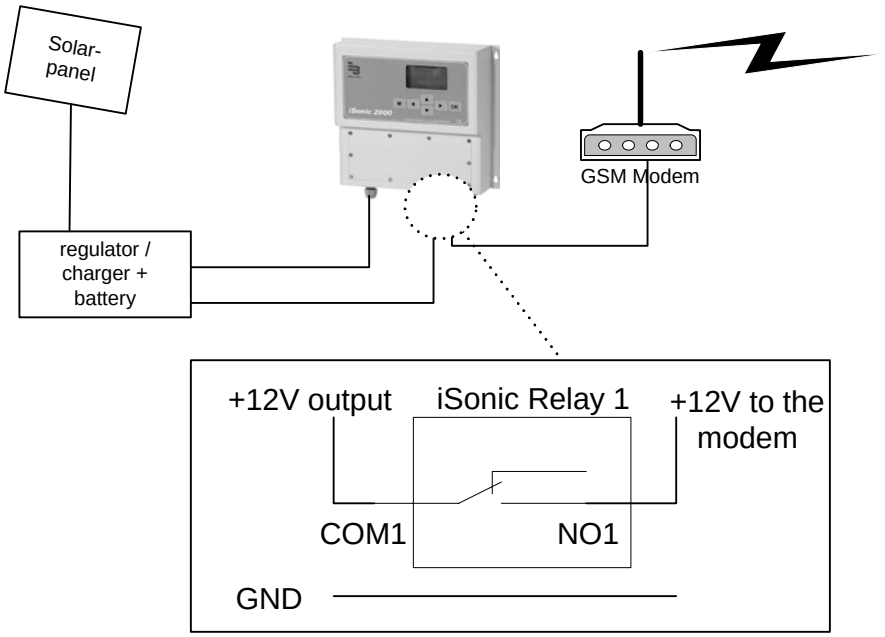


Key:

+12V	power supply for external devices
NC*	normally closed contact
NO*	normally open contact
COM*	common contact
U	upper terminal
L	lower terminal

In case of installations which are not mains operated the external device can be powered from the iSonic 2000 to prevent cable redundancies. If total power consumption is an issue, a relay can be used (programmed as a timer) to enable and disable the external device. Take care to always switch the positive side of the circuit, switching ground might not always work correctly since communication cables also carry ground.

An example of a possible installation:



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