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Wireless 433 MHz to SDI12 Converter

Manual

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1. Version History

5.5.23: Initial

2. Introduction

The “Wireless 433 MHz to SDI12 Converter” is a configurable universal interface to provide your SDI12-Datarecorder with access to GeoPrecision’s “433 MHz Wireless Dataloggers”.

You can receive the latest measurement data from one or more Wireless Dataloggers over the air and read them from the SDI12-Interface of the converter.

This gives you the ability to

- Integrate new GeoPrecision Wireless Dataloggers in your existing measurement-network.
- Upgrade your existing measurement network of Wireless Datalogger with a SDI12-Datarecorder (e.g. for internet transfer, accumulation of data, …).
- Expand your new or existing SDI12-Datarecorder with the 433 MHz wireless feature.
- Bridge longer distances from your testing-side, equipped with small devices, to “bigger” internet-data-recorders, without using cables.

All different kinds of GeoPrecision’s “433 MHz Wireless Dataloggers” can be connected to the “Wireless 433 MHz to SDI12 Converter”, like:

- Temperature dataloggers
- Snow-depth and distance dataloggers
- Tilt /Angle-Dataloggers
- Thermistorstrings

➔ Check www.geoprecision.com for more information.

This document guides through the required steps of:

- Connecting the SDI12-cable to a host.
- Preparing the wireless datalogger.
- Communication and configuration via SDI12-commands.
- Reading the received measurements.

3. Specification

- SDI-12 Standard (see http://www.sdi-12.org for more information)
- 3.6 V … 14 V supply voltage
- Power consumption during measurement: >19 mA
- Power consumption idle: 2 mA
- Power up wait time for first command: 800 ms
- Overvoltage protection by TVS-Surge Absorber 400 Watt
- Receive up to 20 values from a single and max 48 values from multiple Wireless Datalogger(s).
- Operating Temperature Range: - 40°C … + 85°C.

➔ Optional: Plastic housing as external device.

4. Connection

The SDI12 bus topology allows the connection of multiple SDI12 sensors to the same electrical data-, supply- and ground-line. Check http://www.sdi-12.org for more information.

Note:

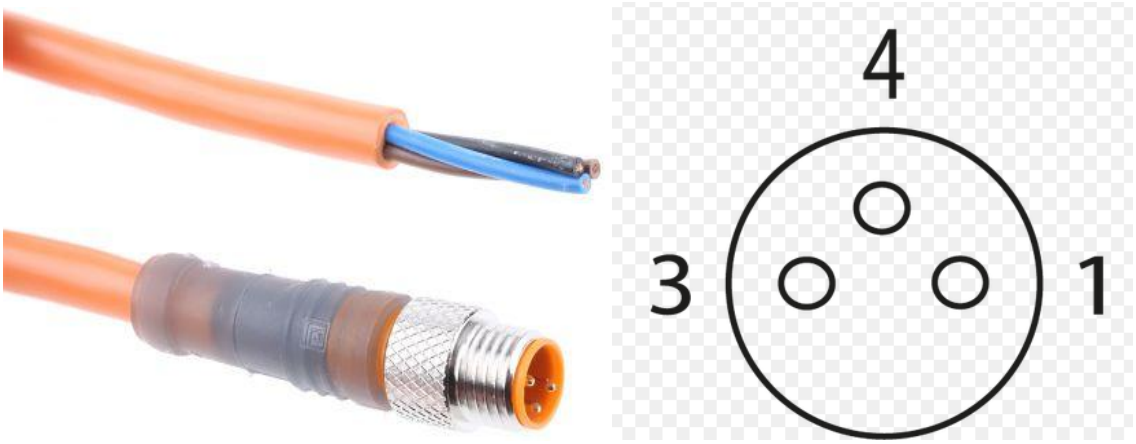
- ➔ The maximum length of the cable is limited by the SDI12 specification. All parts of cable, connected to the same line will be accumulated.
- ➔ By connecting multiple sensors, be sure you have configured the sensor with an unique SDI-address for this bus.

Open wired connection:

Brown: Supply (3.6 to 14 Volt, >20 mA cont.)
Black: Ground GND
Blue: Data

Plugged connection:

Electrical interface: M8 industrial 3 pole connector.
The following schematic shows the pin-usage of the cable with female connector.



Brown (1): Supply (3.6 to 14 Volt, >20 mA cont.)
Black (4): Ground (GND)
Blue (3): Data

5. Preparing the Wireless Datalogger

At first you have to know the basics of the wireless-live-measurement and to prepare your Wireless Datalogger.

5.1 Basics of Wireless-Live-Measurement

This feature, included in all 433 MHz Wireless Dataloggers, always transmits the latest set of measured values over the air.
→E.g. the period for measurement is set to 1 hr. For this period of time the wireless datalogger will continously transmit the previously taken values. The values are updated at the next measurement-period.

The wireless datalogger (depending on the type), records and provides up to 48 values (channels) at a single period of measurement.
→E.g. a wireless datalogger for thermistor-strings, containing 10 sensors, will measure 10 values at a single period.

For the following all measured channels are represented by index-numbers, beginning at 0 (zero):

- The first channel is index '**0**'.
- Second is index '1'.
- n^{th} channel is index 'n-1'.

➔ Index 255 can be used optional to show the signal strength of the wireless transmission.

The first value /index in a set of values is called "**measured-value**". All values /index afterwards are so called "**cached-values**".

A properly configured wireless receiver, like the Wireless 433 MHz to SDI12 Converter, is able to read this transmission.

5.2 Wireless Datalogger configuration

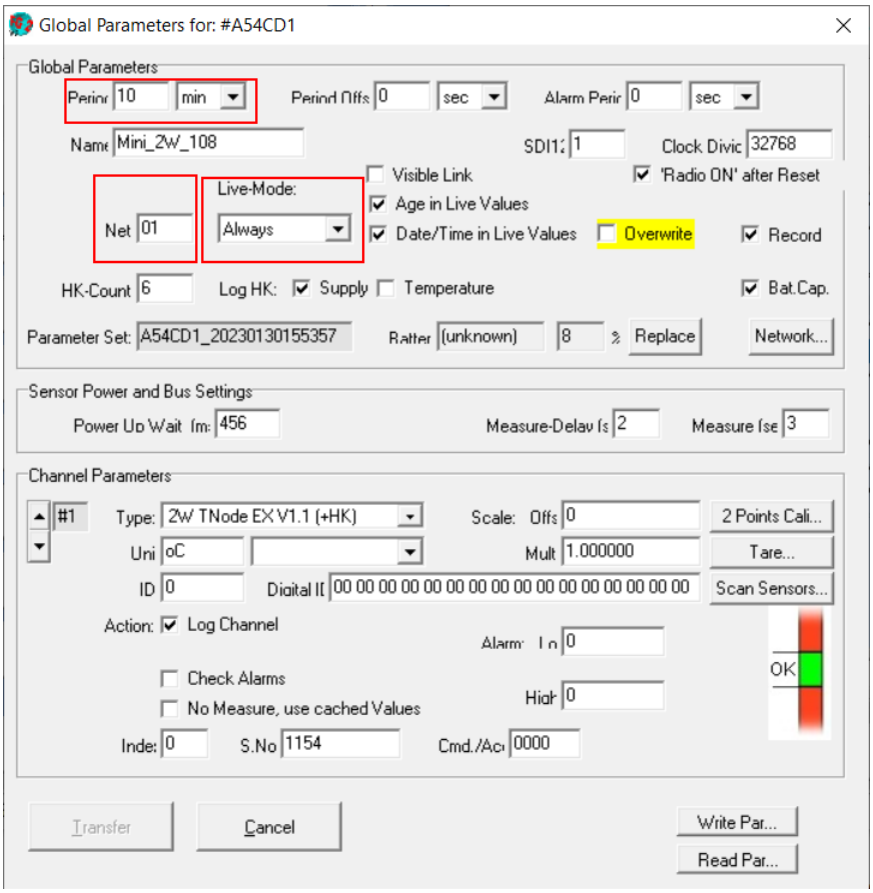
In most cases the device is already properly configured!

The following assumes that your device is working and recording the data correctly[1].

Start the FG2-Shell and open the “Parameter-Form” of your wireless datalogger.

Configure the highlighted settings, like shown below.

- “Net”: Set this to the same value for both devices. By default all devices are configured to “01”.
- “Live-Mode”: set to “Always”.
- “Period”: Note the already configured interval.



[1] For help check „ Doku_FlexGate_Software_Eng “: https://www.thermistor-string.com/additional-string-information/documentation-thermistor-string/category/3-documentation

6. Configuration

To configure the converter for correct measurement and output, a sequence of special not-SDI-conform X-command is used. The configuration is stored in non-volatile memory, so it will resist a power loss of the device.

The extended commands are not compatible to the SDI12-specification. The detailed input- and output-format of each command is described within the examples below.

To apply SDI12-Commands to the converter you have to connect it to a power-supply and a PC-Interface for your preferred SDI12-Terminal (e.g. **SDI Win** or **SDI Term**). Or your data-recorder provides a command line to send SDI12 commands directly to its interface.

Note:

- ➔ The converter must be continuously powered during execution of all steps!
- ➔ A **power up wait time** of at least 800 ms is required!

→For the following examples “>>” marks the command to the sensor, “<<” is the response. Each Command and response ends with <CR><LF>.
→‘**a**’ represents the SDI-address, this might also be ‘?’ (as wild card). Default SDI-address: ‘**1**’.

6.1 Channel assignment

aXPn=5,i,s,c!

‘**n**’: Channel 0 – 47 of the converter to be configured and activated.

‘**i**’: Indexed value of the wireless datalogger to read from.

‘**s**’: Hexadecimal serial number of the wireless datalogger.

‘**c**’: Hexadecimal access-code to the wireless datalogger.

Reply: ‘**a**’ (address).

Configure and activate channel ‘**n**’ of the converter for the “**measured-value**“ with index ‘**i**’ of wireless datalogger ‘**s**’ with the associated device-pin ‘**c**’.

aXPn=3,i!

‘**n**’: Channel 1 – 47 of the converter to be configured and activated.

‘**i**’: Indexed cached value of the wireless datalogger to read from.

Reply: ‘**a**’ (address).

Configure and activate channel ‘**n**’ of the converter for the cached value with index ‘**i**’ of the previously selected wireless datalogger.

aXPn!

Displays the current configuration of channel ‘**n**’.

Example:

Configuration for a 433 Mhz Wireless Datalogger, that provides 4 values.

The first value of index '**0**' is the "**measured-value**", all following (index 1 – 3) are "**cached-values**".

```
>>   "1XP0=5,0,A54CD1,1154! <CR><LF>"
<<   "1<CR><LF>"
>>   "1XP1=3,1! <CR><LF>"
<<   "1<CR><LF>"
>>   "1XP2=3,2! <CR><LF>"
<<   "1<CR><LF>"
>>   "1XP3=3,3! <CR><LF>"
<<   "1<CR><LF>"
```

Checking configuration of channel 0 and 2:

```
>>   "1XP0! <CR><LF>"
<<   "1XP0=5,0,A54CD1,1154<CR><LF>"
>>   "1XP2! <CR><LF>"
<<   "1XP2=3,2,000000,0000<CR><LF>"
```

6.2 Offset and Factor

The configuration of the channels factor and offset is fully optional.

On delivery factor and offset of each single channel are deactivated.

aXKn=o,f!

Adjust the offset '**o**' and factor '**f**' for channel '**n**' (0 – 47).

➔ You always have to set both, offset and factor, separated by a comma '**,**'. The decimal separator is dot '**.**'!

Example:

```
>>   "1XK1=-0.25,2.54! <CR><LF>"
<<   "1<CR><LF>"
```

aXKn!

To read the configured offset '**o**' and factor '**f**' for channel '**n**' (0 – 47) use:

Example:

```
>>   "1XK1?! <CR><LF>"
<<   "1=-0.25,+2.54<CR><LF>"
```

6.3 Enable and Disable a channel

aXAn=s!

Deactivate or activate channel '**n**' (0 – 47). Replace '**s**' by '**0**' to de- and '**1**' to activate.

```
>>"1XAk=n! <CR><LF>"
<<"1 <CR><LF>"
```

aXAn!

Read the status of channel '**n**' (0 – 47) use:

```
>>"1XAk?! <CR><LF>"
<<"1=0<CR><LF>"
```

6.4 Basic SDI12 commands

The command set is based on extended SDI12 (V1.2) command set.

→'**a**' represents the SDI-address, this might also be '?' (as wild card). Default SDI-address: '**1**'.

aAn!

Change address from 'a' to 'n'.

aI!

Identify Node.

7. Reading the measurement

In case of a preconfigured converter directly use the M- and D-commands to start and read a measurement.
Also have a look at the example-code for measurement.

→The converter must stay powered until all operations are finished. In case of a power loss (e.g. between the M- and the D-command) you have to repeat the whole procedure.
→A **power up wait time** of at least 800 ms is required!

7.1 Command description

aM! / aM0!
Start measure of **all** configured sensors. All values are stored at the internal cache. This must be always the first “initial” M-command!
Reply: **atttn**. ‘ttt’ seconds to wait till measurement done (or service reply will be send first) for ‘n’ values (up to 9).

aDn!
This will read the values from the previous M-command. With n = 0 to 9 to get the number of values announced by the previous M-command.

- ➔ Before requesting the data you have to wait for the service-request send by the converter or n seconds, replied by the previous M-command.

aMn!
Prepare the next set of values. ‘n’ must be between 1 and 9.

- ➔ Note: The required number of M-commands depends on the connected number of sensors. So keep in mind: Each M-command responds max 9 values.

Error codes:
-98.00 : Communication error or value not received.
-99.00 : Channel not activated.
-100: No Value.

7.2 Reading example

The following commands and responds will demonstrate how to measure and read values from the converter. The output depends on the channel configuration
→At the following example the converter is configured to read a 433 MHz Wireless Datalogger that provides **13** values.

“>>” marks the command to the sensor, “<<” is the response. Each Command and response ends with <CR><LF>. Default address “1” is used.

```
>>   "1M0!"
<<   "10089"
<<   "1"
>>   "1D0!"
<<   “1[Value 0-2]”
>>   "1D1!"
<<   “1[Value 3-5]”
>>   "1D2!"
<<   “1[Value 6-8]”
>>   "1M1!"
<<   "10014"
<<   "1"
>>   "1D0!"
<<   “1[Value 9-11]”
>>   "1D1!"
<<   “1[Value 12]”
```

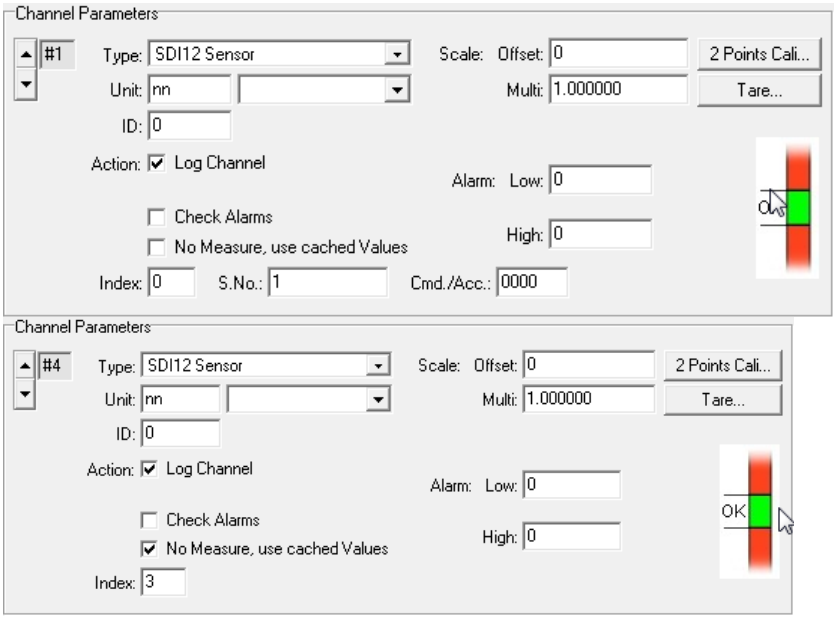
7.3 Example Configuration of a SDI12-Datarecorder

These steps will show you how to configure a GeoPrecision SDI12-Datarecorder to read the measurement of the “Wireless 433 MHz to SDI12 Converter”, using more than one “M-command”.

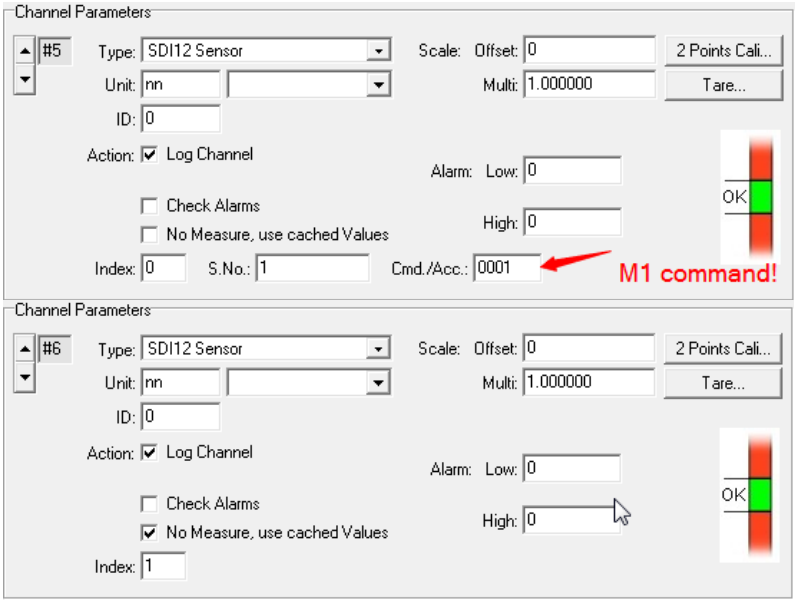
The M1, M2, M3, ... commands are necessary for a setup that provides more than **four** values.

The screenshots are taken from the “FG2-Shell”, showing the configuration of a SDI12-Datarecorder to read 6 values from the converter.

Channel 1 to 4



Channel 5+6



8. Known Issues

I get no reply from my sensor connected to a PC via USB-Serial-Converter.
→Sometimes the delay of a USB converter is too high or it is blocked somehow. Shut down your PC. Disconnect the USB converter and the sensor, disconnect the sensor from power-source. Start your PC and connect everything properly. Now it should work!

The configuration via X-command fails or I get no reply to the X-command.
→Try to send the command again. These commands are not SDI-conform and very complex. So it might happen that the sensor or your PC did not receive everything correctly!
→Be sure the device is powered continuously for the whole sequence of commands.

I cannot measure the connected sensor. The ‘M’ command always replies with "1000".
→The sensor is not configured or the channel is deactivated. You have to set up each sensor the first time it is connected to the SDI-Converter!