vodafone

Vodafone MachineLink

Input/Output Configuration Guide

Doc No CG01206

Document History

This guide covers the following products:

- Vodafone MachineLink 4G Lite NWL-221
- Vodafone MachineLink 4G Lite NWL-222
- Vodafone MachineLink 4G Lite NWL-224

Ver.	Document Description	Date
v. 1.0	Initial document release.	November 2019

Table i - Document revision history

Note – Before performing the instructions in this guide, please ensure that you have the latest firmware version installed on your router.

Visit http://vodafone.netcommwireless.com to download the latest firmware.

Note – The functions described in this document require that the router is assigned with a publicly routable IP address.

Please ensure that your mobile carrier has provided you with a publicly routable IP address before performing the instructions in this document.

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Note – This document is subject to change without notice.

Contents

Introduction

The Vodafone MachineLink routers listed in the Document history section above are equipped with multipurpose inputs and outputs as well as a dedicated ignition input. These inputs and outputs may be independently configured for various functions, including:

- NAMUR (EN 60947-5-6 / IEC 60947-5-6) compatible proximity sensor input
- Proximity sensor input for use with contact closure (open/closed) type of sensors (PIR sensors, door/window sensors for security applications) with the input tamper detection possible (four states detected: open, closed, short and break) by the use of external resistors
- Analogue 0V to 30V Sense input
- Digital input (the I/O voltage measured by the Analogue input and the software making decision about the input state) with the threshold levels configurable in software
- Open collector output.

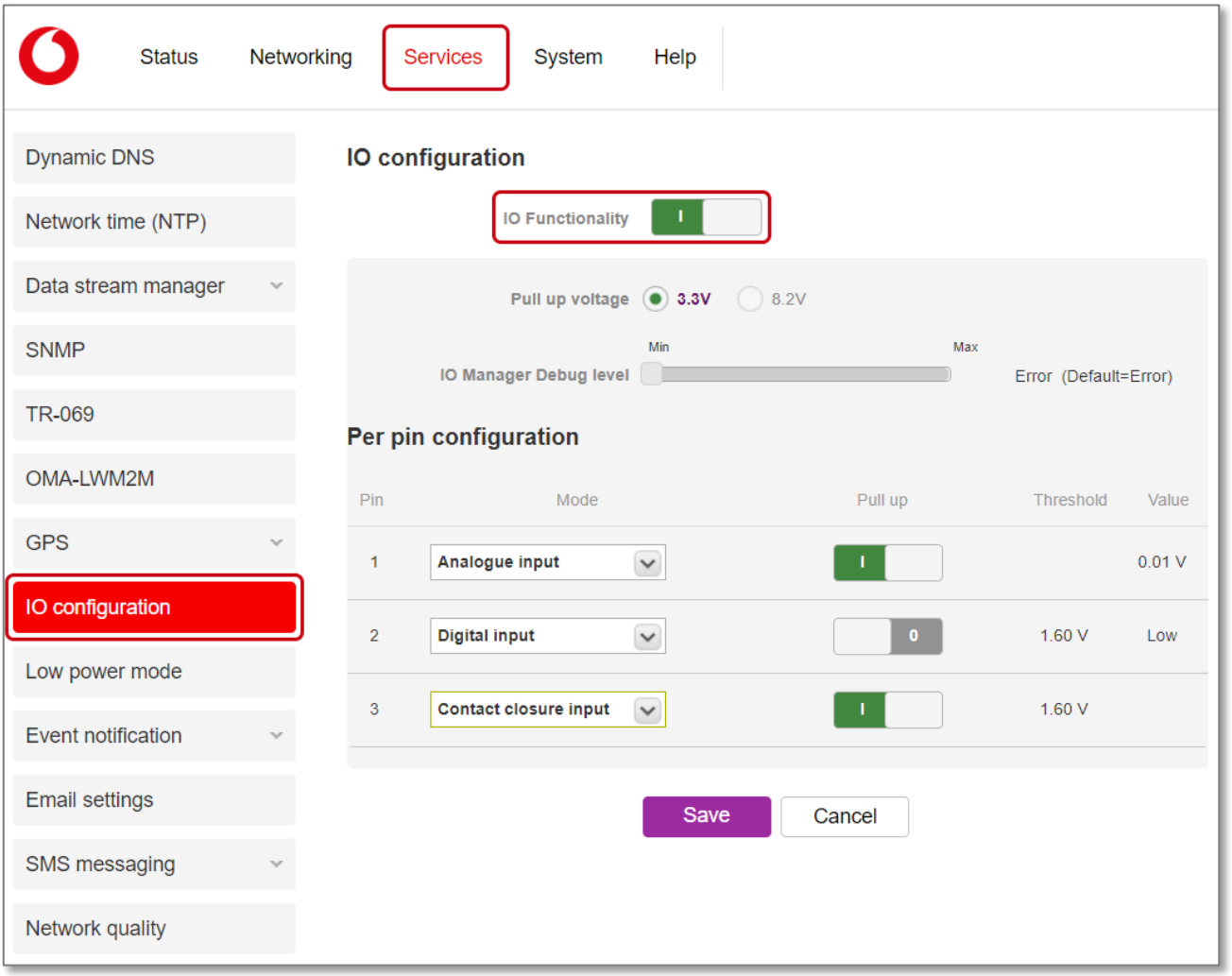
This document provides details of an example where an external sensor is connected to a multipurpose input/output pin.

Refer to the **Vodafone MachineLink router User Manual** for more technical details on other input / output options.

IO configuration options

Vodafone MachineLink routers all have multipurpose input/output pins.

An example IO configuration page is shown below.



Analogue input sensitivity

The analogue input of the router has a range of 0 to 30 Volts, with .01V sensitivity. Most temperature sensors on the market have a much smaller range and higher sensitivity (for example 28 mV per degree Celsius), which makes it crucial to design an amplifier to be connected at the output of the temperature sensor.

For example, an amplifier gain of 10 will make the sensitivity of the output 0.28V per degree Celsius, which is a better value for our analogue input. Extra care should be taken with the amplifier, as most of them change the phase of the voltage and add some nonlinearity to the gain function depending on input and supply voltage. In most cases, the output voltage of the temperature sensor is also a function

of the supply voltage of the circuit. Thus, the best practice is to make some observations and test after building the circuit then come up with a custom temperature to voltage transfer function by interpolation.

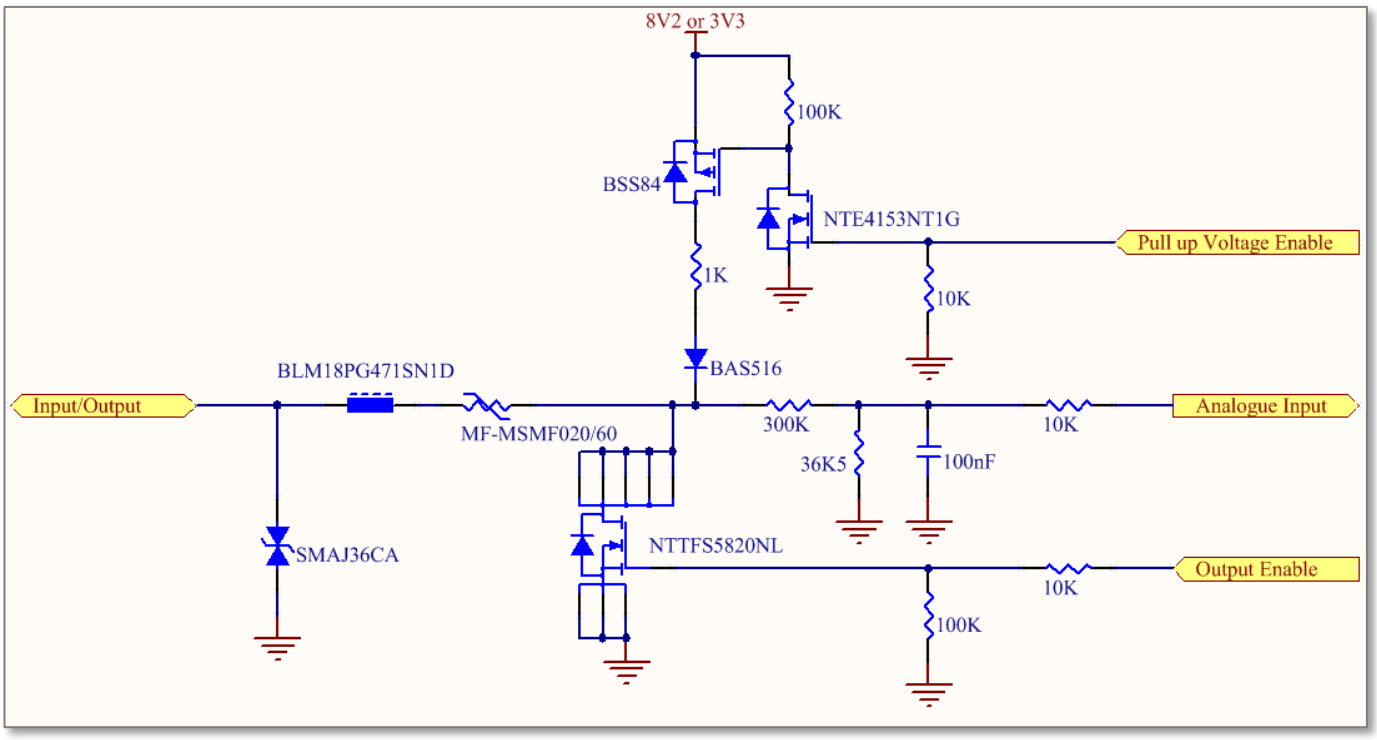
Many temperature sensors require a 5V supply voltage. We can either get a new power supply just for the sensor or use a voltage divider and get the supply voltage from the same 12V power supply as the router.

Digital output

Digital outputs can be used to switch on/off components such as heaters or fans. The best way of doing that is by using relays. There are different types of relays for different applications but the most important factor in choosing a relay is the coil voltage. Coil voltage is the output voltage that will enable the switch. It has to be in the range of the digital output (5-8V). Digital output can have a maximum current of 20mA. As long as the coil voltage is in our range, we can use both AC and DC relay to power different types of equipment.

Hardware Interface

The circuit diagram below applies to units with 3 multipurpose inputs/outputs.



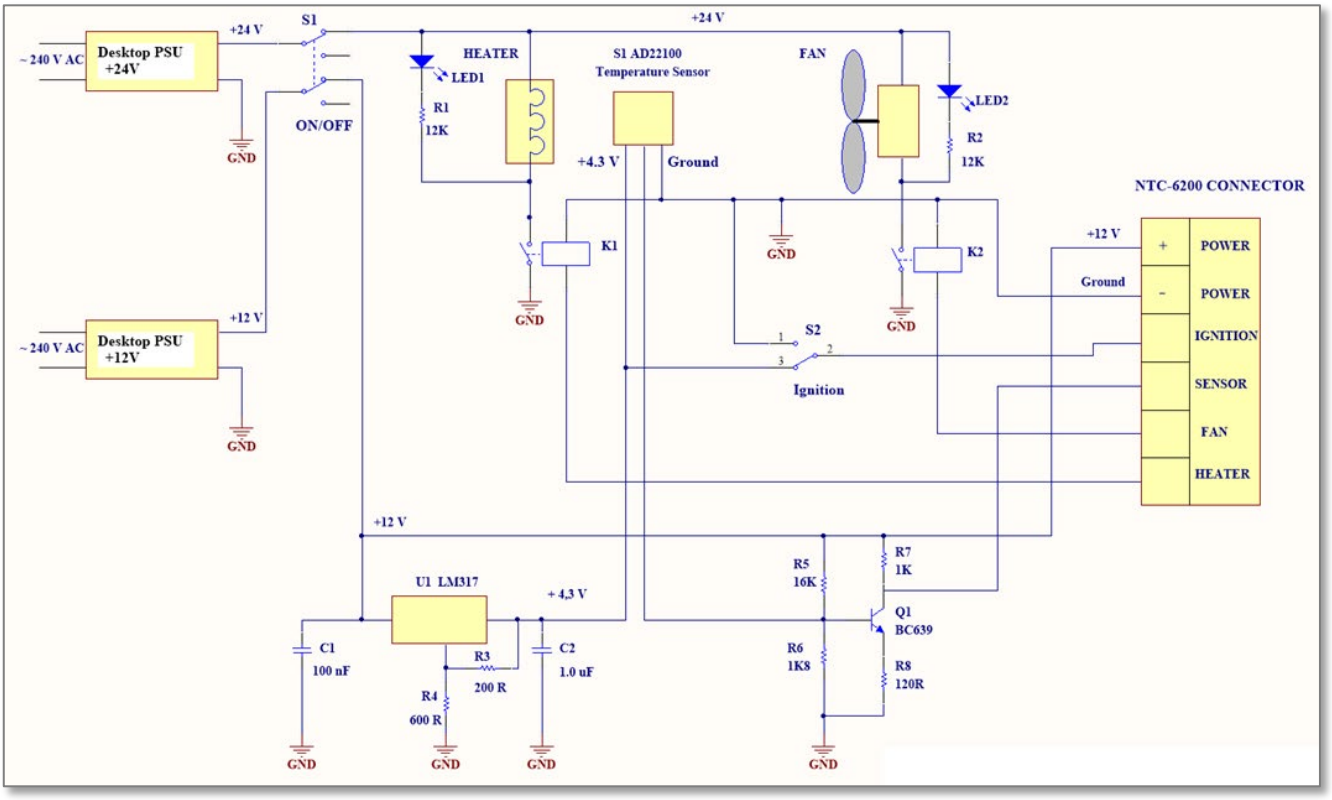
The **Input/Output** label is the physical connection to the outside world. There are protection devices and resistor dividers to condition the signal prior to it going into the processor. The three labels to the right are the interface to the processor. **Output Enable** activates the Transistor which provides an open collector (ground) output and can sink 200mA at 23°C. It is protected by a resettable fuse and transient protection diode. If used with the pull up resistor, which can be activated by the **Pull up Voltage Enable** pin, then you can have a High or Low output rather than open drain. The resistor can be pulled up to 3V3 for Cmos compatible output or 8.2V by software. The **Analogue**

Input pin can read values from 0V to 30V. It is divided by a resistor network to read appropriate levels in the processor. Depending on the sensor type used, the pull up resistor can be switched on or off. If using the NAMUR sensor configuration the pull up will be activated to 8V2 by default.

Example

Attached is a sample working circuit that controls a heater and a fan according to the temperature reading from the sensor (S1). It uses two relays connected to digital output ports (port2 and port 3) to control the heater and fan.

- Analogue input 1 is used for temperature sensor input.
- The temperature sensor is powered by the voltage divider LM317 + R3 R4 circuit. The output of the temperature sensor is connected to a voltage amplifier and then to the analogue input 1.
- The ignition switch is used to power on and off the unit via the ignition input.
- The heater and fan are powered by a separate power supply due to their higher power requirements.
- The script running on the NTC-6200 measures the temperature and compares it with a threshold value, disabling/enabling the heater and fan accordingly.



Further wiring examples and information can be found in the NetComm Wireless Software Developer Guide.