MANUAL

ANAGATE

UNIVERSAL

PROGRAMMER

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Revision History

Version	Date	Changes
1.0	01.10.2009	Initial version
1.1	22.07.2010	THa, Bugfix Renesas pin assignment

Contents

Charts

1 Introduction

1.1 Description

The AnaGate Universal Programmer is used for programming I2C and SPI EEPROMs and flash memories. The integrated JTAG interface can also be used to program flash memories (NOR/NAND/CPUs). Debugging CPU's via JTAG is also supported.

The programming device is always connected to the PC by a standard network connection (TCP/IP, LAN, WLAN).

1.2 Features

- Integrated I^2C, SPI and JTAG interfaces
- I^2C
  - Supports I2C Read and Write commands for all I2C devices (7 and 10 Bit format)
  - Variable I2C bus speed (100 kbps, 400 kbps)
  - Galvanically isolated SCL/SDA lines
- SPI
  - Supports all SPI-Salve devices (sending and receiving data)
  - Variable SPI bus speed (200 – 8333 kbps)
  - Galvanically isolated CLK/MISO/MOSI/CS lines
- JTAG
  - Supports JTAG interface to programm flash memories and debug CPUs
  - Variable JTAG bus speed (10 – 8333 kbps)
  - galvanically isolated –TRST, -SRST, TDI, TMD, TCK, TDO lines
- Static or dynamic assignment (DHCP) of IP addresses

- 4 digital inputs and outputs, which can be adressed via the ethernet interface of the programming device. With the Renesas option 8 digital inputs and output are available.

1.3 Specification

Measurements:

Length:	approx. 155 mm
Width:	approx. 105 mm
Height:	approx. 40 mm
Weight:	approx. 175 g

I^2C Bus:

Baud rate:	100 kbps, 400 kbps, configurable
High-level SCL/SCA:	3,0V - Max: 5,0V (isolated)
Operating mode:	Single Master Mode
Interface:	6 pole plug with SCL, SCA, Vcc, GND

SPI Bus:

Baud rate:	200 – 8333kbps, configurable
High-level:	Min: 1,8V - Max: 5,5V (isolated)
Operating mode:	SPI Master Mode
Interface:	10 pole plug with MISO, MOSI, CLK, -SS, GND, Vcc, GND

JTAG:

Baud rate:	200 – 8333 kbps, configurable
High-level:	Min: 1,8 - Max: 5,5V (isolated)
Operating mode:	JTAG Master Mode
Interface:	20 pole plug with –TRST, -SRST, TDI, TMD, TCK, TDO, Vcc, GND

Digital IO:

Inputs:	4, galvanically isolated (3,3 – 24V)
Outputs:	4, galvanically isolated (3,3 – 24V, $I_{ges\ max}$ = 0,5A)

LAN Interface:

Baud rate:	10/100 Mbps
TCP/IP:	Static or dynamic (DHCP) IP address
Interface:	RJ45 socket

Voltage Supply:

Voltage:	9V-28V direct current
Current consumption:	max. 350mA (9V), without connected USB devices

Ambient Temperature:

Storage:	0 .. 85 °C
In operation:	0 .. 55 °C

Note: The AnaGate universal Programmer must be protected against direct sun exposure.

2 Hardware

2.1 Packing list

The AnaGate Universal Programmer is delivered included with the following components:

- 1x AnaGate Universal Programmer
- 1x CD incl. manual, DLL, Programmer Software for I2C, SPI and JTAG
- 1x 1,8 m Cat. 5 LAN cable (standard, not crossed)
- 1x 10 pole Wago plug
- 1x 2 pole Wago plug
- 1 x plug-in power supply unit (compatible with country of delivery)

2.2 Layout

2.2.1 AnaGate Universal Programmer - front view

Chart 2-1: AnaGate Universal Programmer with Power Module – front view

On the front side are from left to right the three interfaces SPI, JTAG and I2C. Each is galvanically isolated and has its own connector plug. Thus it is possible to use the interfaces with different voltage and electrical potentials independently from each other.

Depending upon the model of the AnaGate Universal Programmer an additional Renasas module or power module is present.

A detailed description of the pin allocation can be found in the following paragraphs.

Remark: The Renesas and the power module interfaces are NOT galvanically isolated from the AnaGate Universal Programmer.

2.2.1.1 I2C socket

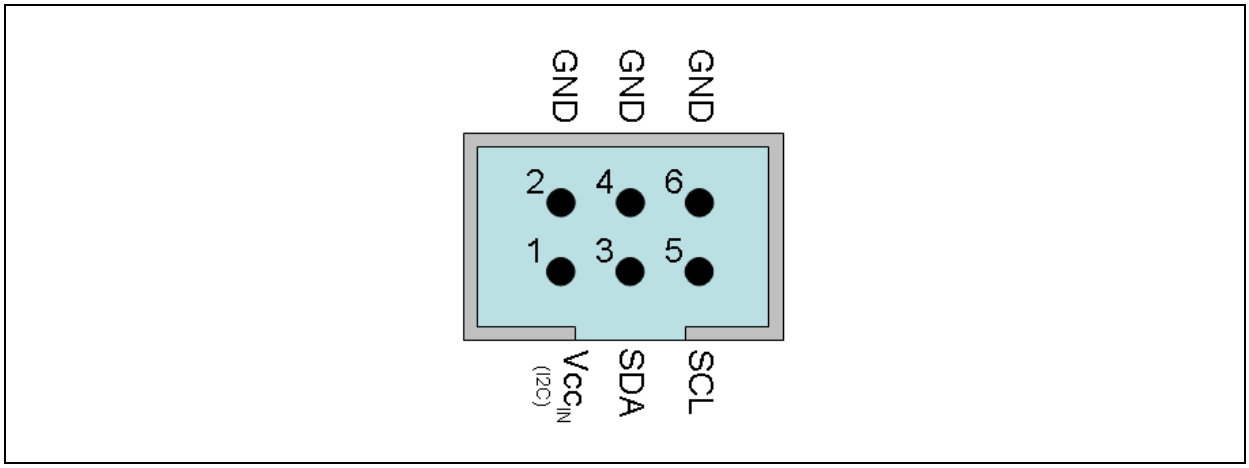

Chart 2-2: I2C pin assignment

Name	Type	Description
Vcc_{IN}:		External voltage for I2C (3.3 up to 5V DC)
SDA:	Input/Output	Data line for I2C
SCL:	Input/Output	Clock line for I2C
GND:		Ground for I2C

2.2.1.2 SPI socket

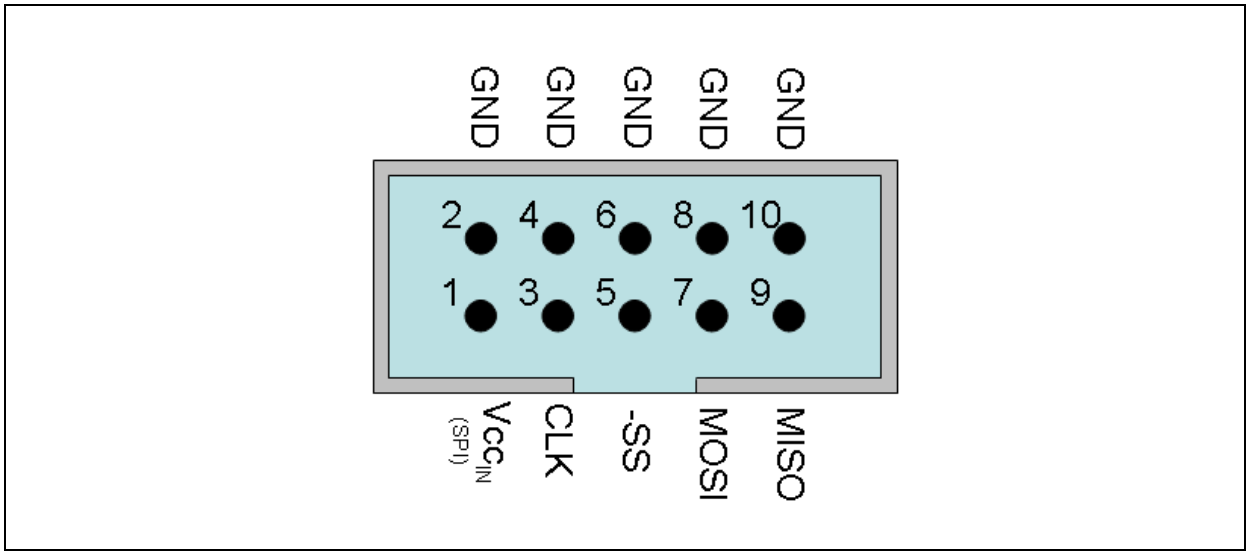

Chart 2-3: SPI pin assignment

Name	Type	Description
Vcc_{IN}:		External voltage for SPI (1.8 up to 5V DC)
CLK:	Output	Clock line
-SS:	Output	Slave Select line (low aktiv)
MISO:	Input	Master-In Slave-Out
MOSI:	Output	Master-Out Save-In
GND:		Ground for SPI

2.2.1.3 JTAG socket

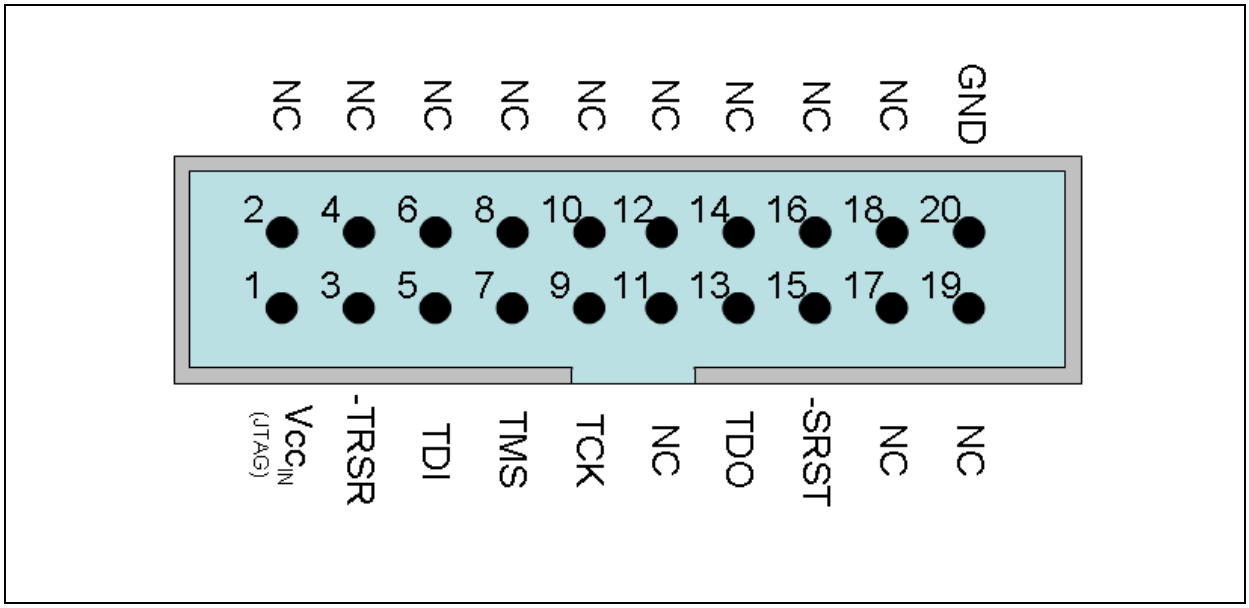

Chart 2-4: JTAG pin assignment

Name	Type	Description
Vcc_{IN}:		External voltage for JTAG (1.8 up to 5V DC)
-TRST:	Output	Test Reset
TDI:	Input	Test Data Input
TMS:	Output	Test Mode Select Input
TCK:	Output	Test Clock
TDO:	Output	Test Data Output
-SRST:	Output	Slave Reset
GND:		Ground for JTAG
NC:		Not connected

Remark: If possible, connect the NC pins to GND to reduce interferences on the ribbon cable.

2.2.1.4 Options

The AnaGate Universal Programmer can be extended with the optional Renesas or power module. Depending on the extension modules an additional connection socket on the device front is present.

2.2.1.4.1 Renesas socket

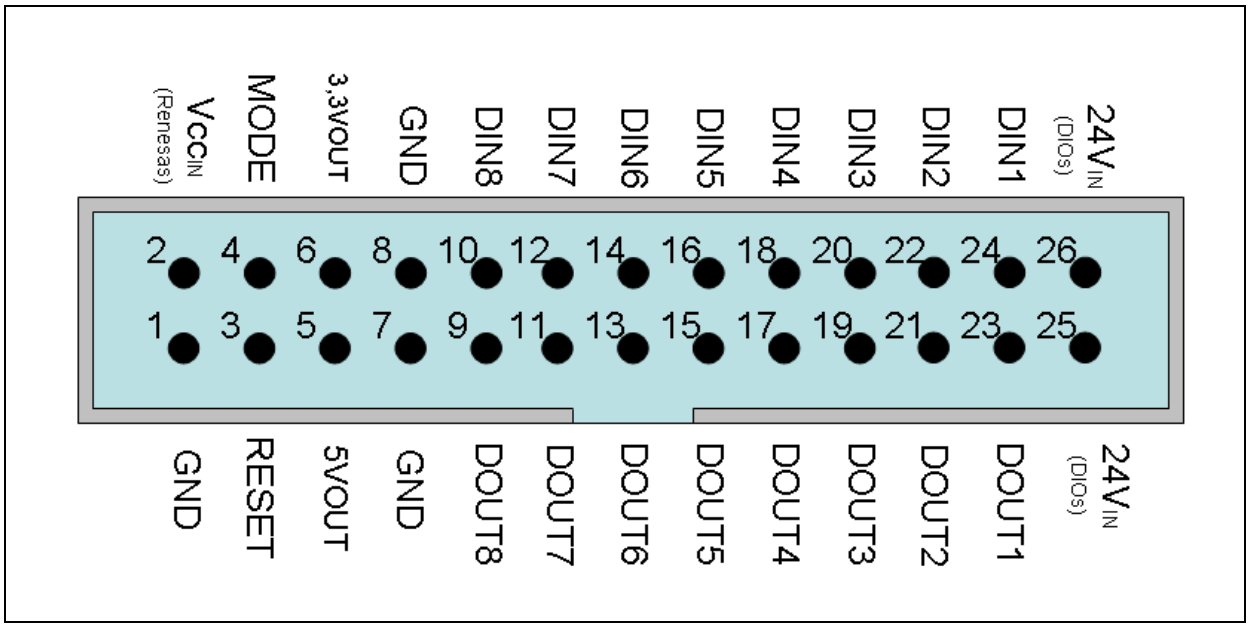

Chart 2-5: Renesas pin assignment

Name	Type	Description
Vcc_{IN}		input for current supply of Renesas interface driver (3.3 up to 5V DC)
$24V_{IN}$	Input	24V input for current supply of digital IOs
$5V_{OUT}$	Output	5V output for current supply of devices up to 200mA
$3{,}3V_{OUT}$	Output	3.3V output for current supply of devices up to 200mA
OUT1 - 8:	Output	Digital 24V outputs
IN1 - 8:	Input	Digital 24V inputs
GND:		Ground

2.2.1.4.2 Power socket

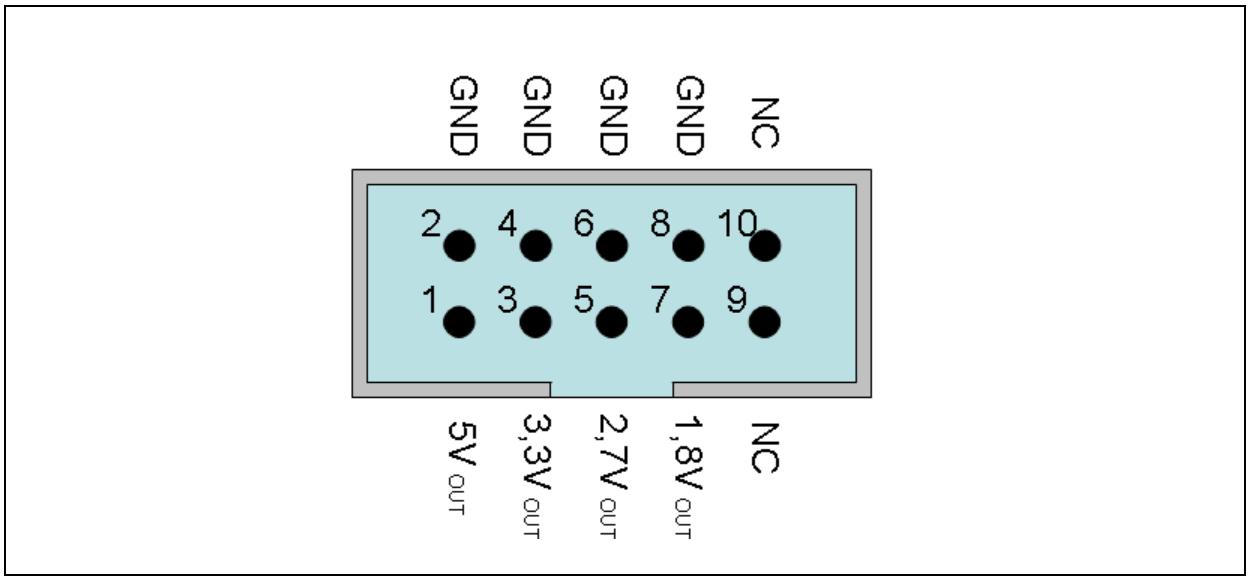

Chart 2-6: Power pin assignment

Name	Type	Description
$5V_{OUT}$	Output	5V output for current supply of devices up to 200mA
$3,3V_{OUT}$	Output	3.3V output for current supply of devices up to 200mA
$2,7V_{OUT}$	Output	2.7V output for current supply of devices up to 200mA
$1,8V_{OUT}$	Output	1.8V output for current supply of devices up to 200mA
GND:		Ground
NC:		Not connected

2.2.2 AnaGate Universal Programmer - rear view

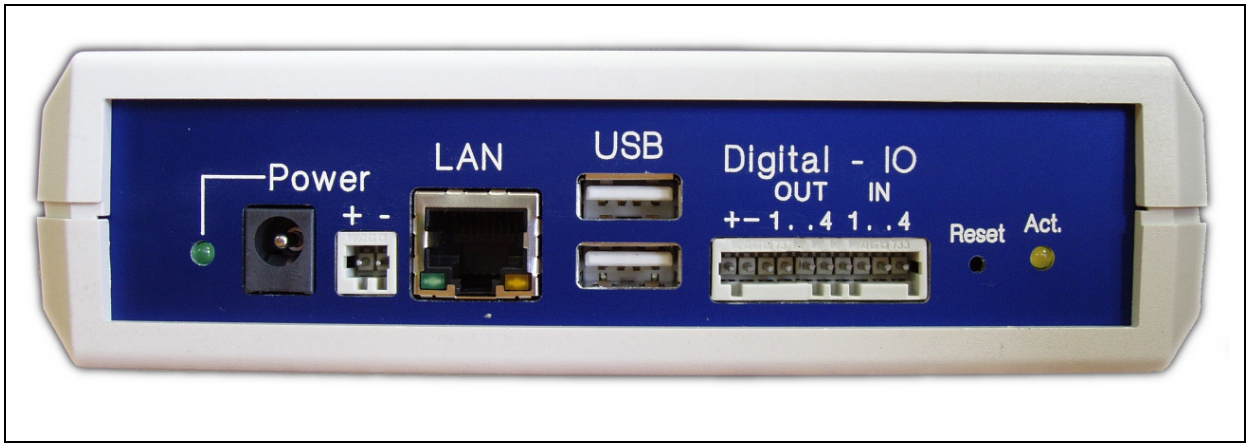

Chart 2-7: AnaGate Universal Programmer – rear view

The rear of the AnaGate features the following connectors and LEDs (from left to right):

1. **Power LED (green)**

   This LED lights up when voltage is being supplied.

2. **Power sockets**

   The AnaGate Universal Programmer can be power supplied in two different ways.

   For the use as desktop device the barrel connector socket is intended, in order to supply the equipment via a plug power supply.

   For the use in a switchboard the two-pole Wago clamping socket can be used to connect an external power supply.

   Be sure to use only one power supply.

3. **LAN port**

   Via the RJ45 socket the AnaGate Universal Programmer is connected with the Ethernet. The equipment can be connected to a network component like a hub or a switch. For a direct connection to a PC a crossover network cable has to be used.

   Note: The cable provided is a normal patch cable for the connection to network components, direct connection to a PC is normally not possible with this cable.

4. **USB ports**

   The AnaGate Universal Programmer has two USB 1.1 interfaces for further extensions or customer specific solutions.

5. **Digital IO**

   The AnaGate Universal Programmer has 4 digital inputs and 4 digital outputs which can be used freely. The digital IO are galvanically decoupled from the device and must be externally power supplied from 3.3V to 24V.

6. **Reset button**

The AnaGate Universal Programmer can be reset to the factory settings using this button. Please refer to 3.4 “Factory reset” for further details.

7. **Activity LED (yellow)**

   This LED lights up when the AnaGate Universal Programmer is processing JTAG communication.

3 Configuration

3.1 Initial installation

First the AnaGate Universal Programmer must be supplied via one of the two power plugs with a tension from 9 to 24 V. Also keep it away from direct sunlight.

Insert the LAN cable into the plug labelled LAN and connect it either to a hub or switch, or directly to the PC using a crossover cable.

The AnaGate Universal Programmer is delivered with the following initial settings:

- Type of address: Static
- IP address: 192.168.1.254
- Network mask: 255.255.255.0
- Gateway: 192.168.1.1

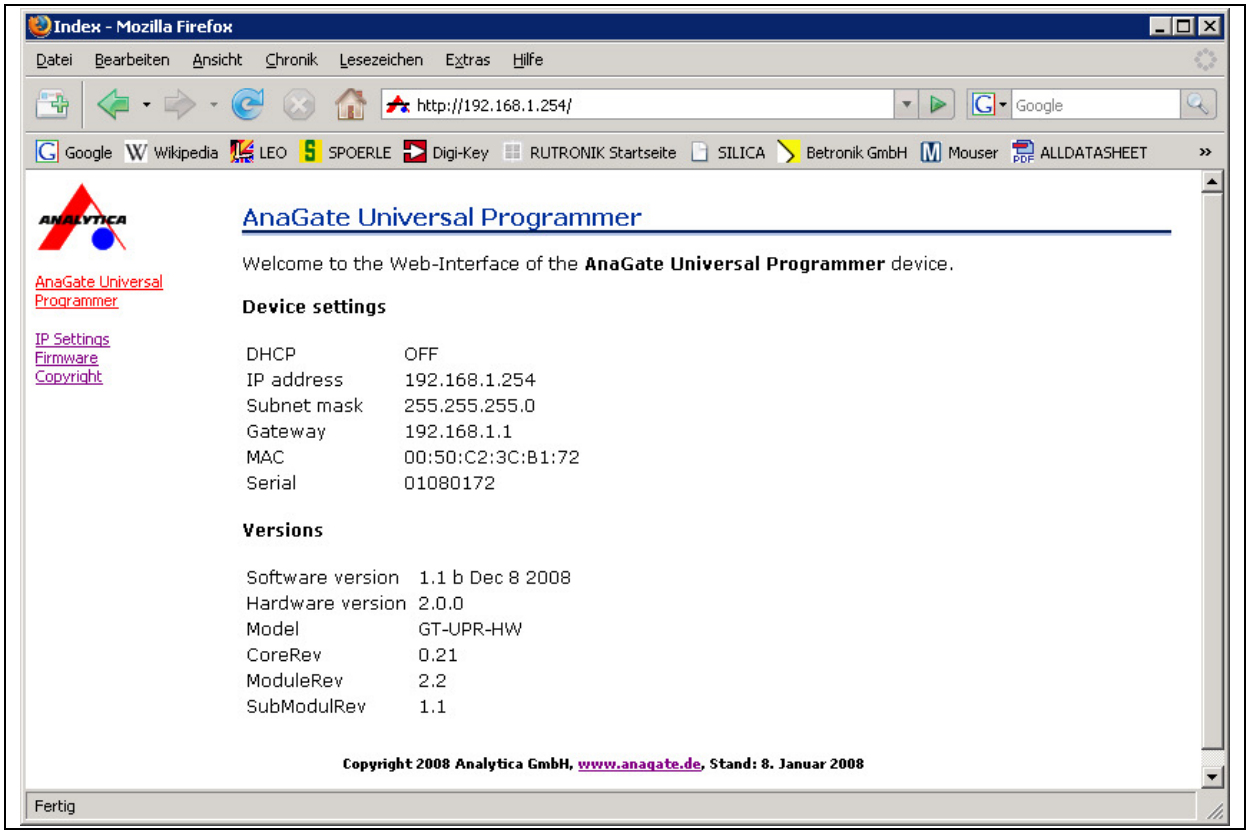

Chart 3-1: Browser interface

The device can now be configured using a standard browser (Internet Explorer, Mozilla, etc.) by using http://192.168.1.254.

The PC used for the configuration must be in the 192.168.1.x network. The static IP address 192.168.1.2 with the subnet mask 255.255.255.0 can be e.g. used.

3.2 TCP/IP parameters

Proceed as follows to configure the TCP/IP parameters:

1. Switching the dynamic/static IP address

   Here you can switch between static IP and dynamic (via DHCP) addresses. If DHCP is being used, the remaining fields cannot be edited as this information is retrieved from the DHCP server. In this case, a DHCP server must be available and accessible in the network.

2. IP address (not DHCP)

   The IP address is entered in a.b.c.d format (e.g. 192.168.1.1) and is permanently stored in the AnaGate CAN Gateway.

3. Subnet mask (not DHCP)

The subnet mask is entered in a.b.c.d format (e.g. 255.255.255.0) and is permanently stored in the AnaGate CAN Gateway.

4. Default gateway (not DHCP)

   The default gateway is entered in a.b.c.d format (e.g. 192.168.1.200) and is permanently stored in the device. Enter “0.0.0.0” if a default gateway is not required.

The inputs are taken over immediately after clicking the button „save settings “and saved permanently on the AnaGate CAN Gateway. A restart of the device is not necessary for activation of the settings.

Note: Maybe the ARP cache of the PC has to be deleted to find the device with the changed IP address.

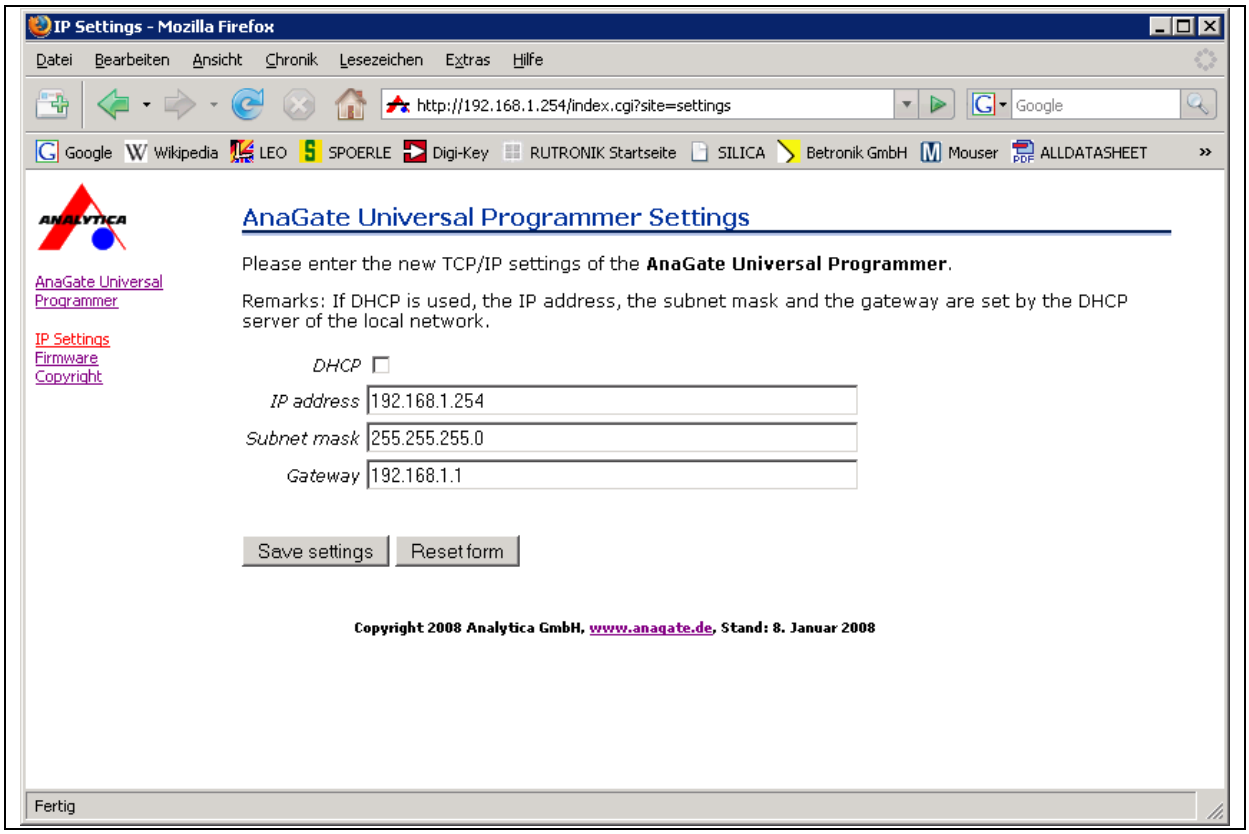

Chart 3-2: Browser interface: tcp/ip settings

3.3 Firmware update

Use the “Firmware” page to load a new firmware to the AnaGate CAN Gateway. Please visit our Web site http://www.anagate.de for further information.

3.4 Factory reset

In order to restore the default factory settings (IP address/subnet mask: 192.168.1.254/255.255.255.0), hold the RESET for approx. 10 seconds.

If the device is reset successfully, the yellow LED blinks until the RESET is released. The default factory settings are activated immediately without a restart of the device,

NOTE: If the RESET push-button is pressed too briefly, the current IP address and network mask is pulsed via the yellow LED (Morse code). A second push of the RESET, terminates the pulsing, the device is not reset.

NOTE:
The factory reset is not possible directly after power on until complete loading of operating system and firmware of the AnaGate. This initialization period is signalled via the yellow activity LED. On power on the LED is switched on and after initialization the LED is switched off.

NOTE: After the change of the IP address, the ARP cache of the personal computer has to be deleted eventually.

3.4.1 Examining the TCP/IP settings

It is possible to check the current TCP/IP settings directly on the device..

After pressing shortly the „Reset“ button the AnaGate starts to pulse out the current TCP/IP settings via the yellow activity LED. Pressing again the buttons stops the pulsing immediately.

The IP address and subnet mask are pulsed out, one after the other. Following pulse codes are used:

- Digits 1, 2, 3, ..., 9: 1x, 2x, ...9x Flashing (200ms delay between each flash)
- Digit 0: 10x flashing (200ms delay between each flash)
- Dot: 1x very fast flash

Between two single digits a delay of 1 second is made, and between the IP address and subnet mask two fast flashes are pulsed out.

Example: IP Adresse: **1 9 2.1 6 8 .1.1**
Netmask: **2 5 5.2 5 5.2 5 5.0**

■ ■■■■■■■■■ ■■ □ ■ ■■■■■■ ■■■■■■■■ □ ■ □ ■ □□

■■ ■■■■■ ■■■■■ □ ■■ ■■■■■ ■■■■■ □ ■■ ■■■■■ ■■■■■ □ ■■■■■■■■■■ □□

Gateway, they must be separately supplied via the pins 1 us 2 with a voltage by 3,3V - 24V DC.

3.5 The digital inputs and outputs

Over the 10-pole pin row on the back of the AnaGate CAN Gateway four digital inputs and four digital outputs are led out, which can be used freely. Since the IO's are electrically isolated from the AnaGate CAN Gateway, they must be separately supplied via the pins 1 us 2 with a voltage by 3,3V - 24V DC.

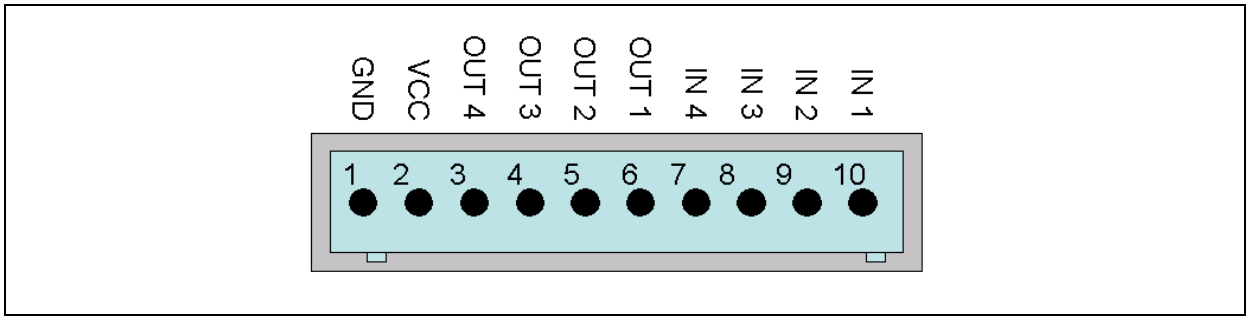

Chart 3-3: pin layouts of the the digital inputs and outputs

3.5.1 Connecting the digital inputs

At the inputs IN1 to IN4 any external voltage between VCC and GND can be applied. As soon as the voltage difference between INx and GND is more than 3.0 V, the AnaGate CAN Gateway interprets the input as logically HI otherwise LOW.

3.5.2 Connecting the digital outputs

The outputs are implemented as open collector drivers. If a output is active, it is pulled down to GND. In the inactive condition the output is floating.

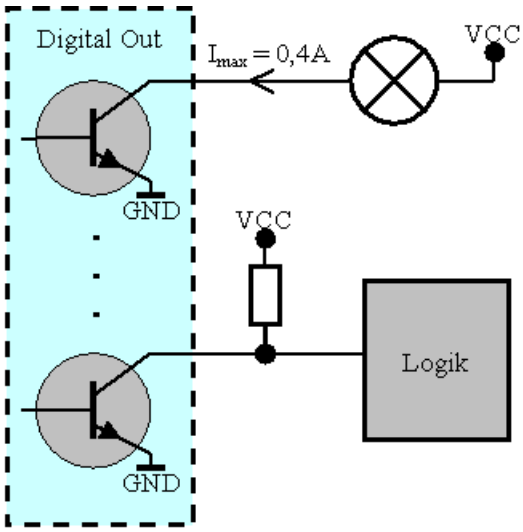

Chart 3-4: Example for connecting the digital outputs

In principle the maximum current of each individual output is 400mA. For thermal reasons is the sum of all output currents is limited to 500mA. The outputs not short-circuit proofed, and must f be protected with a pre-resistor.

Input U_{in} of the digital input can be connected to an external voltage between 0 and 28V. If the input voltage at U_{in} is greater than 2.0 V the AnaGate device interpretes the input as a logical 1, otherwise 0.

4 Application Scenarios

4.1 I²C

4.1.1 Using the I2C interface

Before using the I2C interface the Vcc and GND pins have to be supplied with an external voltage of 3.3V up to 5.0V DC. The signal level of the interface is always identical to the supply voltage. Since the interface is galvanically isolated, the supply voltage of the programming board can be used. Is the optional power module present on the AnaGate Universal Programmer, the interface and the I2C device (up to 200mA) can be supplied directly via the power module (see also 4.5 Power Option).

Two 4.7 kOhm pull-up resistors have to be switched between the voltage supply and the SDA or SCL circuit. These are not integrated in the AnaGate Universal Programmer and must be attached externally. In most cases these resistors are already present on the boards to program.

In the following picture the use of the I2C interface is schematically shown.

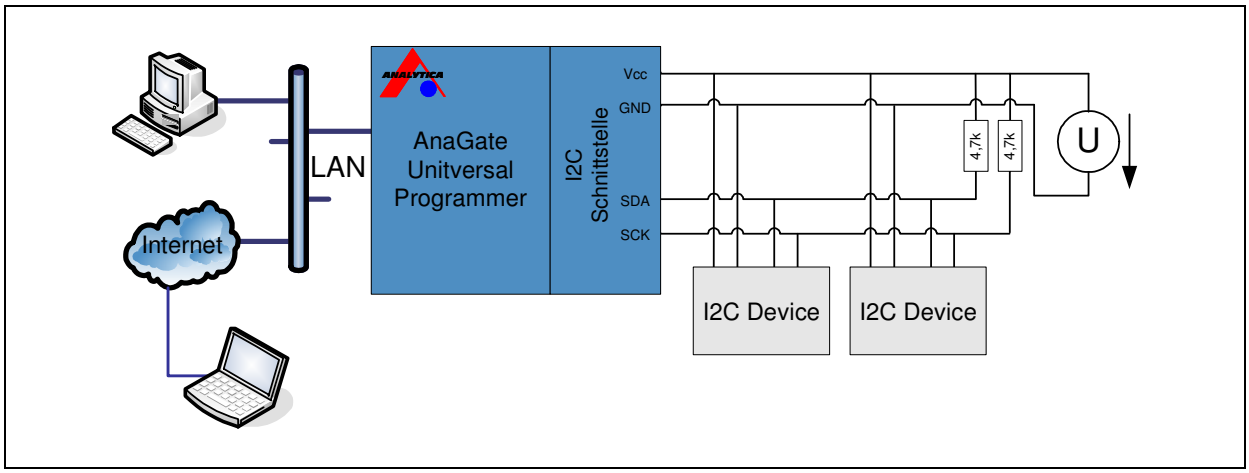

Chart 4-1: Universal Programmer connected to two I2C devices

If the I2C device is fitted with chip-enable address inputs (usually designated A0/E0, A1/E1 and A2/E2), these also have to be provided with GND or power.

If the AnaGate I2C is connected to an application board, please ensure that an existing I2C master is not accessing the I2C device at the same time as the AnaGate Universal Programmer. To set the I2C master on board in the RESET mode is a practical solution in this case. If the I2C master supports Multi-Master mode this should be no problem so far.

4.2 SPI

4.2.1 Using the SPI interface

Before using the SPI interface the Vcc and GND pins have to be supplied with an external voltage of 1.8V up to 5.0V DC. The signal level of the interface is always identical to the supply voltage. So, it is advisable to supply the interface and the device to program with the same power supply. Since the interface is galvanically isolated, the supply voltage of the programming board can be used for example. Is the optional power module present on the AnaGate Universal Programmer, the interface and the SPS slave (up to 200mA) can be supplied directly via the power module (see also 4.5 Power Option).

When using higher baud rates, ensure that a GND is present between two signal lines. The cables should be kept as short as possible.

In the following picture the use of the SPI interface is schematically shown.

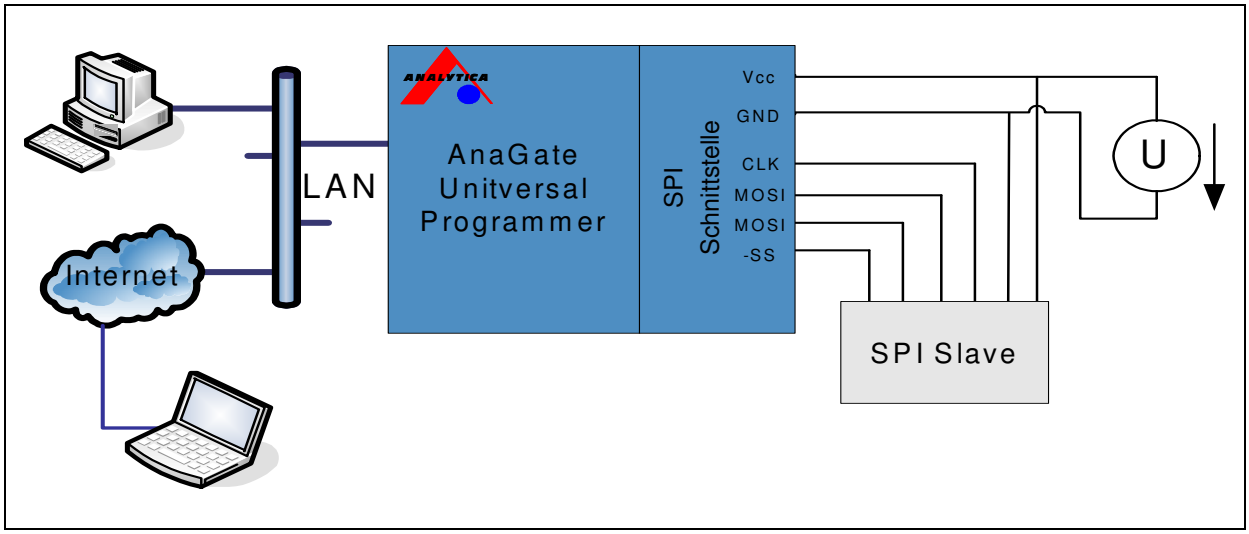

Chart 4-2: Universal Programmer connected to a SPI slave

The lines have to be interconnected as follows:

- **MOSI**
  This line have to be interconnected to the data input of the SPI Slave (often referred as DI or SI)
- **MISO**
  This line have to be interconnected to the data output of the SPI Slave (often referred as DO or SO)
- **CLK**
  This line have to be interconnected to the clock input of the SPI Slave (often referred as CLK or SCK)
- **-SS**
  This line have to be interconnected to the chip select input of the SPI Slave (often referred as -SS or -CS)

4.3 JTAG

4.3.1 Using the JTAG interface

Before using the SPI interface the Vcc and GND pins have to be supplied with an external voltage of 1.8V up to 5.0V DC. The signal level of the interface is always identical to the supply voltage. So, it is advisable to supply the interface and the device to program with the same power supply. Since the interface is galvanically isolated, the supply voltage of the programming board can be used for example. Is the optional power module present on the AnaGate Universal Programmer, the interface and the JTAG slave (up to 200mA) can be supplied directly via the power module (see also 4.5 Power Option).

When using higher baud rates, ensure that a GND is present between two signal lines. The cables should be kept as short as possible.

In the following picture the use of the JTAG interface is schematically shown.

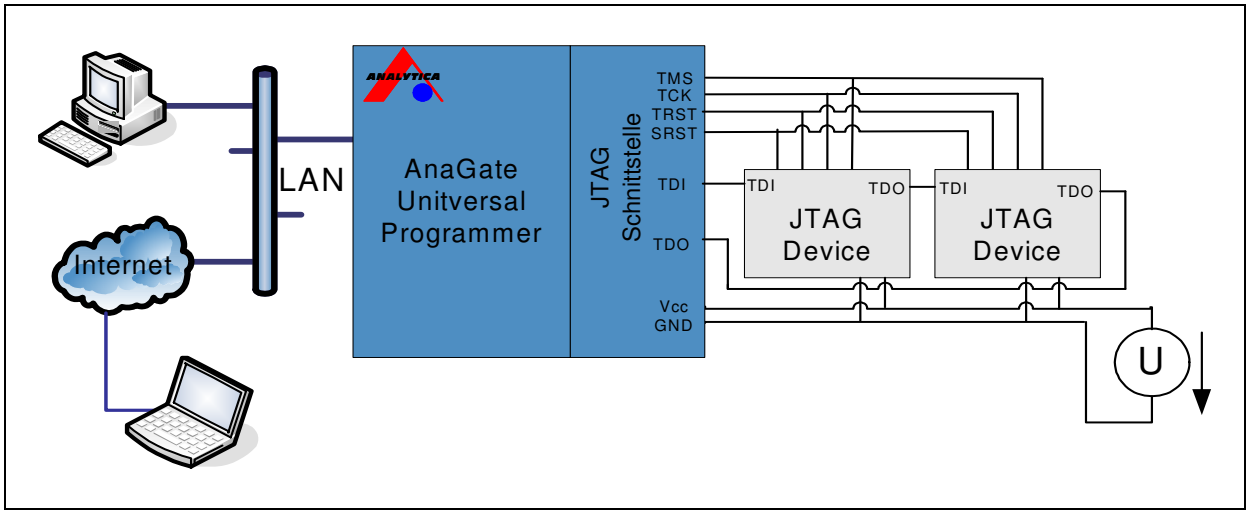

Chart 4-3: Universal Programmer connected to a JTAG devices

The lines have to be interconnected as follows:

- **TMS/TCK**
  These lines have to be interconnected to each JTAG device to the same designation.
- **TRST/SRST**
  These lines have to be interconnected to each JTAG device to the same designation. The connection is optional (test and system reset lines).
- **TDI**
  This line have to be interconnected to the TDI (data input) of the JTAG device.
- **TDO**
  This line have to be interconnected to the TDO of the JTAG device in single device mode.

  If there is more than a single JTAG device is attached, the TDO of the first device is interconnected to the TDO of the second, and so one. The TDO of the last JTAG device have to be interconnected to the TDO of the AnaGate Universal Programmer.

Remark:
RCLK is not supported by the AnaGate Universal Programmer.

4.4 Renesas Option

Diese optionale Schnittstelle stellt die Möglichkeit zur Programmierung von Renesas CPUs (R8C Tiny Serie) sowie 8 digitale Ein- und Ausgänge zur Verfügung.

4.4.1 Using the Renesas interface

Before using the Renesas interface the Vcc and GND pins have to be supplied with an external voltage of 1.8V up to 5.0V DC. The signal level of the interface is always identical to the supply voltage. So, it is advisable to supply the interface and the device to program with the same power supply. Since the interface is galvanically isolated, the supply voltage of the programming board can be used for example. On the Renesas socket a 3.3 V and a 5.0V output is present, which can be used to supply the interface and the JTAG slave (up to 200mA) can be supplied.

In the following picture the use of the Renesas interface is schematically shown.

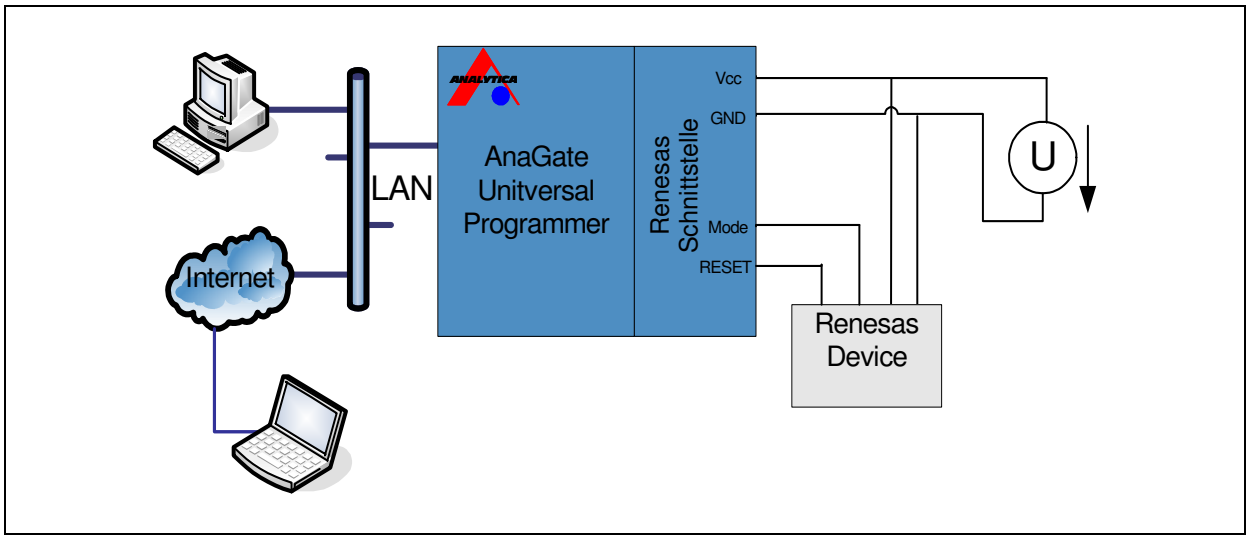

Chart 4-4: Universal Programmer connected to a Renesas devices

The lines have to be interconnected as follows:

- **Mode**
  This line have to be interconnected to the Mode pin of the R8C CPU.
- **RESET**
  This line have to be interconnected to the Reset pin of the R8C CPU.

4.4.2 Digital – IO Extension

The AnaGate Universal Programmer with Renesas option provides 8 additional digital inputs and outputs on the front side of the device. Please note, that the four digital inputs and outputs on the back side of the device are not longer operable with an installed Renesas option.

The 8 digital inputs and outputs are not necessary for programming the Renesas CPU and can be used independently, for example to switch lights or to read some signals, perhaps to make the programming of the CPU more convenient.

Outputs: Each of the 8 outputs can have a current load up to 300mA. In “high” state a current of 24V is provided, in “low” state it is potential free.

Inputs: A current load above 12V is stated as logical „1“, otherwise „0“. The input current is about 14mA (24V).

Remark:
If an output is used to switch a relay, the relay must have a free-wheeling diode to protect from damaging the output..

4.5 Power Option

The optional power interface make the following voltages available during a maximum total current load of 200mA:

- 1.8V DC
- 2.7V DC
- 3.3V DC
- 5.0V DC

These tensions can be used, to supply a PCB during programming.

5 Questions and Troubleshooting

5.1 No LAN connection

If no LAN connection is registered (the link LED next to the RJ45 socket does not light up), please check the wiring between the AnaGate Universal Programmer and the hub or switch. You need a crossover cable to connect the device to a PC.

Check that the AnaGate Universal Programmer is connected to the power supply.

5.2 No TCP/IP connection

If you cannot set up a TCP/IP connection to the AnaGate Universal Programmer, please proceed as follows:

1. Check for an existing LAN connection (see also 5.1).
2. Check if you can address the device with a ping.

   To do this, open the MS Windows command prompt and enter the command “ping a.b.c.d” (replace a.b.c.d with the IP address of the AnaGate). If there is no response, check whether the RX LED next to the RJ45 socket lights up while executing the ping command.

   If you still cannot address the device, perform a factory reset (see 3.4 for details), configure your PC using the IP address 192.168.1.253/255.255.255.0, and repeat the aforementioned procedure using the IP address 192.168.1.254.
3. Check whether you can open a TCP connection at port 5000.

   To do this, open the MS Windows command prompt and enter the command “telnet a.b.c.d 5000” (replace a.b.c.d with the IP address of the AnaGate). If you do not get a connection immediately check whether there is a firewall or packet filter installed between your PC and the AnaGate.

5.3 No I2C Communication

If I2C communication with your I2C device fails, please proceed as follows:

1. Check that the I2C device and the I2C interface of the AnaGate Universal Programmer are connected to a power supply.
2. Check that no other devices/µC are active on the I2C bus.
3. Ensure that the SDA and SCL circuits are provided with an adequate pull-up resistance (e.g. 4.7 kOhm) to the voltage supply (3.3 V resp. 5 V).
4. Ensure that no other electrical components can interfere with communication on the I2C bus between the AnaGate I2C and the I2C device.
5. Ensure that the chip-enable address of the I2C device and the software are identical.

5.4 No SPI communication

If SPI communication with your SPI device fails, please proceed as follows:

1. Check that the SPI device and the SPI interface of th AnaGate Universal Porgrammer is connected to a power supply.
2. Check that no other devices/µC are active on the SPI bus.
3. Ensure that no other electrical components can interfere with communication on the SPI bus between the AnaGate Universal Programmer and the SPI device.

5.5 No JTAG communication

If JTAG communication with your JTAG device fails, please proceed as follows:

1. Check that the JTAG device and the JTAG interface of th AnaGate Universal Programmer is connected to a power supply.
2. Ensure that the TDO pin of the last JTAG device is connected to the TDO pin of the AnaGate Universal Programmer

5.6 No Renesas communication

If communication with your Renesase device fails, please proceed as follows:

1. Check that the Renesas device and the Renesas interface of the AnaGate Universal Programmer is connected to a power supply.

2. Ensure that the Reset and Mode pin
3. Ensure that the Reset and Mode pins are connected with an adequate pull-up (resp. pull-down) resistance to Vcc (resp. GND).

5.7 Firewall

When working with a firewall, the following TCP ports to be opened for communication with the AnaGate Universal Programmer.

- I2C interface:5000
- SPI interface:5002
- JTAG interface: 3333, 4444, 20,21, (FTP)

Literature

[1] I2C Bus http://www.semiconductors.philips.com/buses/i2c/

[2] SPI Bus http://www.mct.net/faq/spi.html

http://www.embedded.com/story/OEG20020124S0116

Abbreviations

DHCP	Dynamic Host Configuration Protocol
LSB	Least Significant Byte
MSB	Most Significant Byte
SPI	Serial Peripheral Interface
I2C	Inter-Integrated Circuit
JTAG	Joint Test Action Group
SDA	seriel data line
SCL	seriel clock line
MISO	Master In Salve Out
MOSI	Master Out Salve In
SS	Saver Select
CLK	Clock
TRST	Test Reset
TDI	Test Data Input
TDO	Test Data Output
TMS	Test Mode Select Input
TCK	Test Clock
SRST	Slave Reset
NC	Not Connected