



# user's guide

## Quick Data

Size: 97 x 60 x 15 mm  
 Mounting:  $\varnothing 4,1\text{mm}$  x 4 holes (c-c 50 x 50 mm)  
 Power: 7..32Vdc max 20mA (ex add.ons)  
 Temp range: -35°C to +75°C (User Interface to -10°)  
 Interfaces: RS-232, RS-485 2-wire, TTY20mA  
 2 x opto inputs for counting  
**NOTE:** TTY20mA output is not included. Use an external converter or ND5052.  
 Communication: 300 to 115k Baud 7 or 8 data bits N, E, O

Options include Ethernet/PoE, Radios, Analog Interface, GPS/GNSS etc

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## WARNING

Electronic cards are sensitive to electrostatic discharge. Use proper grounding when handling!

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# CONNECTION

The controller card has numerous functions and the use of I/O will vary. Some of the I/O will behave according to the selected use.

<b>Power input (+V and 0V)</b>	Supply voltage 5-30VDC	Typical 3mA/24V
<b>Power Output +L and 0V plus X0</b>	Output = (+V – 1)V for back light. Max 400 mA	Use X0 instead of 0V for dimmable voltage (PWM gnd).
<b>RS-485 (A+ and B- refers to 0V)</b>	Half duplex RS-422/RS-485 for bus communication. Extensively protected.	Note that the Controller may be set up as Server or Client, so pay attention when using RS-485 i/o!
<b>RS-232 (Tx, Rx and PR refers to 0V).</b>	Has 100 ohm series resistor and transzorbors on all lines.	Connect PR (Program) only during setting of parameters. Potential noise pick up.
<b>TTY Current loop (I+ and I-)</b>	Optocoupler input accepts 3-30V max 30mA. Galvanically isolated.	Used as serial data receiver, or could be used as pulse input for Counter
<b>Optocoupler input (C+ and C-)</b>	Optocoupler input accepts 3-30V max 30mA. Galvanically isolated.	Used for switch input and Counter reset/pulse input.
<b>EARTH ( Ground )</b>	Connected to mounting holes/ cable shield -- THIS IS <b>NOT 0V</b> --	Cable shields should be terminated as close as possible to the cable entry/glands.
<b>USB</b>	Micro USB	Used for factory control and programming
<b>6 pin</b>	Flat cable for ND displays	Careful when disconnecting!
<b>8 pin (Option SPI) 8 pin (Option2: USART, I<sup>2</sup>C)</b>	Flat cable for utility cards	Note: these are not the same! Careful when disconnecting!
<b>12 pin (Extra)</b>	Flat cable for extension boards	Careful when disconnecting!

The Status light will blink:

Blue: Communication input.

Green: Status ok (each 5 seconds) and output communication.

Red: Error condition.



Conductors:  
Min: 0,2mm<sup>2</sup>  
Max: 1,2mm<sup>2</sup>  
including ferrule

Light sensor facing forward is used to dim the LED signs or the backlight of LCD signs. You may alter the behaviour of dimming through the DISPLAY menu.

# MAIN FUNCTIONS

The ND5134 controller card could be set up for a variety of tasks. These will largely define behaviour and use of the controller. Its flexibility makes the ND5134 a good service part as it will replace almost all earlier controllers.

The controller may be used as a simple 'analyser' as you may need to inspect data in various ways e.g while installing or checking output from your equipment.

The User Interface will display useful information during setup and normal operations. Use the  arrow to display different pieces of info (where applicable), and **BACK** to freeze dynamic content.

## Serial Controller

This is the basic mode for remote displays and scoreboards. COM0 is used for communication with a PC or an instrument, and will display the data/value received.

Optional input and output/resending is available over RF/BT/WiFi and the serial line. Protocols or message formats are set by automatic detection or selecting through an on-board list of manufacturers or by downloading/keying parameters manually.

Some serial protocols (e.g. Modbus/RTU) have their own Function Mode.

*User interface for control and setup:*

Serial data from COM0 is displayed. Control characters are shown as <2> (= STX). Use  Display the processed value  Current COM0 settings , Current protocol  RF module and activity.

Press **BACK** to freeze incoming data and traverse with , . You will see the actual incoming data if baud rate and parity is correct.

*Protocols:*

A much used message format is the Norsk Display standard as used for re-transmitting:

**[<STX><SOH>AA] <STX> [<ESC>XY] data <CR>** where <xxx> means ASCII xxx decimal.

**<STX>** = 02d = 02hex (Start of TeXt)

**<SOH>** = 01d = 01hex (Start Of Header)

**<ESC>** = 27d = 1Bhex (ESCAPE)

**<CR>** = 13d = 0Dhex (Carriage Return)

**AA** is the address, 2 bytes of ASCII characters '0' through '9', 'A' through 'F'

Parts in square brackets ([ ]) are optional; brackets are not sent.

Using the addressed mode will update only the displays with the correct address – and those used without specific address. Address «00» (broadcast) will update all connected displays.

Minimum message is: **<STX>data<CR>** (02d 100d 97d 116d 97d 13d will send «data» to the display)

The ESC sequence is optional commands for e.g setting traffic light R/G on/off:

<ESC>R turns on the Red light

<ESC>G turns on the Green light

## **Automatic Detection**

**This is the default mode and requires data to be received continuously (eg 1 message/second or faster).**

Baudrates could be selected as **Auto** and thus will set baudrate, databits and parity correctly after some 10s of data bytes have been received.

After communication settings is stable, the incoming data may be analyzed:  
The Auto Protocol Find parameter PX = 1 means it will try to find the correct protocol.  
In case of success, it will allow you to confirm & save (exit auto mode) the found settings.  
Otherwise, it will restart each 45 seconds if Comms or message format is faulty.

These are the protocols currently detected: (( fw ver. 054.016- ))  
Cardinal SB500, Dini Argeo/ AND std, Kimax, Mettler-Toledo Continuous, Pfister/Bilanciali short/long, ...

## **Pulse Counter**

On-board opto coupler inputs I+/I- and C+/C- are defined as counting or set/reset inputs.  
Up- or down-counting may be set. Input filter will allow 1 to 200ms de-bouncing.  
Outputs total value on display and on COM0 and RF (optional).

**Requires:** -

**Options:** more channels

## **Analog Converter**

Standard 0-20/4-20mA input may be field calibrated and scaled.  
Outputs value on display, COM0 and RF (optional).  
Voltage input may be ordered (specify option!).  
More input channels available as an option.  
Accuracy will depend on the whole system setup, including your sensor and analog setup.  
Expect a total error between 0.1% - 1% of full scale, and make sure you understand that various readouts in the loop may differ in the last digit(s). If you utilise a full 6 digit readout, the 2 least significant digits should not be trusted.

**Requires:** ND5148 AD Converter Isolated

**Options:** Voltage inputs, higher accuracy

## **Time/Temperature/Wind Speed**

Used for advertising local time and temperature. Time zone and daylight saving could be set and automated.

Optional wind speed interface (variable diameter and pulses/rev).

**Requires:** External GPS/temp sensors

**Options:** Wind speed sensor, reed relay output

## **Modbus RTU**

RS232 or RS485 (half duplex) based, allows two registers to be combined with simple combinations like add, subtract. Multiply, divide or alternate based on time or pin input.  
Handles hex and 32 bit IEEE floating point. See special application note for a more detailed description. Various application specific behaviours available.

**Requires:**

**Options:** Modbus ASCII is not implemented yet – send request!

## **RF Client**

Automatic detection and reception of broadcasts from a Server.

Hooks up to a RF Server to receive data over the air & displays and retransmits on COM0 for redistribution. A good solution when cables are scarce or expensive.

Standard is EU 868MHz. Others are Bluetooth, WiFi, US 905MHz

**Requires:** Radio Card: LoRa, BLE or WiFi

**Options:**

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## **EXTRA FUNCTIONALITY**

- Installation helper: let you see raw data to verify correct communication parameters, plus may give valuable help to determine the message format.
- Alarms could be set based on the display value. Actions could be turning on/off red or green lights, or sending a message on the serial line. For other actions, contact factory.
- Converting the input data to another data format.

Contact factory for special actions – it may already be available, or we may do what you need for free.

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## **DISPLAY AND ADD-ON**

This controller is mainly made to control our LCD- and LED-display boards. It may however serve other purposes as well.

With the optional add-on cards for communication (WiFi, ethernet, LoRa, BT/BLE,..) it may serve as a reasonable way to convert and/or process simple data.

Do not hesitate to contact the factory for information on custom designed and produced electronics like displays and sensors in low and medium production quantities.

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## **FIRMWARE UPDATE**

Updates of the firmware (controller software) is available for registered and approved customers. As new and enhanced functions and improved protocol support are added, updates may be a valuable tool for old and new installations.

Note however that the pre-installed firmware delivered with ND5134 when you do the original purchase is the only warranted setup. Updates are done at your own risk.

A special guide is available for the purpose of reprogramming using Windows(tm). The only hardware needed is a USB to USB-micro cable. Unix/Linux users will probably also be well off using the guide.

# MENU SYSTEM

## NOTE

You may connect a PC running our ND CONFIG Windows software to set pre-tested parameters, or you may use the self-contained menu system to set parameters to match your application.

To be able to set up the system according to your needs, a simple on-board user interface is included. Most set-ups are done with very few alterations of parameters:

When operating the user interface, a timeout function ensures the system will resume normal operation after a few minutes of inactivity.

To enter the menu, press and hold **OK** and then **BACK** simultaneously. When the display responds by asking **Enter Menu?** you need to release and press **OK** to accept. Any other response will exit and reset the system.

There are 4 keys labelled **BACK**, **↵**, **↶** and **OK**. Their function is basically covered by their names:

Traversing between menu items on the same level is done using **↵** **↶** keys, while going back to previous levels is done using **BACK**. Next level is accessed by pressing **OK**.

When inputting text or numbers, **BACK** operates as a 'Go to previous character' and **OK** works more like a 'Go to next character'. **↵**, **↶** will change the current (blinking) character position. When **BACK** is used on the first character or **OK** is used on the last, input is accepted. Note that there are no abort mechanism.

First line displays menu item IN CAPITAL LETTERS, normally indicating its use. 2<sup>nd</sup> line often displays e.g the selected value or other useful information in lower case letters.

For some common set-ups, there are special downloadable guides in PDF format. You may want to look them up at [www.norskdisplay.com/products/ND5134/](http://www.norskdisplay.com/products/ND5134/)

## NOTE

New functions are regularly added and some inconsistencies with documentation will be unavoidable. Luckily you are probably brighter than us – so you will figure it out! Call us if you need support NOW!





# MAIN MENU SELECTION

Each menu is elaborated in its own following chapter. 2<sup>nd</sup> line is the chosen setting.

Message	Press key	Explanation
COMMUNICATIONS serial, rf, gprs..	OK→	Set comm parameters for main serial line (RS-232, RS485 and TTY-20mA), message format, protocol, echo, response, repeat behaviour. Also set radio, wifi, BT, GPRS parameters.
BOARD SETTINGS behaviour, displ	OK→	Select main card behaviour; serial, analog, counter, modbus, RF Client etc Select the display type and timeout, power save, mirroring. Reset to factory default values. <b>NOTE:</b> changing the type will change some other parameters (e.g. backlight) automatically.
ALARM SETTINGS action, triggers	OK→	Works with integer or float values shown on the large display. Select action for high alarm and/or low alarm. Will trigger red/green lights when value is higher than HI or lower than LO.
ANALOG INPUT 4-20mA	OK→	<u>Only displayed in ADC MODE:</u> Scale, adjust and calibrate the analog converter. Requires add-on card.
COUNTER SETUP C0=in, C1=res	OK→	<u>Only displayed in COUNTER MODE:</u> Set counting per pulse and reset value, filter, decimals, ... Allows control of optional extra inputs.
TIME/TEMP gmt+1	OK→	<u>Only displayed in TIME/TEMP MODE:</u> Adjust time zone and display time for GPS, Celcius or Fahrenheit, Wind speed etc. Requires add-on card.
MODBUS ascii adr=01	OK→	<u>Only displayed in MODBUS MODE:</u> set parameters and use of the serial RTU/ASCII Modbus.
<b>BACK</b>		
Exit menu?	OK→	Restarts the controller after some seconds.

# MENU -- DISPLAY SETTING

DISPLAY SETUP	OK→	DISPLAY TYPE	OK→	25mm v1 std
		↓		↓
				45mm v0
				↓
				45mm v1
				↓
				67mm v0
				↓
				100mm v0
				↓
				100mm v1 *
				↓
				125mm v0
				↓
				140mm v0
				↓
				150mm ASCII
				↓
				150mm Bitwise
				↓
				200mm v0 proto
				↓
				200mm v1
				↓
				105mm 8x16 LED
				↓
				225mm 8x16 LED
				↓
				no display
				↓
		↓		
		DISPLAY LENGTH	OK→	>6< 5 digit display
		↓		
		DISPL MAX INTENS	OK→	>25< set maximum level intensity
		↓		
		DISPL MIN INTENS	OK→	>03< set minimum level intensity
		↓		
		POWER SAVE	OK→	>0< 0=none, 0 to 99 allowed 50=50%
		↓		
		POWER TIMEOUT	OK→	>0< 0=none (0 to 99 minutes) 10=10 minutes
		↓		
		DISPLAY MIRROR	OK→	>0< 0=normal 1=display mirrored
		↓		
		DISPLAY AT PWRUP	OK→	>1< 0=silent power up 1=info at power up

# MENU – COM0 PROTOCOL SETTING

PROTOCOL SETUP	OK→	COM0: AUTO FIND	OK→	>0<	1=Auto ON
		↓			
		COM0: START CHAR	OK→	>002<	STX=02d ASCII decimal
		↓			
		COM0: END CHAR	OK→	>013<	CR=13d ASCII decimal
		↓			
		COM0: PROT PROCES	OK→	>000<	00=no special handling 01=Mettler-Toledo Continuous 02=Philips/Global 1613 03=Rice Lake 04=Demo text 05=Pfister/Bilanciai Simple 07=Schenck 8861 .....and much more
		↓			
		COM0: TIMEOUT SEC	OK→	>008<	Seconds before blank (0=OFF)
		↓			
		COM0: TEXT IGNORE	OK→	>000<	Ignore # of characters
		↓			
		COM0: TEXT LENGTH	OK→	>000<	Use # of characters after ignore
		↓			
		COM0: SUPR ZEROS	OK→	>1<	1=remove leading zeros
		↓			
		COM0: FIXED DECIP	OK→	>000<	insert decimal point
		↓			
		COM0: R/L ADJUST	OK→	>082<	R=082= right adjusted text L=076= left adjusted text
		↓			
		COM0: FIXED TEXT	OK→	'kg'	Add fixed text after message
		↓			
		COM0: SIGN POSITI	OK→	>000<	Sign/status byte to hold sign
		↓			
		COM0: SIGN BitNo	OK→	>000<	Bit number to signal negative
		↓			
		COM0: CTRL BYTE P	OK→	>000<	Test byte position from START
		↓			
		COM0: CTRL BYTE M	OK→	>000<	Test byte mask
		↓			
		COM0: CTRL BYTE V	OK→	>000<	Test byte value
		↓			
		COM0: REQUEST STR	OK→	'Rx9'	String to request new data
		↓			
		COM0: SLOW UPDATE	OK→	>000<	Slow down update of display

The selection **CONNECT TO A MANUFACTURER** will allow you to select the manufacturers name and model/protocol for a quick setup of the most used parameters. It allows subsequent changes to the parameters, to further enhance or mess things up.

Our staff will be happy to help you to find correct setup for any equipment – based on available documentation.

For manufactures: we can implement special protocol handling and simplified/automated set up for your users.

## OPTIONS TO ADD

ND51XX : RF-868MHz spread spectrum will transfer data reliable 100-1000m almost anywhere, although reach will depend on local building structures and noise. 2 way communication allows simple verification of signal strength and status.

Opto inputs allows 4 additional inputs to counter or special applications. Used where you need more than the 2 built-in optocouplers.  
Filter can be collectively set for debouncing.

ND5148 Analog interface with 1500V isolation allows various sensors and equipment to be read. Signal is scaled in-field to a readable value and may be transmitted on COM0 and/or RF. Current and voltage input available. +/-20mA, 4-20mA, 1-10V etc

GPS/GLONASS and digital temperature interface allows various data to be collected and displayed. A few standard uses are prepared, while others will be made on request.

WiFi, BLUETOOTH and BLE 5 is coming...

Ethernet and PoE ND5129 has been available since 2009. PoE has a limited 12W output and works best for our backlit LCD based signs up to 150mm.

## VERSION HISTORY

### Hardware

ND5134 v3 : Display output is now 5V for all historic displays

ND5134 v2 : first release. Display output is 3V3, ND7028, ND7037 and ND7046 need a 5V converter

### Firmware (only selected major versions):

P054.016- : Protocol Find may be set to Auto=1. Use  to see the guessed Protocol settings. You could also permanently save the findings

P054.014- : Baudrate may be set to Auto. Use  to see the guessed COM0 settings.

P054.010c : Selection of protocol by lists of manufacturers

P054.xxx : Serial controller, pulse counter, Modbus RTU,

**Contact factory for updates and requests!**