

Technical Specification

Fieldbus communication protocol definition for LED-Controller CTR-52

09. December 2022

Version	Author	Date	Changes	Status
1.01	B. Kuhrmann	May 11 th 2022	Initial Release	Valid
1.02	B. Kuhrmann	Aug. 23 rd 2022	Added the 'Discharge Mode' for a controlled discharge of the capacitors before the light source is changed.	Valid
1.03	A. Bayer		Expert mode voltage control and configuration Bugfix GapTime Max flash time set to 59s Channel 0,1,2,3 -> Channel 1,2,3,4 Flash pattern	in Process
1.04	A. Beck	Dec. 1 st 2022	New Format	Valid

1. Hardware

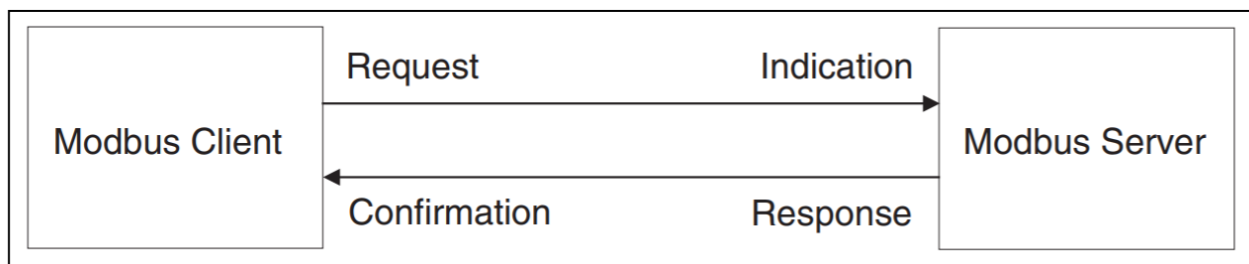
The standard fieldbus provided with the LED controller CTR-52 product line, is based on Modbus TCP. Modbus is a data communications protocol for use with its programmable logic controllers (PLCs).

2. Modbus Setup Information

The LED controller CTR-52 is a Modbus device that allows you to access the light settings via Ethernet and communicates using a master-slave technique in which only one device (the master) can initiate transactions (called queries). The other devices (slaves) respond by supplying the requested data to the master, or by taking the action requested in the query.

The CTR-52 controller is implemented as a Modbus slave (server). The server receives messages from the master (client), processes them and responds to them. The product does not send messages by itself.

Modbus Type: Slave (Server)
 Modbus Format: Modbus TCP
 Output Data Mode: Auto



Field name	Description
Register	The Modbus register address
Point	The number of the I/O point
Description	The function description for the Modbus register
Data Format	Indicates the type of data in the Modbus register
Attribute	Indicates the attribute of Modbus register R: Read W: Write E: Save to the EEPROM

3. Modus Register Table

Coils: Function codes 01 (read) 05/15 (write)

Address (decimal)	Points	Description	Data format	R/W/E	Factory Default
00	1	Restore all settings to default (does not modify EEPROM). Is set back to 0 by the controller	1: reset	W	-
01	1	Switching on and off the voltage control for STEADY mode	0: regulation off 1: regulation on	R/W/E	1
02	1	Switching on and off the voltage control for FLASH mode	0: regulation off 1: regulation on	R/W/E	0
03	1	Switching on and off the voltage control for AUTO mode	0: regulation off 1: regulation on	R/W/E	1
04	1	Flash Pattern 1 (Sample 5: Channel 1+3 active)	1: Channel 1 2: Channel 2 4: Channel 3 8: Channel 4	R/W/E	same as channel
05	1	Flash Pattern 2 (Sample 10: Channel 2+4 active)	1: Channel 1 2: Channel 2 4: Channel 3 8: Channel 4	R/W/E	same as channel
...					
11	1	Flash Pattern 8 (Sample 12: Channel 3+4 active)	1: Channel 1 2: Channel 2 4: Channel 3 8: Channel 4	R/W/E	same as channel
12	1	Reset all Error Codes	1	W	1
13 - 19	8	Reserved	-	-	-
Channel specific					
20	1	Channel 1: Software trigger, overrules hardware input only if hardware signal is low	0: low 1: high	W	-
21	1	Channel 1: Tune voltage to target current. Is set back to 0 by the controller.	1: start tuning	W	-
22	1	Channel 1: Set trigger line to inverted	0: not inverted 1: inverted	R/W/E	0
23	1	Channel 1: Enable voltage regulation The regulation is only switched on if the corresponding mode-specific regulation (coil 1, 2 or 3) is also switched on.	0: regulation off 1: regulation on	R/W/E	1
24 - 29	7	Reserved	-	-	-
30 - 39	10	Channel 2 specific			
40 - 49	10	Channel 3 specific			
50 - 59	10	Channel 4 specific			

Discrete inputs: Function code 02 (read single bits)

Address (decimal)	Points	Description	Data format	R/W/E	Factory Default
00	1	Alive bit. Toggles every 500ms	-	R	-
01 - 19	19	Reserved	-	-	-
Channel specific					
20	1	Light source detected	0: no light source attached 1: light source attached	R	-
21 - 29	9	Channel 1 specific (Reserved)	-	-	-
30 - 39	10	Channel 2 specific	-	-	-
40 - 49	10	Channel 3 specific	-	-	-
50 - 59	10	Channel 4 specific	-	-	-

Holding Register: Function codes 03 (read) 06/16 (write)

Address (decimal)	Points	Description	Data format	R/W/E	Factory Default
00 - 01	2	IP Address 192.168.0.99 Valid after reboot	00: high byte: 99 00: low byte: 0 01: high byte: 168 01: low byte: 192	R/W/E	See left
02 - 03	2	Subnet Mask 255.255.255.0 Valid after reboot	02: high byte: 0 02: low byte: 255 03: high byte: 255 03: low byte: 255	R/W/E	See left
04	1	Store current settings by setting the magic number: 12345 (0x3039)	0: do nothing 12345: store all settings to EEPROM		
05 - 06	2	Minimal time gap to next trigger after flash is off [µs]	10 µs (default)	R/W/E	See left
07	1	Expert Mode	0: default 1: expert (no reset possible)	R/W/E	See left
08	1	Flash Pattern Mode (only valid on)	0: off, default . 8: max No. of flash patter	R/W/E	See left
09	1	Reserved	-	-	-
10	1	Internal command: set production week. Can be set after setting access key in holding register 11	High byte: year Low byte: week	R/W/E	-
11	1	Access key (0x6E09) to set private data (holding registers 10 and 12)	28169: allow setting else: values cannot be changed	W	0
12 - 14	3	Internal command: MAC Address e.g. 70-B3-D5-E0-30-12 Can be set after setting access key in holding register 11 Valid after reboot	12: low byte: 70 12: high byte: B3 13: low byte: D5 13: high byte: E0 14: low byte: 30 14: high byte: 12	R/W/E	-
15 - 19	5	Reserved	-	-	-

Channel specific					
20	1	Channel 1: Operation Mode	0: OFF 1: STEADY ON 2: FLASH MODE (on rising edge) 3: AUTO (Light on while trigger line set) 4: DISCHARGE (capacitors empty, LED can be changed)	R/W/E	2
21	1	Channel 1: Trigger input lines in AUTO and FLASH mode: Start the flash, when either of the input lines is set high. E.g.: respond to Trigger line 0 or 3 are set: 1+8 = 9 If set, Address 22 is set to 0	1: Trigger line 0 2: Trigger line 1 4: Trigger line 2 8: Trigger line 3	R/W/E	same as channel
22	1	Channel 1: Trigger input lines in AUTO and FLASH mode: Start the flash, when all of the input lines are set high E.g.: respond to Trigger when line 0 and 3 are set: 1+8 = 9 If set, register 21 is set to 0	1: Trigger line 0 2: Trigger line 1 4: Trigger line 2 8: Trigger line 3	R/W/E	same as channel
23	1	Channel 1: Target current [mA] Min: 50 mA Max: see input register 10 If LED is connected: Auto or Steady mode: tune and set current immediately In Flash mode: tune after current and set for next flash	mA	R/W/E	150
24 - 25	2	Channel 1: Target flash length [μs], Min: see input register #11 Max: see input register #12	μs	R/W/E	20
26 - 27	2	Channel 1: Target voltage [mV] Min: 1500 mV Max: 21.600 mV If LED is connected: Auto, Steady, Flash mode: tune and set voltage immediately 'Tune' not working	mV	R/W/E	1500
29	1	Reserved	-	-	-
30 - 39	10	Channel 2 specific			
40 - 49	10	Channel 3 specific			
50 - 59	10	Channel 4 specific			

Input Register: Function code 04 (read)

Address (decimal)	Points	Description	Data format	R/W/E	Factory Default
00	1	Number of available light channels	Number	R	4
01	1	HW version (e.g. 3.012, 0x030C)	High byte: Major release (e.g. 3) Low byte: Minor release (e.g. 12)	R	-
02	1	Firmware version (e.g. 1.007)	High byte: Major release (e.g. 1) Low byte 1: Minor release (e.g. 7) 0x0107	R	-
03	1	IO and protocol version (e.g. 1.000)	High byte: Major release (e.g. 1) Low byte: Minor release (e.g. 0) 0x0100	R	1.000
04	1	Production week (batch number) (e.g. 2020 KW35: 20-35 -> 0x1423)	High byte: Year Low byte: Week	R	-
05	1	Error Code	Bit1: Ch1 error Bit2: Ch2 error Bit3: Ch3 error Bit4: Ch4 error Bit8: DAC error	R	0
06 – 07	2	Debug output register	internal	R	-
08	1	Hardware trigger line input status	Bit 0: Trigger 0 Bit 1: Trigger 1 ...	R	0
09	1	Min Current [mA]	mA	R	50
10	1	Max Current [mA] per channel in continuous or auto mode	mA	R	X
11	1	Max Current in flash mode at minimal flash time	mA	R	21000
12	1	Min Flash time [µs]	µs	R	3 µs
13 – 14	2	Max Flash time [µs]	µs	R	1.000.000µs
15	1	Max Capacity per channel [mAs] in flash mode (current x time)	mAs	R	-
16	1	Number of boot sequences	Number	R	-
17 – 19	3	Reserved	-	R	-
Channel specific					
20	1	Channel 1: LED current [mA]. STEADY or AUTO: actual current FLASH MODE: last flash current	mA	R	-
21	1	Channel 1: Last flash time [µs]	µs	R	-
22	1	Channel 1: Voltage [mV] STEADY or AUTO: actual voltage FLASH MODE: last flash voltage	mV	R	-
23	1	Channel 1: Tuning status	0: tuning never started since boot 1: tuning in progress 2: last tuning successful 3: last tuning failed	R	0
24	1	Channel 1: Channel specific error code. If set, 05 is set, too.	0x80: current not reached 0xff: short circuit	R	0
25 – 29	5	Reserved	-	-	-

30 – 39	10	Channel 2 specific
40 – 49	10	Channel 3 specific
50 – 59	10	Channel 4 specific

Error Codes

Code (hex)	Decimal	Description	Remediation
0x0000	0	No Error	No applicable
0x0080	128	Current not reached	
0x00ff	255	Short circuit on channel output	

Blink Codes

- permanent off: No LED attached or channel is discharged
- permanent on: Everything ok, LED detected and tune process was successful
- blink: An error has occurred on this channel. The tuning operation was not successful. The blink code remains until the device is power cycled, even if the problem is corrected.