M-6088-32

User Manual



Version: 2.0.0

Date: Oct. 2021

Edited by David Chen

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for damages consequent to the use of this product. ICP DAS reserves the right to change this manual at any time without notice. The information furnished by ICP DAS is believed to be accurate and reliable. However, no responsibility is assumed by ICP DAS for its use, not for any infringements of patents or other rights of third parties resulting from its use.

Copyright

Copyright © 2021 by ICP DAS. All rights are reserved.

Contact Us

If you have any questions, please feel free to contact us via email at:
Service@icpdas.com

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Contents

1. Introduction....4
2. Hardware....6
    2.1 Specifications....6
    2.2 Appearance....8
    2.3 Pin Assignments....9
    2.4 Wire Connections....10
    2.5 Internal I/O Structure....11
    2.6 Switch (SW1)....12
    2.7 Dimensions (unit: mm)....13
3. Configuration via RS-485....14
Appendix A: DCON Command Sets....21
    A-1. M-6088-32 DCON Command Sets....21
Appendix B: ModbusMasterToolPC....27
Appendix C: Modbus Address Table....31
    C-1. M-6088-32 Modbus Address Mappings (Base 1)....31
Revision History....34

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1. Introduction

The M-6088-32 provides 32-channel PWM (Pulse Width Modulation) Output, and can be used to develop powerful and cost-effective analog control systems. PWM is a powerful technique for controlling analog circuits that uses the Digital Output to generate a waveform with a variable duty cycle and frequency which can then be used to control an analog circuit in applications such as controlling the position or speed of motors, the brightness of lamps, or the speed of fans, etc. Either burst mode or continuous mode can be used for the PWM output depending on the application. It supports both the Modbus RTU and the DCON protocols, and External PWR allows the load voltage to be increased from +5 to +40 V for the 32-channels PWM (Pulse Width Modulation) output.

When required, communication with the M-6088-32 can be programmed based on the Modbus RTU protocol, with the added benefit that different addresses can be configured via hardware to allow for Modbus RTU communication.

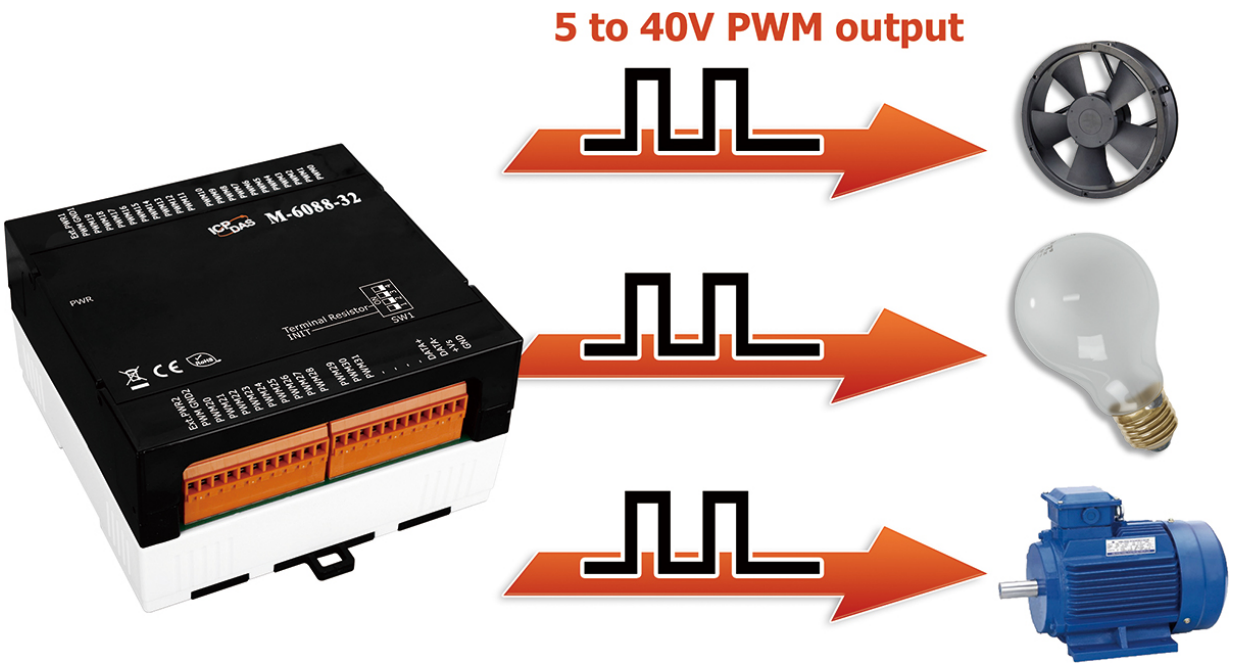
Features

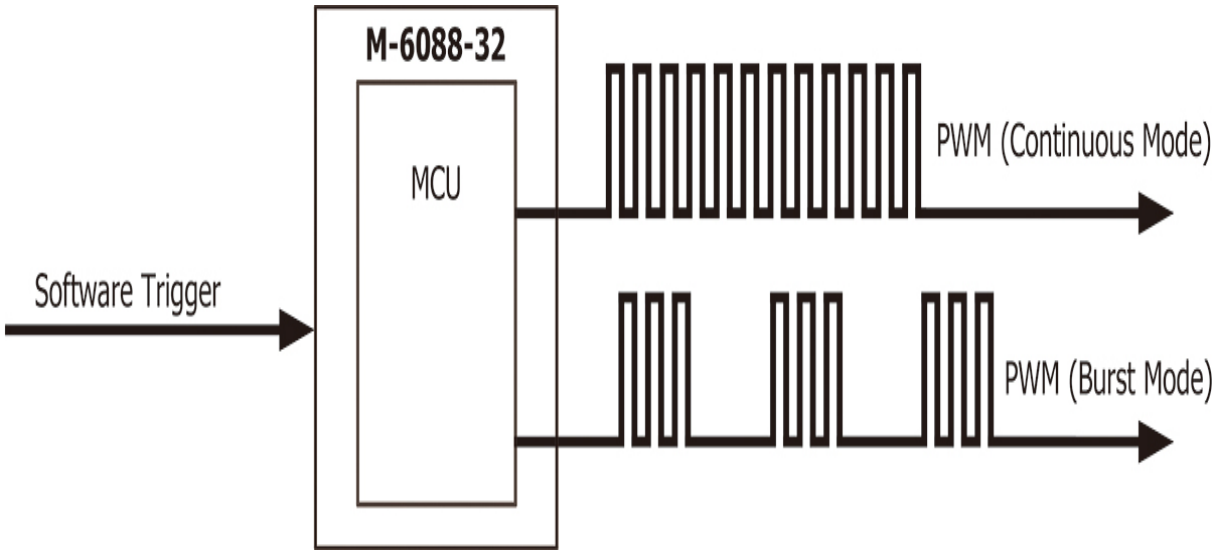
- **32-channel PWM Output**
- **Burst Mode and Continuous Mode for PWM Output**
- **Individual and Synchronous PWM Output**
- **4 kV ESD and EFT Protection**
- **Supports the DCON and the Modbus RTU Protocols**
- **Embedded Dual Watchdog**
- **Wide Operating Temperature Range: -25 to +75°C**
- **DIN-Rail Mounting or Wall Mounting**

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Application

- **Heating system in buildings**
- **Ventilation system**
- **Controlling Fan Speed**





Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2. Hardware

2.1 Specifications

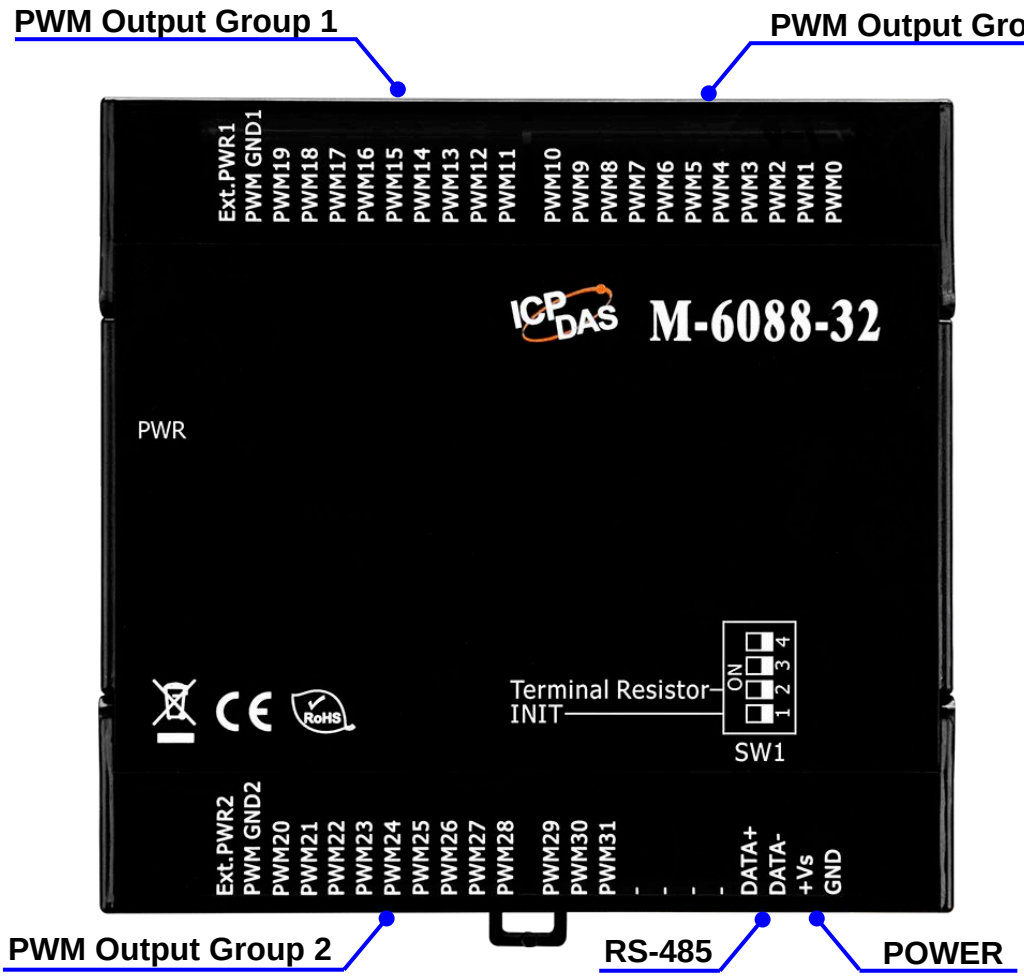
Model	M-6088-32
PWM Output	
Channels	32
Type	Open Collector
Sink/Source (NPN/PNP)	Sink
Load Voltage	+5 ~ +40VDC
Max.Load Current	+40VDC @ 200 mA/Channel
PWM Frequency	50 Hz
PWM Duty Cycle	0.1 to 99.9%
Mode	Burst, Continuous
Burst Count	1 to 65535
Min. PWM Period	1ms
Power-on Value	Yes
Safe Value	Yes
Communication	
Interface	RS-485 X 1
Data Format	N,8,1 / O,8,1 / E,8,1 / N,8,2
Baud Rate	1200 ~ 115200 bps
Protocol	Modbus RTU or DCON
Dual Watchdog	Yes, Module (1.6 seconds), Communication (Programmable)
LED Indicators	
System	1 as Power/Communication Indicator (Red LED)
Isolation	
Intra-module Isolation, Field-to-Logic	2500 VDC
EMS Protection	
ESD (IEC 61000-4-2)	±4 kV Contact for each Terminals ±8 kV Air for Random Point
EFT (IEC 61000-4-4)	±4 kV for Power
Surge (IEC 61000-4-5)	±2 kV for Power
Power Requirements	

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Reverse Polarity Protection	Yes
Input Voltage Range	+10 ~ +48 VDC
Consumption	1.0 W Max.
Mechanical	
Dimensions (L x W x H)	116 mm x 120 mm x 64 mm
Installation	Wall Mounting or DIN-Rail Mounting
Environment	
Operating Temperature	-25 ~ +75°C
Storage Temperature	-30 ~ +75°C
Humidity	10 ~ 90% RH, Non-condensing

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.2 Appearance



LED Indicators

- PWR: Power/Communication Indicator

PWM Outputs

32-Channels Open Collector

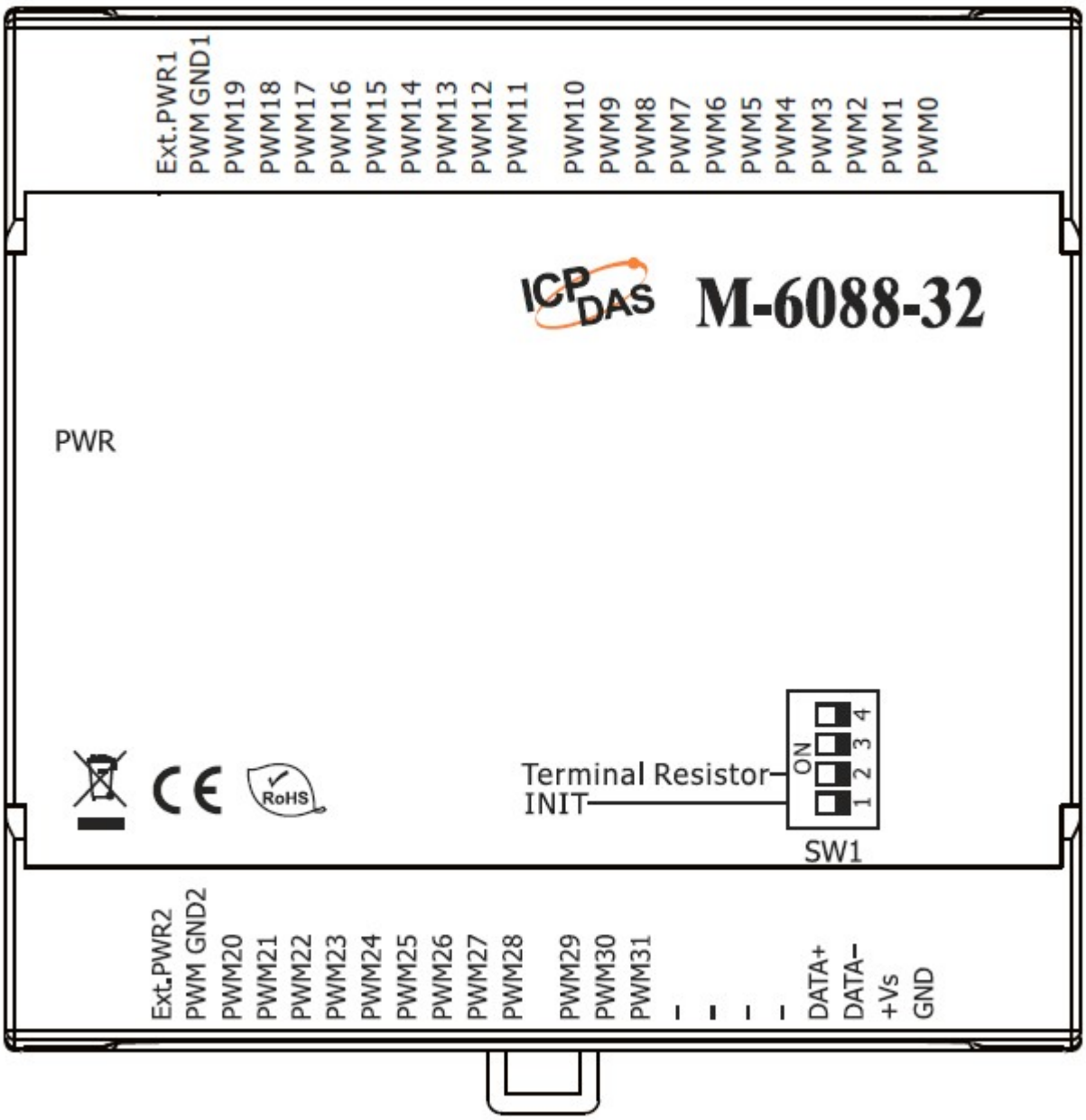
Switch (SW1)

INIT

Terminal Resister

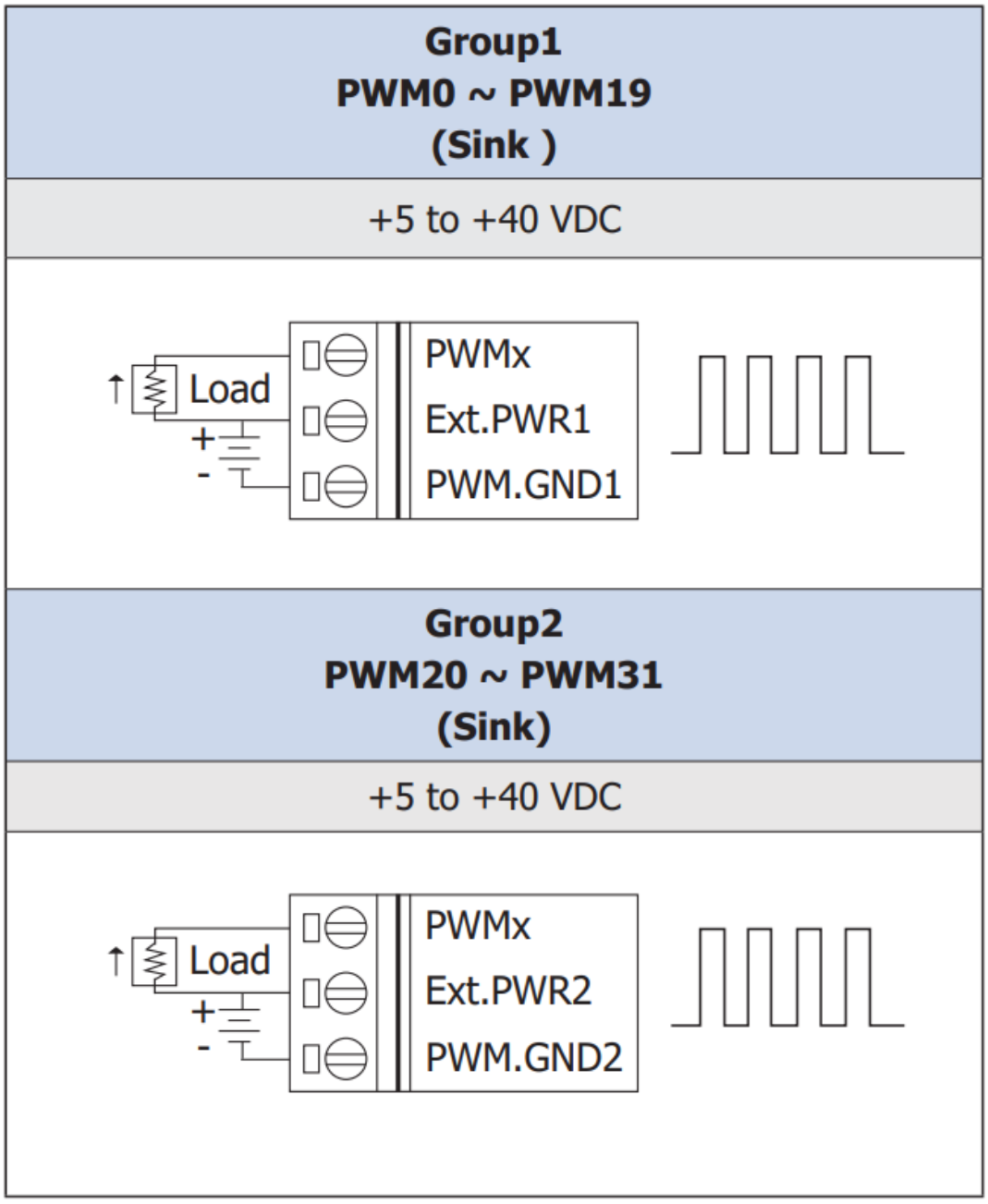
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.3 Pin Assignments



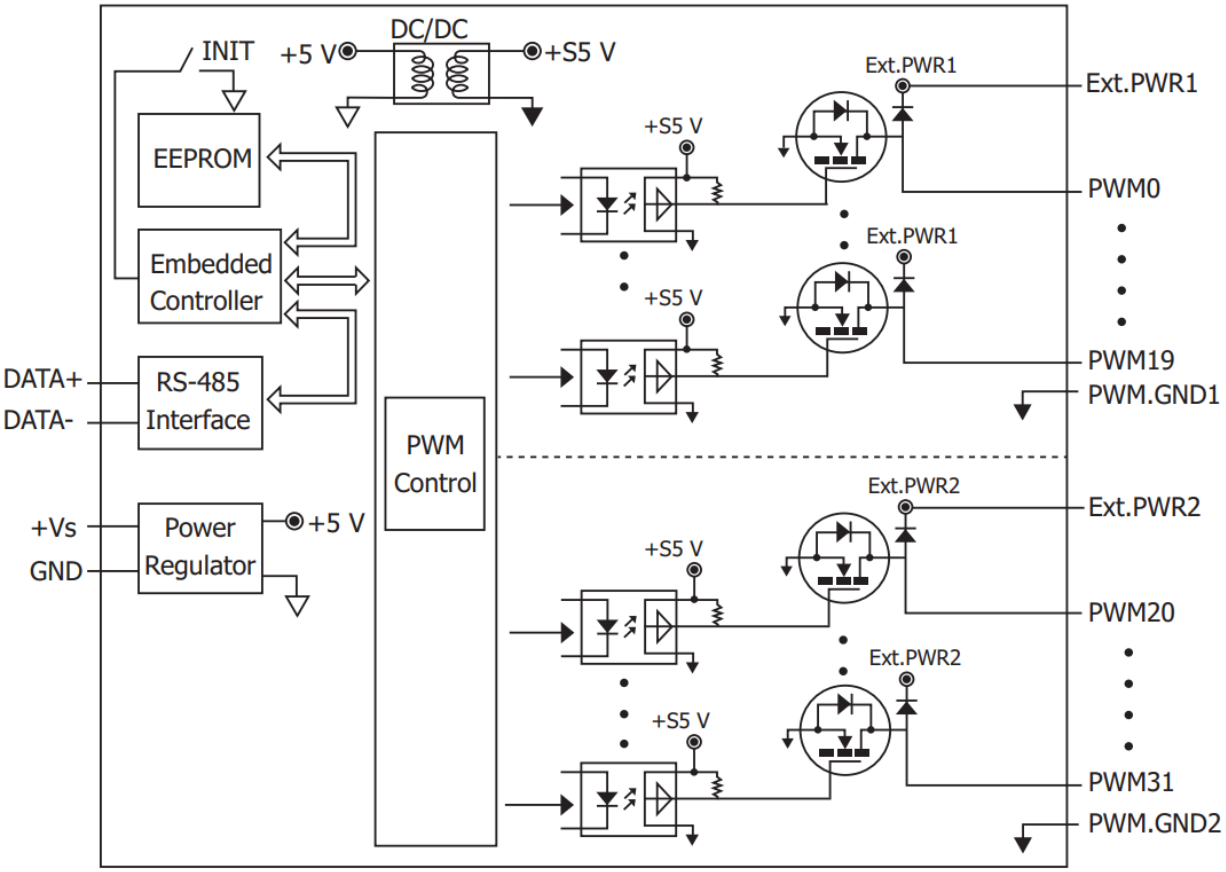
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.4 Wire Connections



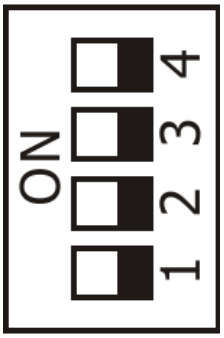
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

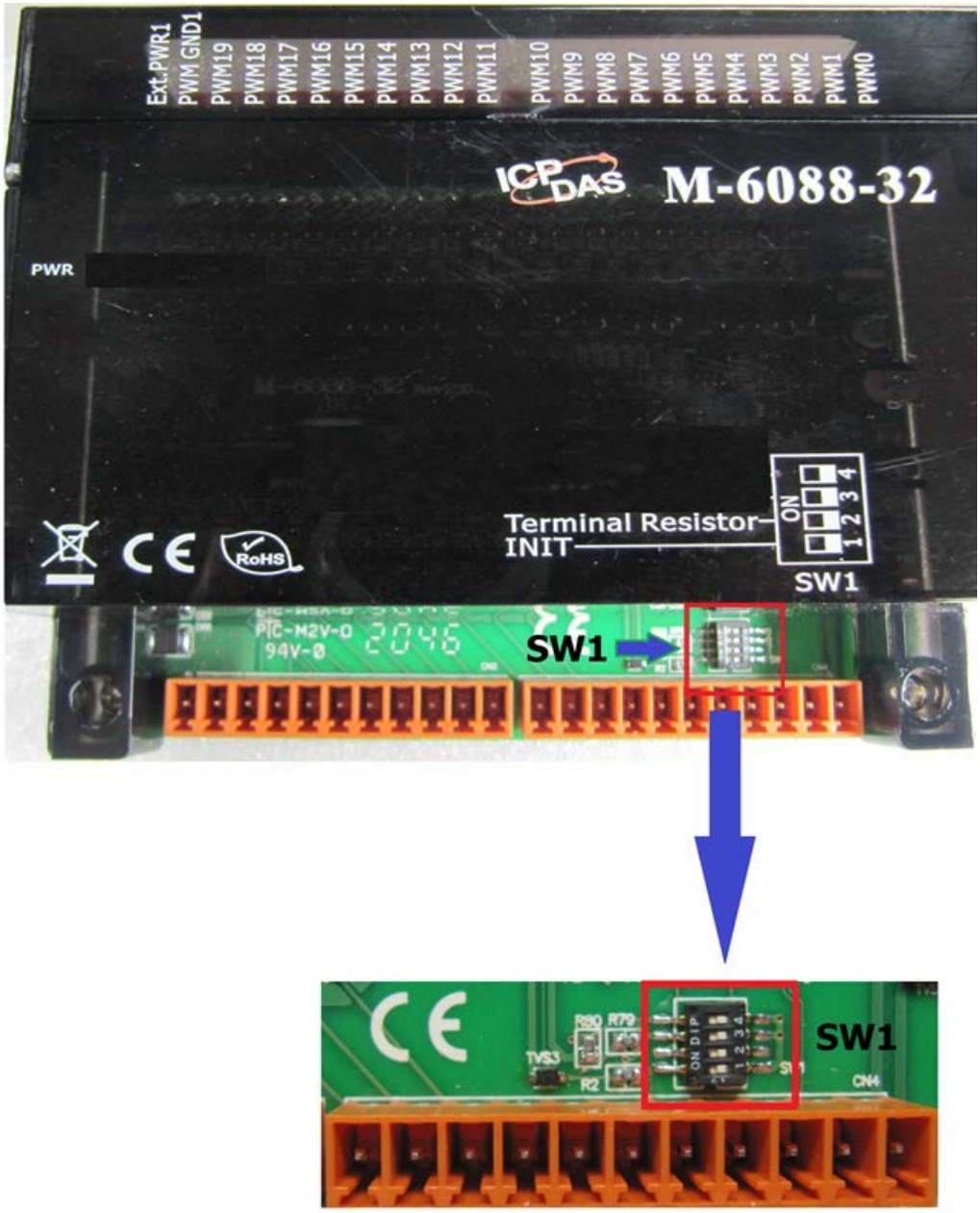
2.5 Internal I/O Structure



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

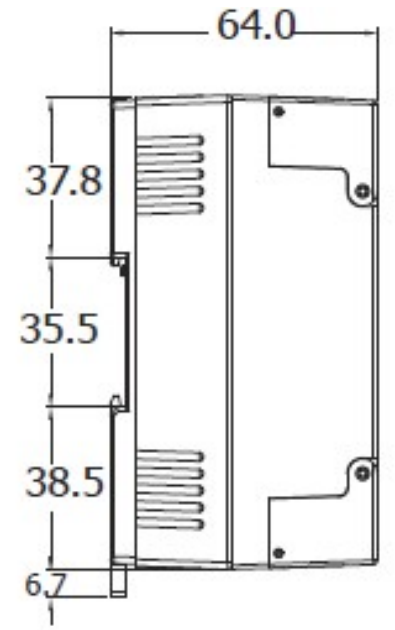
2.6 Switch (SW1)

SW1			
	4	ON	-
		OFF	-
	3	ON	-
		OFF	-
	2	ON	Enable Terminal Resister
		OFF	Disable Terminal Resister (Factory default)
	1	ON	INIT Mode
		OFF	Normal Mode

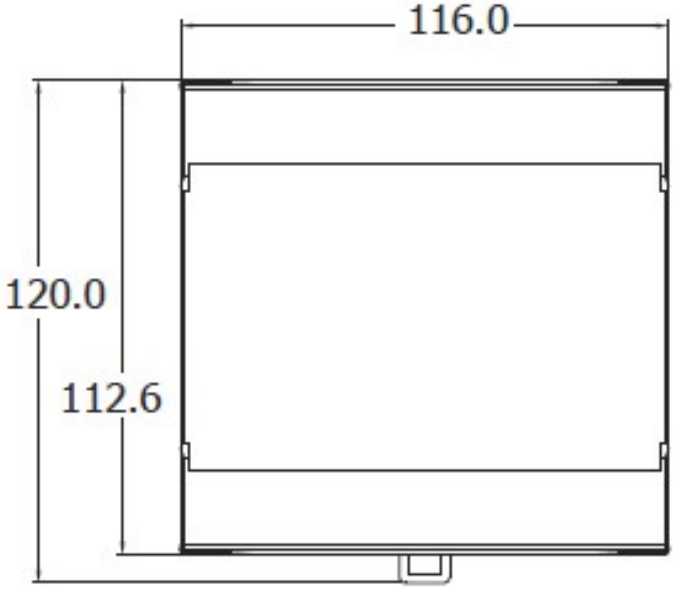


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

2.7 Dimensions (unit: mm)



Left View



Front View

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3. Configuration via RS-485

- The factory default settings for RS-485 communication
  - Address: 1
  - Protocol: Modbus/RTU
  - Baudrate: 9600
  - Parity: N,8,1
  - Response Delay (ms): 0

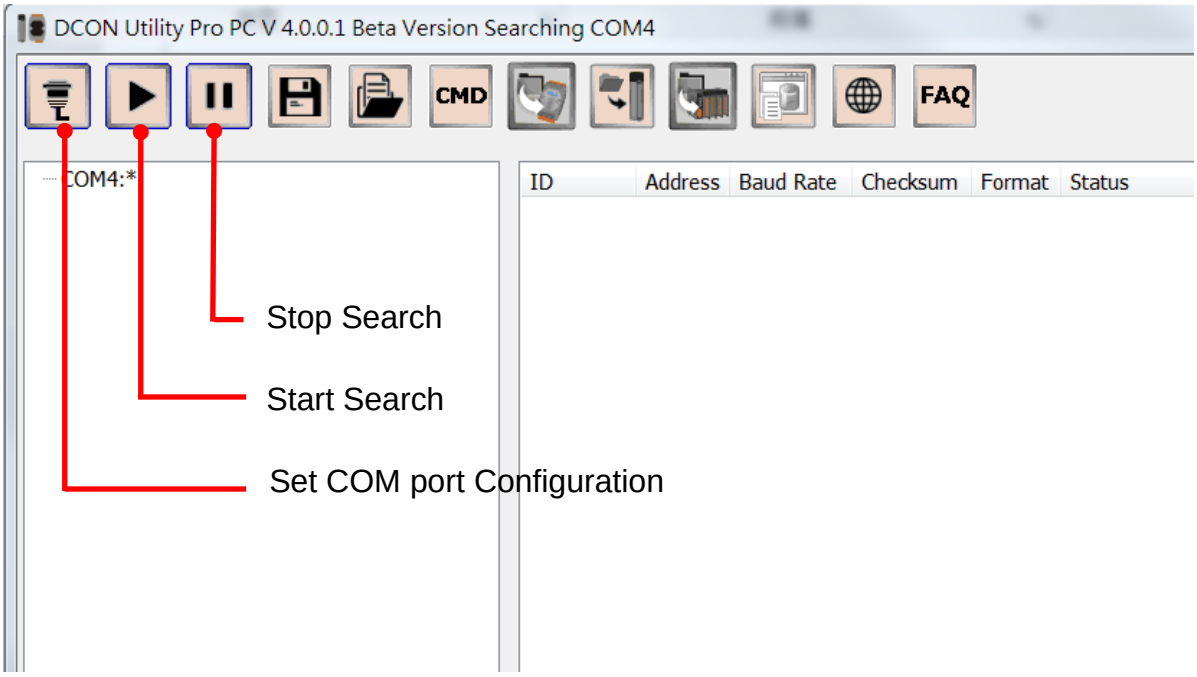
Note

If there are multiple M-6088-32 connected to the same RS-485 network, each module needs be set with a unique RS-485 address. More than one module having the same address will cause communication failure

- Testing RS-485 Communication

  1. Download the DCON Utility Pro from
     ICPDAS web site : https://www.icpdas.com/en/download/DCON_Utility_Pro

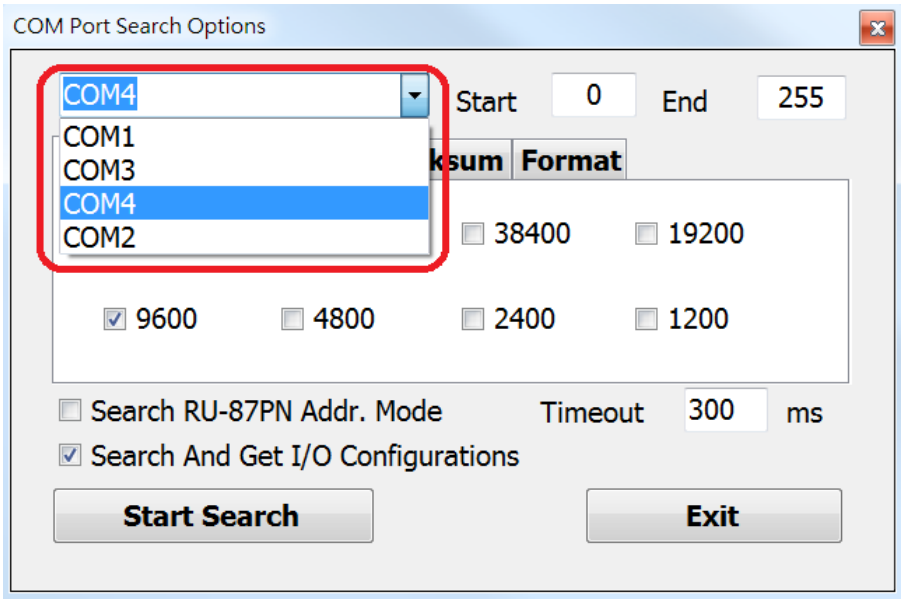
  2. Launch the DCON_Utility_Pro.exe.



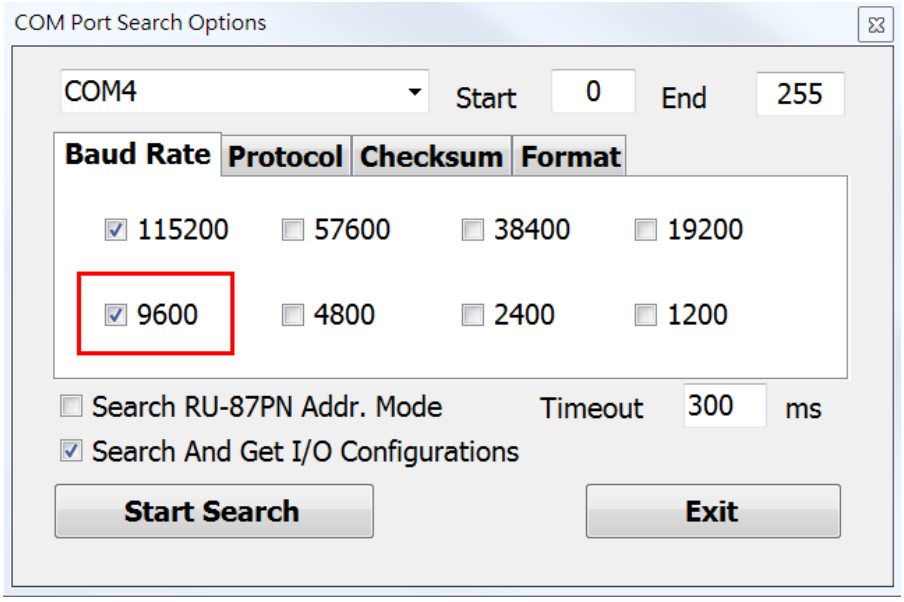
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

3. Click the icon  to configure the COM port.

4. Select the COM Port number used to connect the M-6088-32 logger.

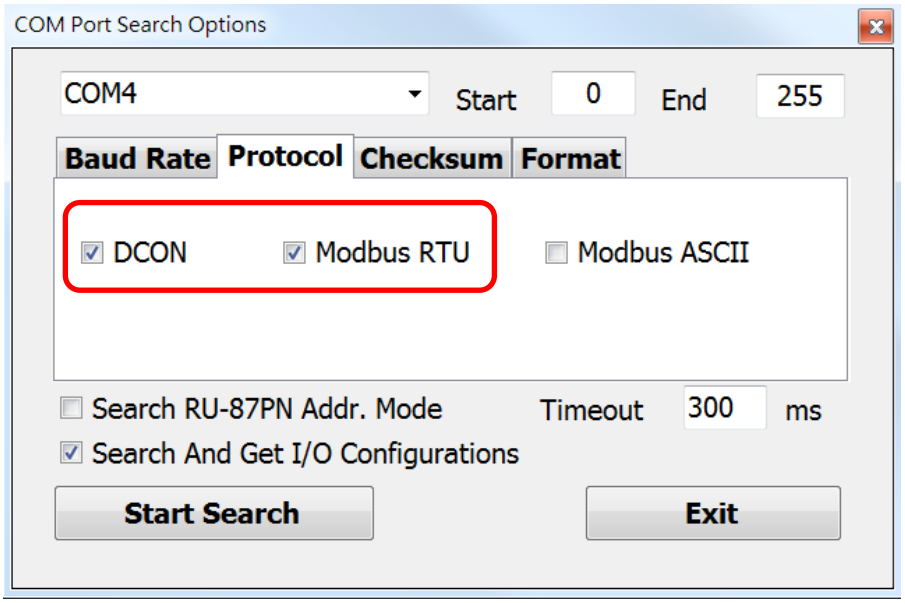


5. The Baud Rate is factory default to 9600 bps.

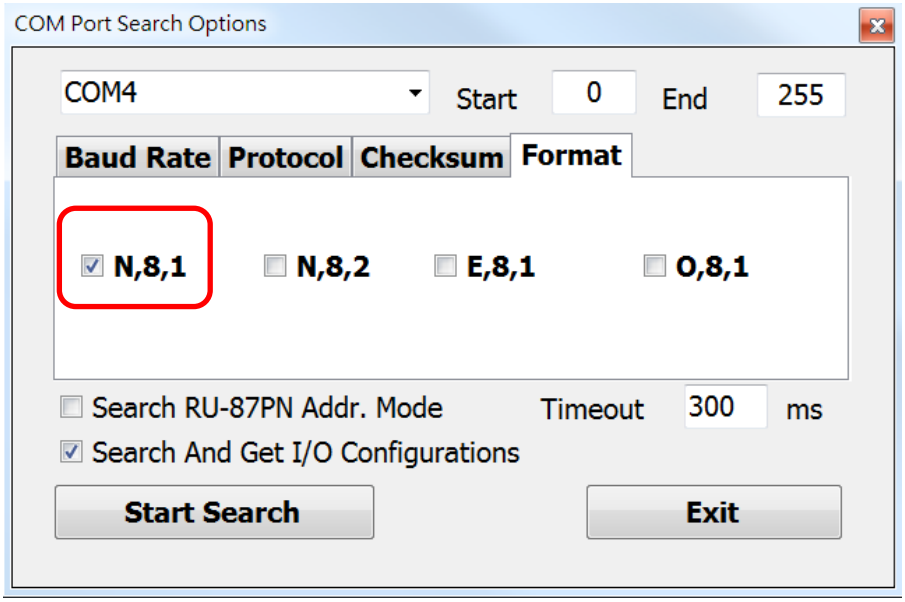


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

6. Select the Protocol tab.

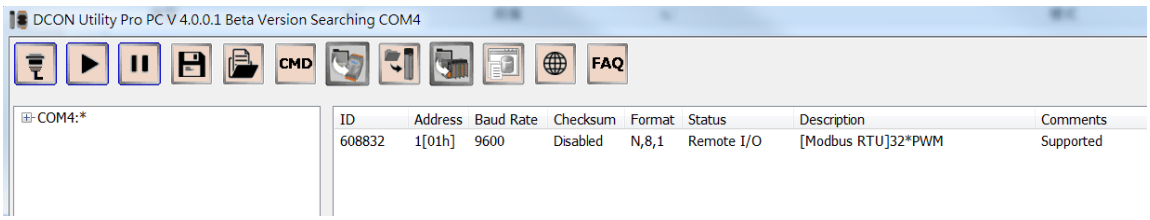


7. Select the Format tab and check the parity that set in the logger.



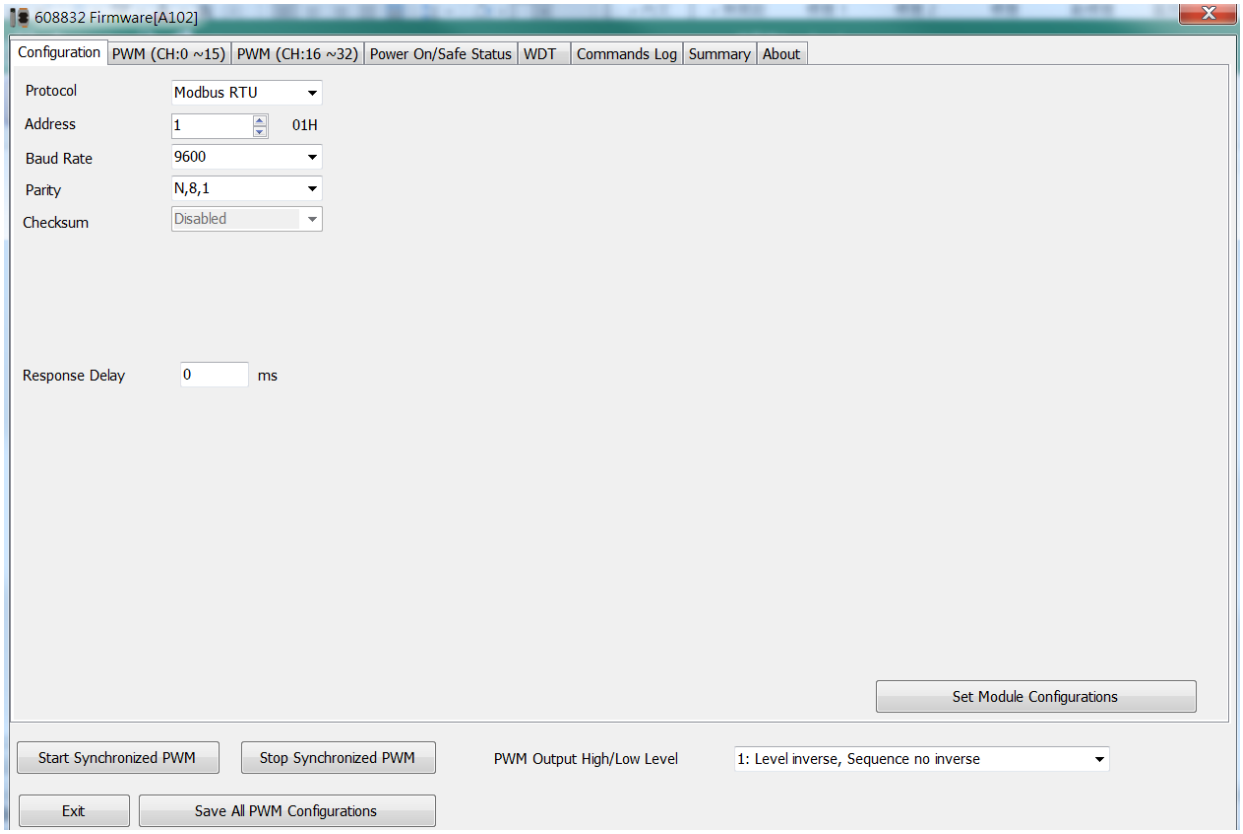
8. Click the Start Search icon. 

9. The M-6088-32 logger searched out will be listed as below.



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

10. Click the module name to configure the logger.

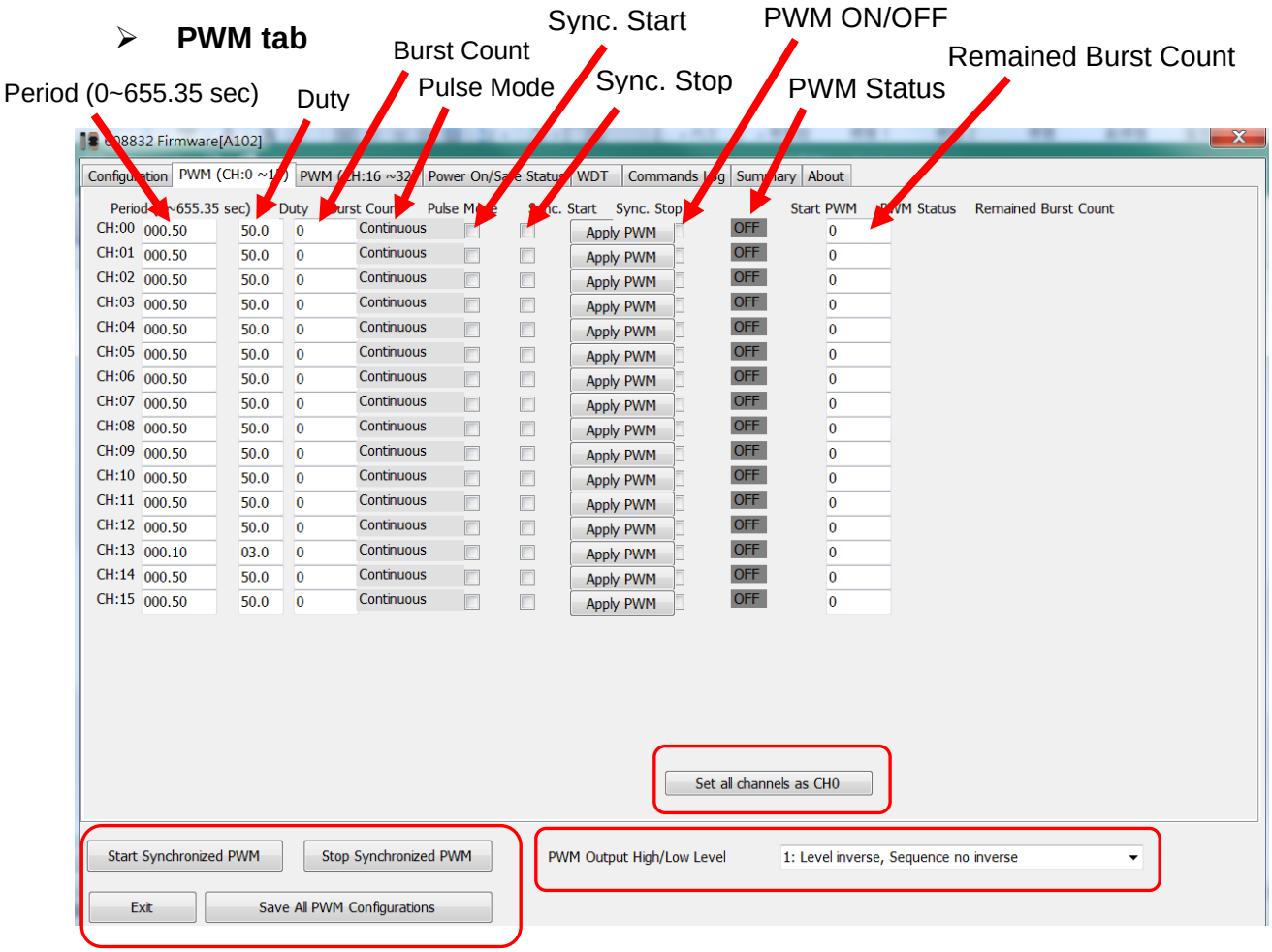


Note

The Protocol/Baud Rate/Parity/Checksum items marked with ”(INIT*)” means that when any of those items needs be modified, the pin 1.INIT needs to be set in ON position and power cycle the logger, then the item can be modified. After complete setting, set the pin 1.INIT back to OFF position and power cycle the logger again to take the setting effect.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

➢ **PWM tab**



➢ **Host Watchdog**

Host Watchdog is used to monitor the RS-485 communication status; if the host (PC) does not send command "~**" in the time period of WDT Timeout setting, the enabled Host Watchdog will announce the timeout error and turn the relay output to Safe value to avoid an unsafe act. Users can not control the relay until the command "~AA1" is sent to clear the WDT timeout status.

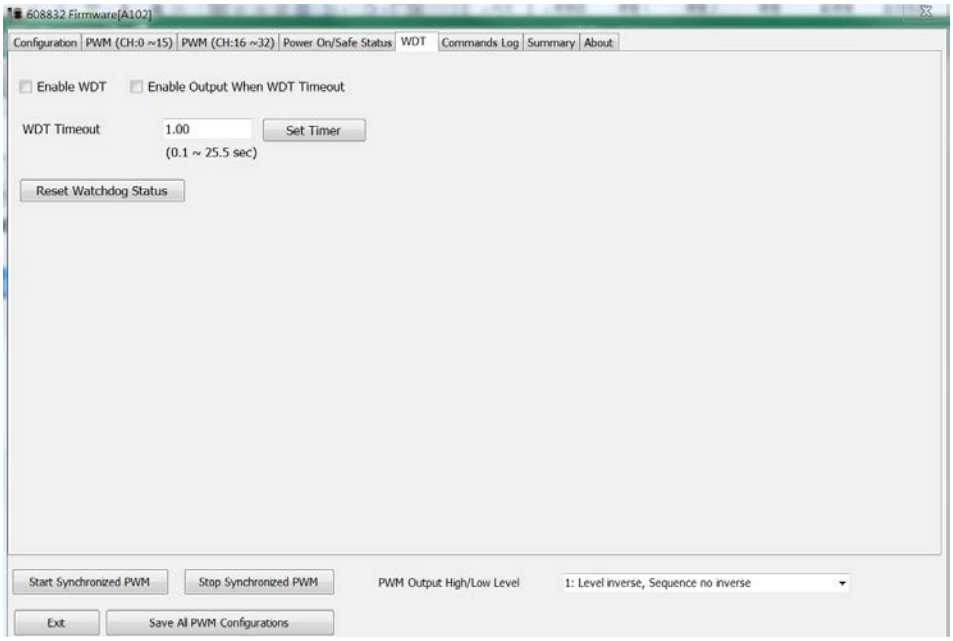
On this tab:

1. Set the time period for WDT timeout, check the checkbox next to Enable WDT and click the Set WDT button to enable the Host watchdog.
2. Check the checkbox next to Send Host OK to send the "~**" command.
3. Uncheck the checkbox next to Send Host OK to stop sending ~** command, the Host watchdog timeout will occur and relay will turn to Safe value.
4. Click the Reset WDT button to clear the Host watchdog timeout status.
5. Uncheck the checkbox next to Enable WDT and click the Set WDT button to disable the Host watchdog.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

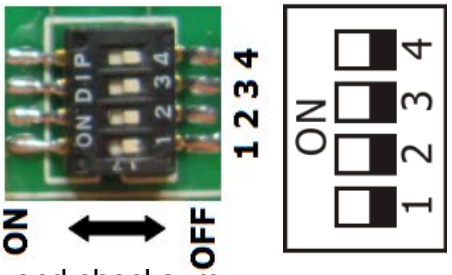
Note

The relay will not turn to Safe value when alarm for detected liquid is enabled. If the alarm is enabled, the relay will be linked to the Alarm status. In case an Alarm occurs, the relay turns ON, it can be used to turn on the user's alarm light or beeping alarm or other device.



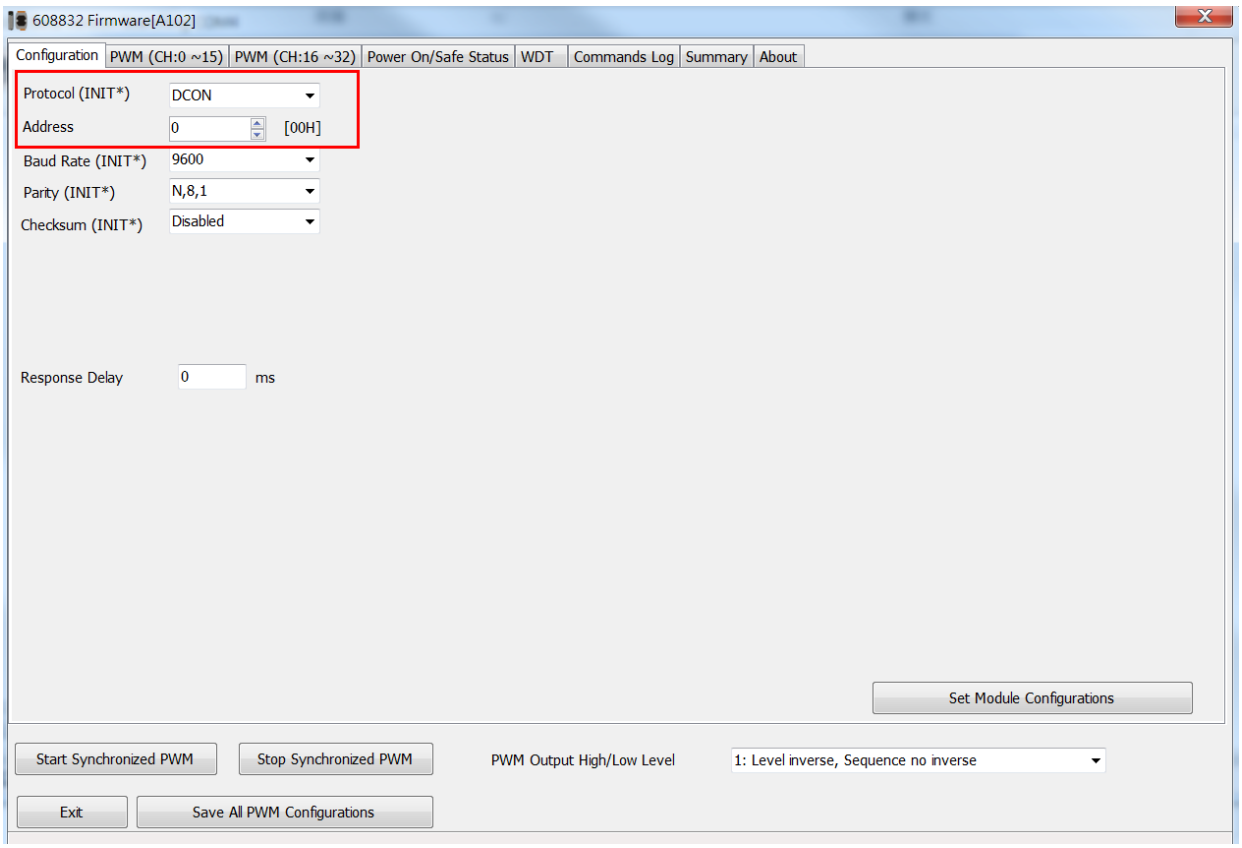
- INIT

In case of the following situations, users have to set the pin 1.INIT on SW1 in the ON position and power-cycle the M-6088-32 module:



- Change protocol from PC
- Change DCON configuration such as baud rate, parity and checksum
- Communication failure with a M-6088-32 module.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



When a M-6088-32 module is powered-on with the pin 1.INIT in ON position, the protocol is DCON, address is 0, Baud Rate is 9600 bps, Parity is set to N/8/1 and Checksum is disabled.

After configuring the communication parameters, click the *Set Module Configurations* button, set the INIT to OFF position and power-cycle the M-6088-32 to take the settings effect.

Note

The INIT switch does not need to be set in the ON position when changing the address, baudrate and parity for ModbusRTU communication; users only have to power-cycle the module after complete configuration.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Appendix A: DCON Command Sets

A-1. M-6088-32 DCON Command Sets

Command	Description
#AA1cDD	Channel PWM start/stop for lower 16 channels c: channel number in hex, 0 ~ F for channel 0 to 15 DD: 00 for stop and 01 for start response > for OK ! for host watchdog timeout
#AAAcDD	Channel PWM start/stop for lower 16 channels c: channel number in hex, 0 ~ F for channel 0 to 15 DD: 00 for stop and 01 for start response > ! for host watchdog timeout
#AABcDD	Channel PWM start/stop for upper 16 channels c: channel number in hex, 0 ~ F for channel 16 to 31 DD: 00 for stop and 01 for start response > ! for host watchdog timeout
%AANNTTCCFF	set configuration, NN: new address, TT = 00, CC: new baud rate, FF: bit 6 for DCON checksum

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Command	Description
@AADI	Read PWM status of all channels response !AAHHHHHHHH, HHHHHHHH in hex, each bit corresponds to a channel, where 0 for stopped and 1 for started
@AADOHHHHHHHH	Start/stop PWM for all channels HHHHHHHH: in hex format, each bit corresponds to a channel, where 0 for stop and 1 for start
$AA2	Read configuration
$AA5	Read reset status !AA1 first after power on, !AA0 others
$AACccB	Read channel burst count remained in burst mode cc: channel in hex, 00 ~ 1F response !AAHHHH, HHHH in hex
$AACccD	Read channel duty cycle cc: channel in hex, 00 ~ 1F response !AAdd.d
$AACccDdd.d	Set channel duty cycle cc: channel in hex, 00 ~ 1F dd.d: duty cycle, 00.0 ~ 99.9

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Command	Description
$AACccL	Read channel pulse period in second cc: channel in hex, 00 ~ 1F response !AAddd.dd
$AACccLddd.dd	Set channel pulse period in second cc: channel in hex, 00 ~ 1F ddd.dd: pulse period, 000.00 ~ 655.35
$AACccN	Read channel sync mode cc: channel in hex, 00 ~ 1F response !AAtp, t for sync start and p for sync stop, it can be 0 for disabled and 1 for enabled
$AACccNtp	Set channel sync mode cc: channel in hex, 00 ~ 1F t: sync start, 0 to disable and 1 to enable p: sync stop, 0 to disable and 1 to enable
$AACccP	Read channel burst count cc: channel in hex, 00 ~ 1F response !AAHHHH, HHHH in hex
$AACccPhhhh	Set channel burst count cc: channel in hex, 00 ~ 1F hhhh: burst count in hex

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Command	Description
$AAF	read firmware version
$AAI	read INIT status response: !AA0 -> INIT short to GND !AA1 -> else
$AAM	read module name
$AAP	Read Modbus RTU/DCON protocol response: !AA0 -> DCON !AA1 -> Modbus RTU
$AAPN	Set Modbus RTU/DCON protocol N-> 0: DCON, 1: Modbus RTU
$AAW	Save PWM configuration to EEPROM
$AAYs	Sync start/stop all synced channels which are specified by the $AACccNtp command s: 0 to stop and 1 to start
~**	clear host watchdog timeout counter
~AA0	read host watchdog status
~AA1	clear host watchdog timeout status
~AA2	read host watchdog enable/disable status and timeout value

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Command	Description
~AA3ETT	enable/disable host watchdog and set timeout value E-> 0: disable host watchdog, 1: enable host watchdog TT: host watchdog timeout in 0.1s in hex format
~AA4P	Read the power on PWM settings response: !AAhhhhhhhh, hhhhhhhh in hex, each corresponds to a channel, 0 to stop and 1to start
~AA4S	Read the safe PWM settings when host watchdog timeout response: !AAhhhhhhhh, hhhhhhhh in hex, each corresponds to a channel, 0 to stop and 1to start
~AA6Phhhhhhhh	Set the power on PWM settings Hhhhhhhh: in hex, each corresponds to a channel, 0 to stop and 1to start:
~AA6Shhhhhhhh	Set the safe PWM settings when host watchdog timeout Hhhhhhhh: in hex, each corresponds to a channel, 0 to stop and 1to start:
~AAD	Read inverse settings response: !AAhh, hh in hex, bit 1 for inverse high/low level and bit 2 for inverse high/low sequence

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Command	Description
~AADhh	Set inverse settings hh: in hex, bit 1 for inverse high/low level and bit 2 for inverse high/low sequence
~AARD	read response delay time in ms in hex format response: !AAhh, hh in hex
~AARDVV	set response delay time in ms, VV in hex format, 00 - 59

Baud Rate Setting (CC)

Bits 5:0

Baud rate, 0x03 ~ 0x0A

Code	0x03	0x04	0x05	0x06
Baud	1200	2400	4800	9600
Code	0x07	0x08	0x09	0x0A
Baud	19200	38400	57600	115200

Bits 7:6

00: no parity, 1 stop bit

01: no parity, 2 stop bits

10: even parity, 1 stop bit

11: odd parity, 1 stop bit

Data Format Setting (FF)

Bit 6

0: checksum disabled

1: checksum enable

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

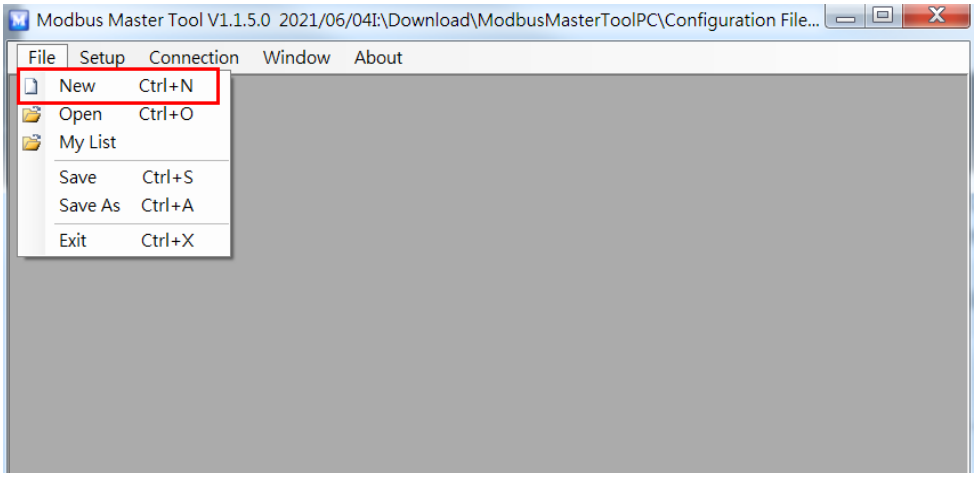
Appendix B: ModbusMasterToolPC

ModbusMasterToolPC is a free, easy-to-use tool for Modbus communication and diagnosing the wiring.

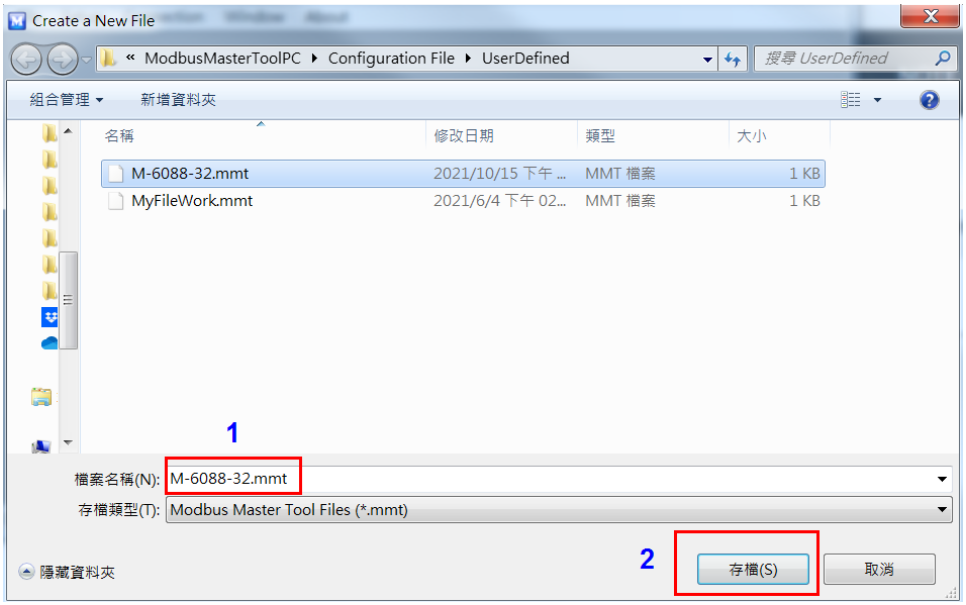
ICPDAS web site :https://www.icpdas.com/en/download/ModbusMasterToolPC

This section intends to guide the steps for creating the Modbus communication with M-6088-32 logger.

1. Launch the ModbusMasterToolPC.exe.
2. Select ***New*** in the File menu.

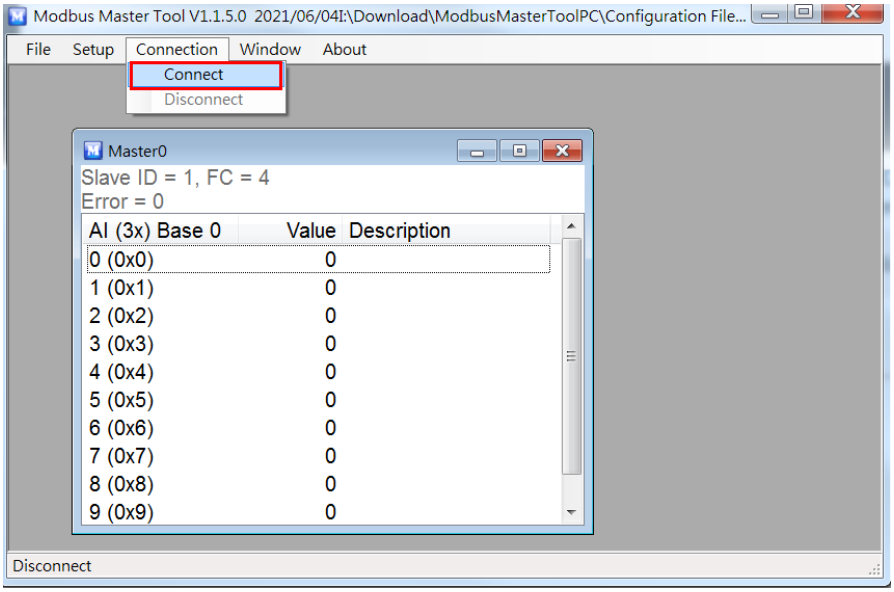


3. Input the file name and click on the ***Save*** button.

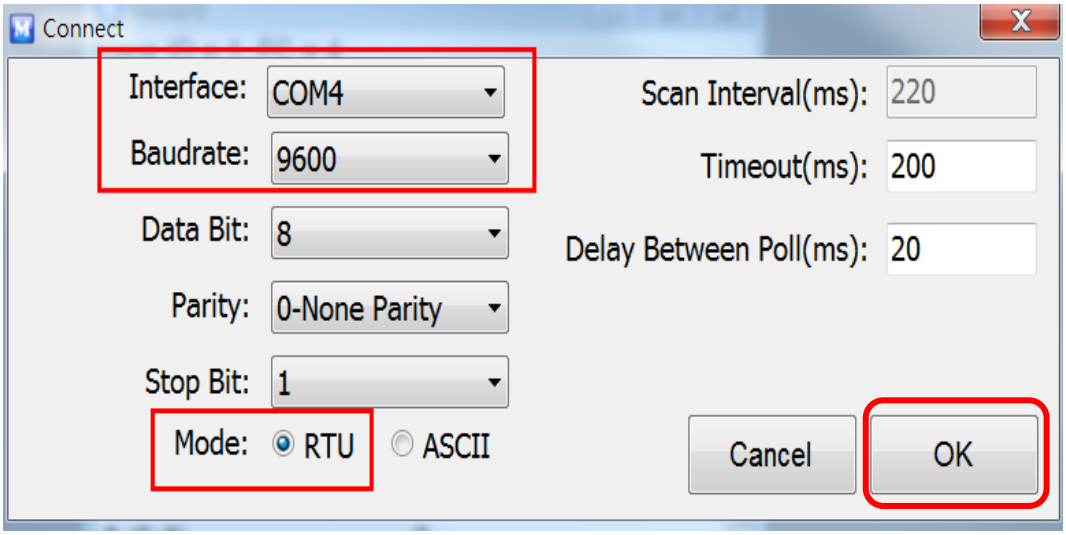


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

4. Select ***Connect*** in the *Connection* menu.

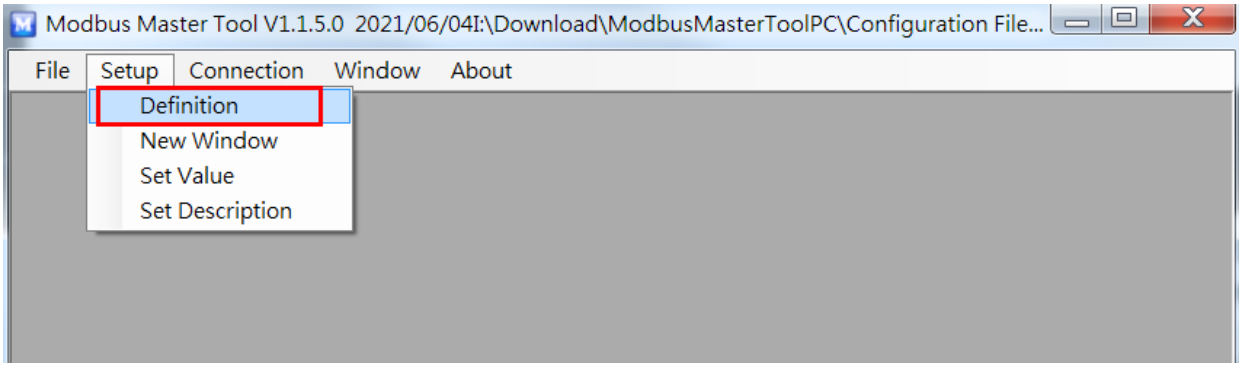


5. Select the communication interface.



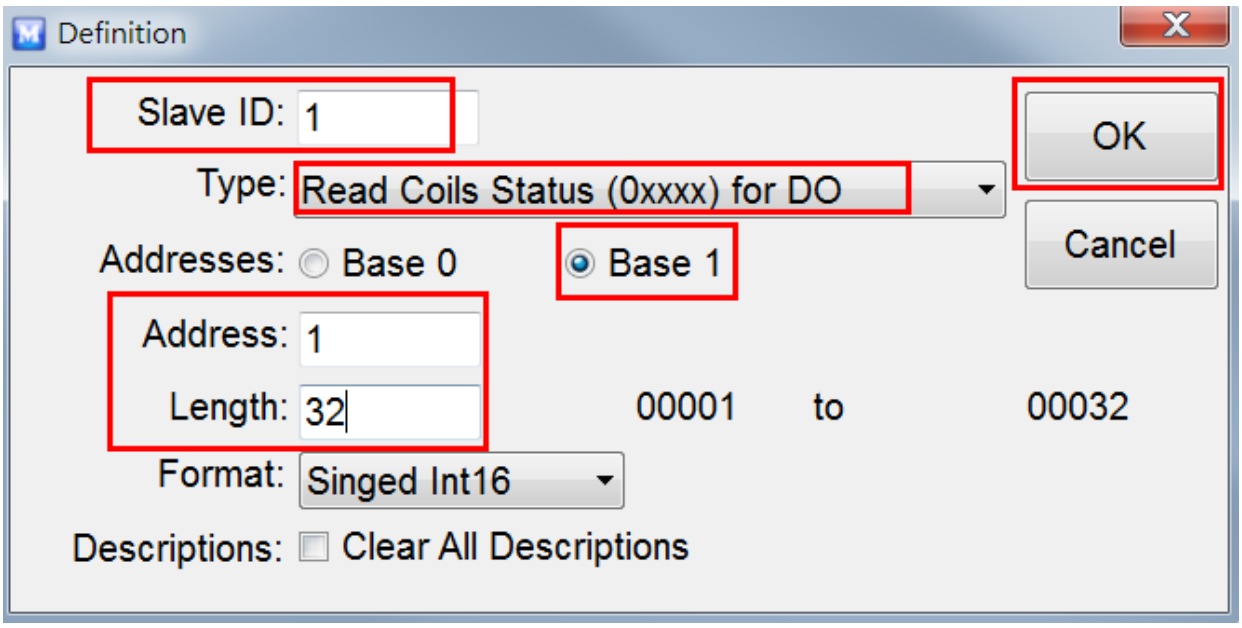
When using RS-485 as the interface, select the COM port, check the RTU mode and click on the ***OK*** button.

6. Select ***Definition*** in the *Setup* menu.

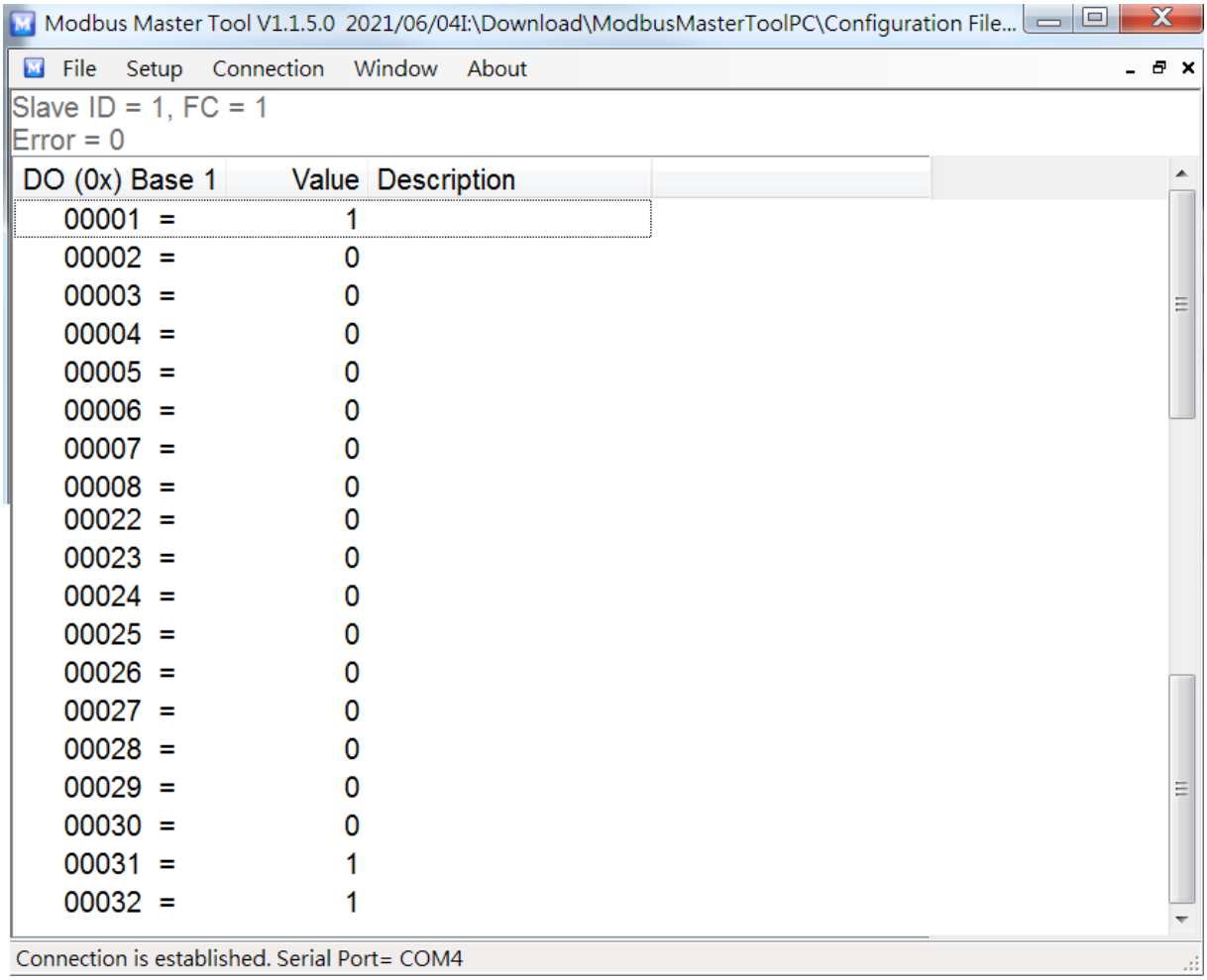


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

7. Select the Modbus function code, input the start address and length, and click on the ***OK*** button.



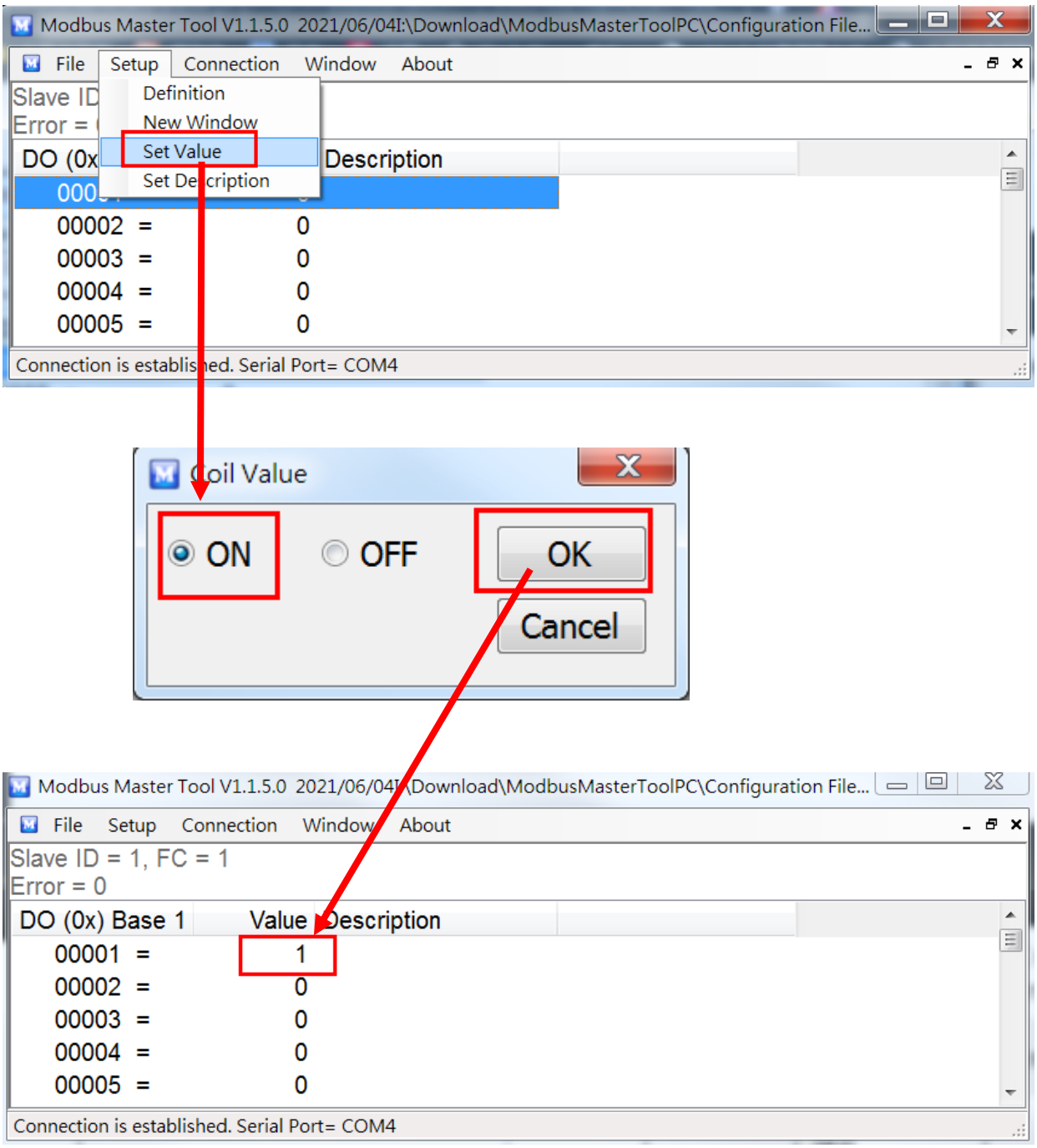
8. Read data.



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

9. Write data to Holding Register or Coil Status

1. Highlight the Modbus address in the Holding Register or Coil Status list
2. Select ***Set Value*** in the *Setup* menu.
3. Input the data in the Value box and click on the ***OK*** button



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Appendix C: Modbus Address Table

C-1. M-6088-32 Modbus Address Mappings (Base 1)

Address	Description	Attribute
00001 ~ 00032	PWM status 0: Stop 1: Start	R/W
00129 ~ 00160	PWM safe value when host communication timeout 0: Stop 1: Start	R/W
00161 ~ 00192	Power on value of the PWM status 0: Stop 1: Start	R/W
00257	Protocol 0: DCON 1: Modbus RTU	R/W
00260	Modbus Host Watchdog mode 0: The same as I-7000 series modules 1: The AO and DO command will clear Host Watchdog timeout status	R/W
00261	Host Watchdog 0: Disabled 1: Enabled	R/W
00266	Inverse the PWM output level 0: No inverse 1: Inverse	R/W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Address	Description	Attribute
00267	Inverse the pulse output high/low sequence 0: low then high 1: high then low	R/W
00270	Host Watchdog timeout status, write 1 to clear the Host Watchdog timeout status	R/W
10273	Reset status 0: Not the first read after power-on 1: First read after power-on	R
00289	Save all PWM configurations into EEPROM, write 1 to save	W
00290	Sync start/stop 0: sync stop 1: sync start	W
00961 ~ 00992	Enable/disable channel PWM sync start	R/W
00993 ~ 01024	Enable/disable channel PWM sync stop	R/W
30481	Firmware version (low word)	R
30482	Firmware version (high word)	R
30483	Module name (low word)	R
30484	Module name (high word)	R
40485	The module address, valid range: 1 ~ 247	R/W

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

<table>
<tr><th>Address</th><th>Description</th><th>Attribute</th></tr>
<tr><td>40486</td><td>Bits 5:0
Baud Rate, 0x03 ~ 0x0A
<table>
<tr><td>Code</td><td>0x03</td><td>0x04</td><td>0x05</td><td>0x06</td></tr>
<tr><td>Baud</td><td>1200</td><td>2400</td><td>4800</td><td>9600</td></tr>
<tr><td>Code</td><td>0x07</td><td>0x08</td><td>0x09</td><td>0x0A</td></tr>
<tr><td>Baud</td><td>19200</td><td>38400</td><td>57600</td><td>115200</td></tr>
</table>
Bits 7:6
00: No parity, 1 stop bit
01: No parity, 2 stop bits
10: Even parity, 1 stop bit
11: Odd parity, 1 stop bit</td><td>R/W</td></tr>
<tr><td>40488</td><td>Response delay time in ms, valid range: 0 ~ 89</td><td>R/W</td></tr>
<tr><td>40489</td><td>Host Watchdog timeout value, 0 ~ 255, in 0.1s</td><td>R/W</td></tr>
<tr><td>40492</td><td>Host watchdog timeout count, write 0 to clear</td><td>R/W</td></tr>
<tr><td>40673 ~ 40704</td><td>PWM pulse period in 0.01s, 0 to 65535, 0 for always low.</td><td>R/W</td></tr>
<tr><td>40705 ~ 40736</td><td>PWM duty cycle in 0.1%, 0 to 1000, 0 for always low, 1000 for always high</td><td>R/W</td></tr>
<tr><td>30769 ~ 30800</td><td>PWM burst count remained in burst mode</td><td>R</td></tr>
<tr><td>40801 ~ 40832</td><td>PWM burst count, 0 for continuous mode</td><td>R/W</td></tr>
</table>

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

Revision History

Revision	Date	Description
1.0.0	2021/10	First released

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000