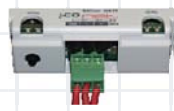




BACnet IP, BACnet Ethernet,  
HTTP, SNMP, & Modbus IP



BACnet MS/TP



Modbus RTU



# STULZ Controller Communications Manual

STULZ **E<sup>2</sup>** Controller  
6000/7000 MIB  
FieldServer

## **Preface**

**These set-up procedures supplement the Installation & Operation Manual that is provided with your network communications device.**

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STULZ Air Technology Systems, Inc.  
1572 Tilco Drive  
Frederick, MD 21704, USA





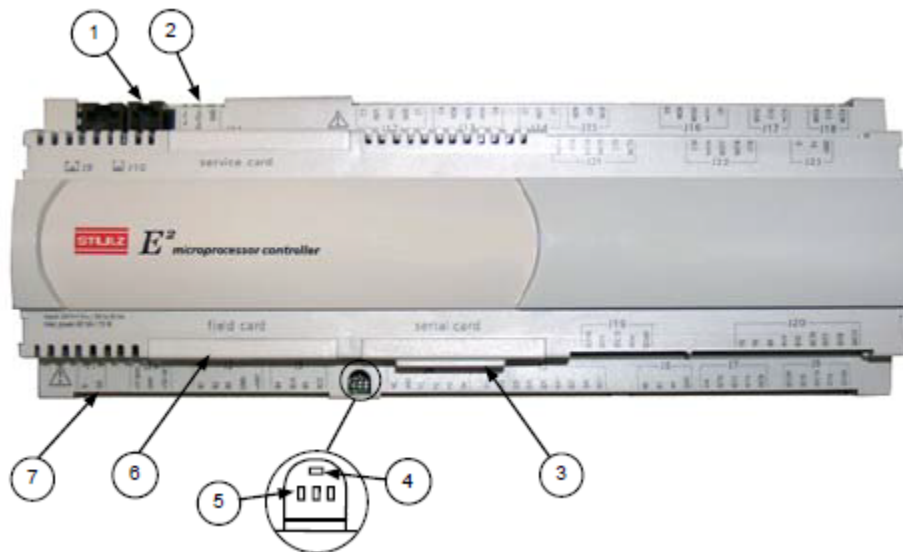
globally close to you



## Product Support

### Table of Contents

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Modbus RTU.....	15
pCOWeb Clock Configuration.....	16
C6000 MIB.....	17
Field Server.....	20
Flash Memory Life.....	23



- |  |                                      |
|--|--------------------------------------|
| 1. RJ11 telephone connection (J10) for display panel | 6. Hatch for expansion I/O module(s) |
| 2. Connection for pLan (J11)                         | 7. Power connector (J1)              |
| 3. Hatch for BMS card                                |                                      |
| 4. Power on LED (Yellow)                             |                                      |
| 5. Signal LED's (Red, Yellow, and Green)             |                                      |



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## Product Support

### BACNET MSTP

1.) Before attempting to communicate with the pConet card, an RS485 adapter and Carel software (BACset) is required. The communication software is a free utility which may be downloaded at [ksa.carel.com](http://ksa.carel.com), or by following the link below.

[http://ksa.carel.com/home?p\\_p\\_state=maximized&p\\_p\\_mode=view&saveLastPath=0&\\_58\\_struts\\_action=%2Flogin%2Flogin&p\\_p\\_id=58&p\\_p\\_lifecycle=0&\\_58\\_redirect=%2F](http://ksa.carel.com/home?p_p_state=maximized&p_p_mode=view&saveLastPath=0&_58_struts_action=%2Flogin%2Flogin&p_p_id=58&p_p_lifecycle=0&_58_redirect=%2F)

The screenshot shows the login page of the 'ksa knowledge sharing area'. It features a search bar at the top right, a red 'Welcome' banner, and a 'Sign In' section with fields for 'Email Address' and 'Password'. There is a 'Remember Me' checkbox and a 'Sign In' button. Below the login section are links for 'OpenID', 'Create Account', and 'Forgot Password'. At the bottom, there is a footer with 'Legal notice | Contacts', company information for CAREL INDUSTRIES S.p.A., and the CAREL logo.



Example: USB – RS485 converter

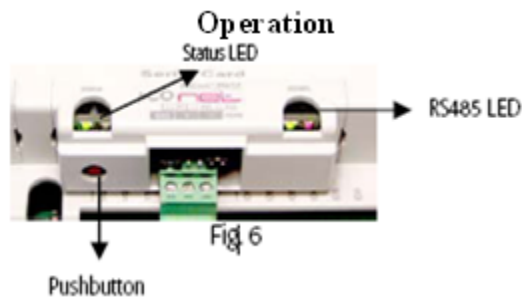


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## Product Support

2.) Each card has a default address of 77000 (device instance), the card must be initialized to communicate with it. Turn the units power off, hold the pushbutton and restore power, the status LED must flash three times for the initialization process, release the pushbutton after the third flash.



Starting sequence after powerup:

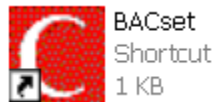
- Two seconds after restarting: quick flash red-green-red green
- Five seconds after restarting: green on steady
- About fifty seconds after restarting: the status LED flashes to indicate quality of communication with pCo
- Quick green – off green: communication with pCo is okay
- Slow red – off red: communication has not been established
- Green-red-green: pCOnet detects error or lack of response from the pCo

Starting sequence after initialization:

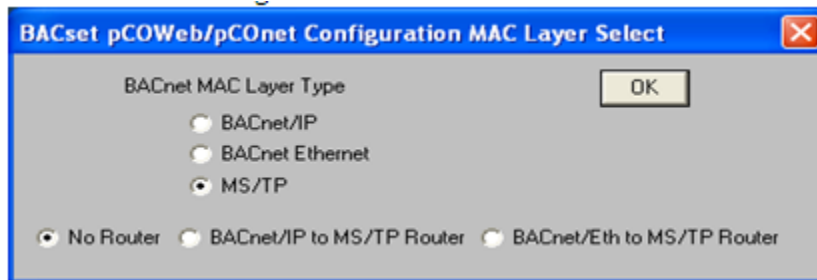
- After fifty seconds: slow green-red-green-red, at the end BACnet will be active
- RS485 LED: indicates status of communication with the network, green with occasional red flashes when communication is OK

## Product Support

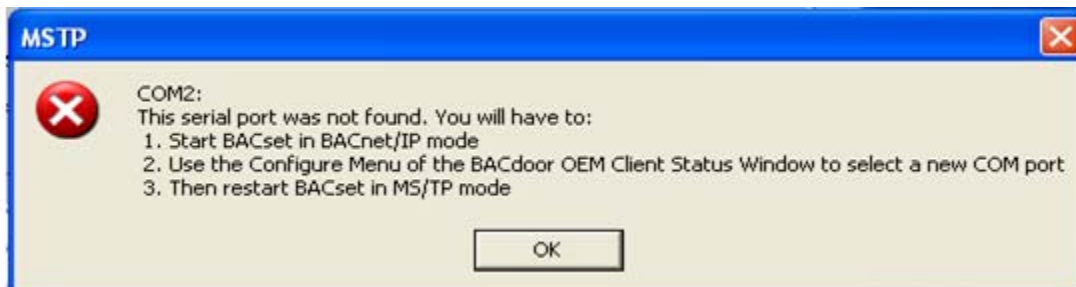
3.) A shortcut will be saved to your desktop, click on the BACset icon to open the utility.



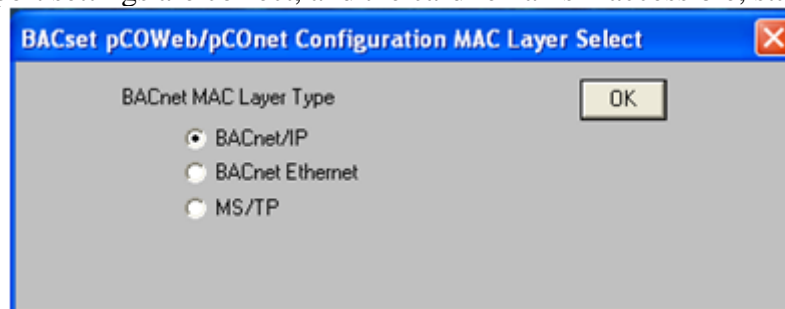
4.) Select MS/TP, if a router is being utilized select the correct configuration, if not select no router.



5.) If you receive a COM error confirm your port/RS485 settings; 19200 baud rate & assigned port.



6.) If your computer port settings are correct, and the card remains inaccessible, start BACset in IP mode.



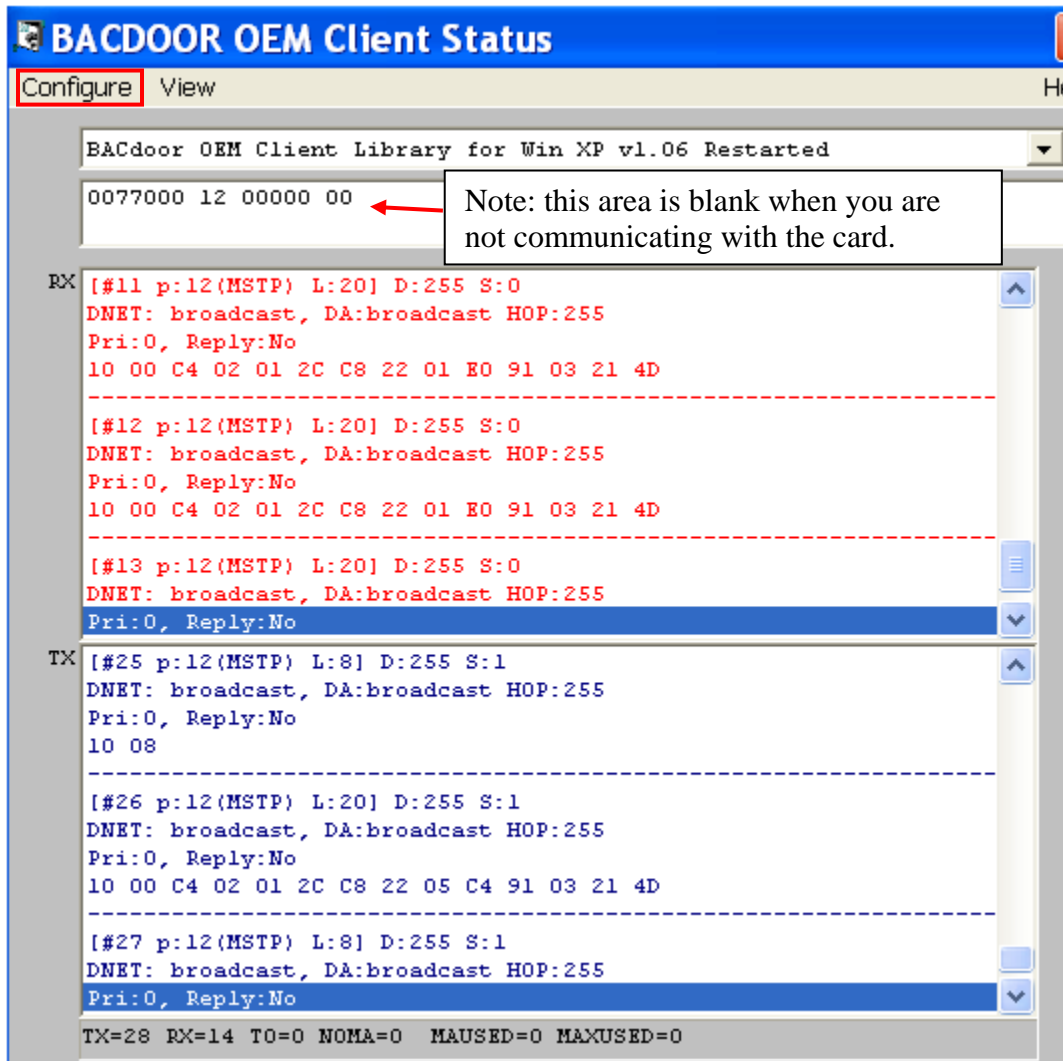


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## Product Support

7.) When the BACset screen opens locate the BACdoor icon in your taskbar, select the icon and configure menu in BACdoor.





*globally close to you*



## Product Support

8.) Set the MS/TP parameters, the Com Port must match your computer settings, the TS (MS/TP Node) must always be higher than the node you are attempting to communicate with on the network. Try starting out with a default setting of 15 or higher to allow access without changing this parameter frequently. Once the parameters have been set then select OK, close BACset and reopen the utility to discover card.

**BACDOOR OEM Client Library Configuration**

Our Device Instance: 77000 OK

Our Object Name: BACLIB Cancel

Our Description: BACdoor Device Object

Our Location: unknown

Whols/IAm Interval: 1 Minutes (0=None)

BACnet/IP Parameters

172.16.2.43 [255.255.0.0] Dell Wireless 1390 WLAN Mini-Card

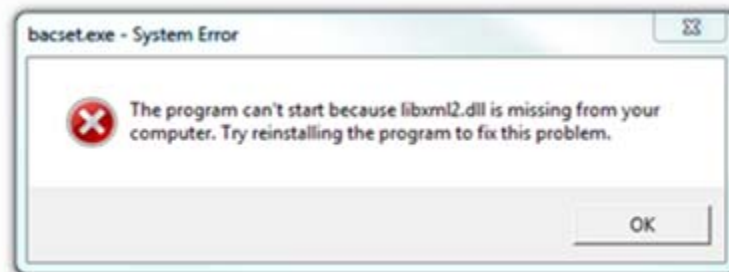
UDP port: 0xBAC0 Subnet: 255.255.0.0

MS/TP Parameters

Com Port (restart): 1 Baud (restart): 38400 (no parity, 8 data, 1 stop)

TS (MS/TP Node): 1 MaxMaster: 127 MaxInfoFrames: 10

Note: This error may occur with Window 7 OS, locate the file online and download to your computer.







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## Product Support

9.) If all settings are correct the following screen would appear after opening BACset, click read to establish communication with the card. If the card device instance has been changed, the new device instance shall be displayed via BACdoor when discovered. Change the device instance for the desired network member your computer is connected to, and then click the read icon. The read/write status should display 100% when complete.

**BACset for pCOWeb/pCOnet BACnet(R) Windows XP v2.15**

**BACset** for pCOWeb/pCOnet BACnet® **CAREL**

BACset for pCOWeb/pCOnet BACnet(R) Windows XP v2.15 - Restarted - MS/TP

pCOWeb Device Instance: 77000

Device | Objects | Notify Classes | Schedules | Calendars | Test | Database | System | Plugin

Read Write Factory UTC Time Sync Time Sync

Read/Write Status: 100 % Read Complete Cancel

Device Settings for 77000:

MS/TP Baud Rate \* ☐ 9600 ☐ 19200 ☒ 38400 ☐ 76800 MS/TP Station Address: 0 (0 to 127)

☐ Enable / ☒ Disable Device Instance Write Max Master: 127 (0 to 127)

Device Instance: 77000 (0 to 4194303) Max Info Frames: 20 (0 to 255)

Object Name: pCOnet77000 Firmware: A485-1.1.7 - B485-1.0.2

Description: Carel BACnet Gateway App Software: 1.22.4

Location: Unknown

APDU Timeout: 5000 milliseconds Alarm Enabled: ☐ Yes ☒ No

APDU Retries: 3 (0 to 255) Broadcast Alarms: ☐

Password for Restart: 1234 Alarm Destination: 0 (0 to 4194303)

Local Date/Time: 2006-1-1 (Sun) 01:29:38 Alarm Process ID: 0

Daylight Savings Time: ☐ Yes ☒ No

UTC Offset: 0 minutes (-720 to +720)

Interval to send Whols: 1 minutes (0=none)

Max Analog Vars\*: 207 Max Integer Vars\*: 207 Max Digital Vars\*: 207 Max Total Vars: 621 Reboot

\* Must reboot

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## Product Support

10.) When communication has been established with the card, settings may be changed. The MS/TP station address, max master and baud rate may be changed, do this first! After entering the requested data in the fields click write to save the settings. Enable the write option to change the device instance; the shaded box will turn “white” allowing the change from 77000 to the desired instance number. Once the desired device instance has been entered select write>reboot, the card will be accessible within 2 minutes following the reboot.

Note: The BACdoor baud rate must match the card setting, open BACdoor and change the baud rate, close BACset and reopen to connect with the pCOnet card.

\* Must reboot have to be performed after “all” writes to the card!



globally close to you



## Product Support

11.) After configuration of the card commissioning can be performed, all variables (analog & binary) are accessible. You may read or write to variables when testing, reference the Stulz BMS table for data type.

**BACset for pCOWeb/pCOnet BACnet(R) Windows XP v2.11**

**BACset** for pCOWeb/pCOnet BACnet® **CAREL**

BACset for pCOWeb/pCOnet BACnet(R) Windows XP v2.11 - Restarted - MS/TP

pCOWeb Device Instance: 77000

Device | Objects | Notify Classes | Schedules | Calendars | Test | Database | System | Plugin

Read Clear

Read Status: 100 % Read Complete Cancel

☐ AV 1 to AV 207 ☐ AV/MV 1001 to AV/MV 1207 ☒ BV 1 to BV 22

Include ☐ Object ID ☐ ObjectID/ObjectName/Units ☒ Description/Units ☒ Show Unreliable Values

Description	PresentValue
Digital Variable 1	0 (off)
Digital Variable 2	1 (on)
Digital Variable 3	0 (off)
Digital Variable 4	1 (on)
Digital Variable 5	0 (off)
Digital Variable 6	0 (off)
Digital Variable 7	0 (off)
Digital Variable 8	0 (off)
Digital Variable 9	0 (off)
Digital Variable 10	0 (off)
Digital Variable 11	0 (off)
Digital Variable 12	0 (off)
Digital Variable 13	0 (off)
Digital Variable 14	0 (off)
Digital Variable 15	0 (off)
Digital Variable 16	0 (off)
Digital Variable 17	0 (off)
Digital Variable 18	0 (off)
Digital Variable 19	0 (off)
Digital Variable 20	0 (off)
Digital Variable 21	0 (off)
Digital Variable 22	0 (off)

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### BACNET IP/Ethernet & Modbus TCP

\*One card is utilized for these protocols

1. Disable your wireless connection on your lap top computer
2. Set IP Address and subnet mask of PC to 172.16.0.2 / 255.255.0.0 (pCOWeb manual 3.1.1)
3. Connect the Ethernet cable from the PC to the pCOWeb card (manual 3.1.2)
4. Reboot the IP card: push the reset button on the IP card and observe LED, continue holding until the LED flashes three times then release. (manual 3.1.2)



Figure 1.b - MAC address and indicator LEDs

Ethernet LED	Meaning	Notes
Green steady	Correct Ethernet data connection signals	-
Green flashing	Correct Ethernet data exchange	-
Red	No Ethernet signal detected	See 3.1.3 on page 13



globally close to you



## Product Support

5. Perform a ping to verify communication
  - a. start>run>cmd>ok
  - b. type Ping 172.16.0.1 (DOS screen)
  - c. close window if ping is successful

```
C:\WINDOWS\system32\CMD.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\abarnes>ping 172.16.0.1

Pinging 172.16.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 172.16.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

6. Open Internet Explorer on PC and type in address field 172.16.0.1 (manual 3.1.4)
7. The pCOWeb page will appear
8. Click go to administrator area
9. Enter user name (admin) and password (fadmin) then select OK (manual 8.2.1)





globally close to you



## Product Support

10.) The pCOWeb page will display if the initialization process, and computer settings are correct, after the IP address has been entered in internet explorers address field. To change the card settings select configuration then network to change the IP address, netmask and desired gateway address.

**pCOWeb Configuration - Windows Internet Explorer**

Address bar: <http://172.16.0.1/config/adminpage.html>

Left Sidebar:

- Information
- Configuration** (highlighted with a red arrow)
- Clock and Logger
- Events
- Tests
- Customer Site
- Info & Contact

Reboot button

System is using:  
User parameters  
Firmware Release:  
A1.4.2 - B1.2.1  
Mac Address:  
00:0a:5c:10:7f:77  
pCOWeb's date:  
2012-10-05 14:37

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Analog Variables	
Var Idx	1-207
1-20	72.0
21-40	45.0
41-60	75.3
61-80	44.6
81-100	52.1
101-120	71.9
121-140	71.2
141-160	61.8
161-180	0.0
181-200	0.0
201-207	0.0

Integer Variables	
Var Idx	1-207
1-20	100
21-40	100
41-60	0
61-80	8196
81-100	12
101-120	0
121-140	0
141-160	0
161-180	0
181-200	0
201-207	0

**pCOWeb Configuration - Windows Internet Explorer**

Address bar: <http://172.16.0.1/config/adminpage.html>

Left Sidebar:

- Information
- Configuration** (highlighted with a red box)
- Clock and Logger
- Events
- Tests
- Customer Site
- Info & Contact

Reboot button

System is using:  
User parameters  
Firmware Release:  
A1.4.2 - B1.2.1  
Mac Address:  
00:0a:5c:10:7f:77  
pCOWeb's date:  
2012-10-29 11:28

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General **Network** pCO Com SNMP BACnet Plugins Users Firmware

☒ View network configuration

**Ip Addresses and Subnet Masks**

**Eth0**

IP Address main:  (Write here DHCP or leave it empty to set dhcp function)

NetMask main:

**Eth0:1**

IP Alias 1:

Netmask 1:

**Eth0:2**

IP Alias 2:

Netmask 2:

**Eth0:3**

IP Alias 3:

Netmask 3:





globally close to you



## Product Support

11.) The IP address, NetMask & Gateway address must be entered in the fields as shown below. A reboot must be performed to save the writes, do not power off the unit during the reboot process. After the reboot process has been completed change the computers IP & NetMask to reflect that of the card, the computer IP address must be higher than the communication card address otherwise communication will not be possible.

The screenshot shows the pCO Web interface with the 'Network' tab selected. The 'Configuration' menu item is highlighted in the left sidebar. The 'Ip Addresses and Subnet Masks' section is visible, with the 'Eth0' configuration highlighted by a red box. The 'IP Address main' field contains '172.16.0.1' and the 'NetMask main' field contains '255.255.0.0'. Below this, there are fields for 'Eth0:1', 'Eth0:2', and 'Eth0:3' with their respective IP Alias and Netmask. A 'Reboot' button is located in the bottom left corner of the sidebar.

The screenshot shows the pCO Web interface with the 'Gateway' section highlighted by a red box. The 'Gateway Address' field is empty. Below this, there are fields for 'DNS servers' with 'Primary DNS' and 'Secondary DNS' fields. A 'Submit' button is located at the bottom of the 'DNS servers' section, with a red arrow pointing to it. The 'Reboot' button in the bottom left corner of the sidebar is also highlighted by a red box. The footer of the page contains copyright information: 'Copyright © 2003-2010 by Carel Industries S.r.l., Brugine (PD) - Italy. All rights reserved. Contact: [pcoweb@carel.com](mailto:pcoweb@carel.com)'.



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## Product Support

12.) Modscan32 may be utilized to confirm communication with a pCOWed card when Modbus TCP has been selected as the communication protocol.

Note: Integer variables in the **E<sup>2</sup>BMS** Table start with address 5002 (5001 + offset of 1).

To get your modbus device working, these are the basic things you need to know:

- Port 502 TCP (default by protocol, cannot be changed)
- Address format: Decimal (digital number 1 = coil 1)
- Variable bindings (version <=1.3.5)
  - Digitals: Coils 1-207
  - Analogues: Registers 1-207
  - Integers: Registers 5001-5207
- The ranges of variables for version 1.4.2 (when *pCO* communicates using Modbus extended protocol) have been extended as explained here below:
  - Digital variables: coils from 1 up to 2048
  - Analogue variables: registers from 1 up to 5000
  - Integer variables: registers from 5001 to 10000
- Variable types: Signed Integers (mandatory in some software to correctly read/write the variables)

These are the only commands supported by the *pCOWeb* in modbus TCP/IP

- 01: Read coils
- 03: Read holding registers
- 05: Write single coil
- 06: Write single registry
- 15: Write multiple coils
- 16: Write multiple registers





globally close to you

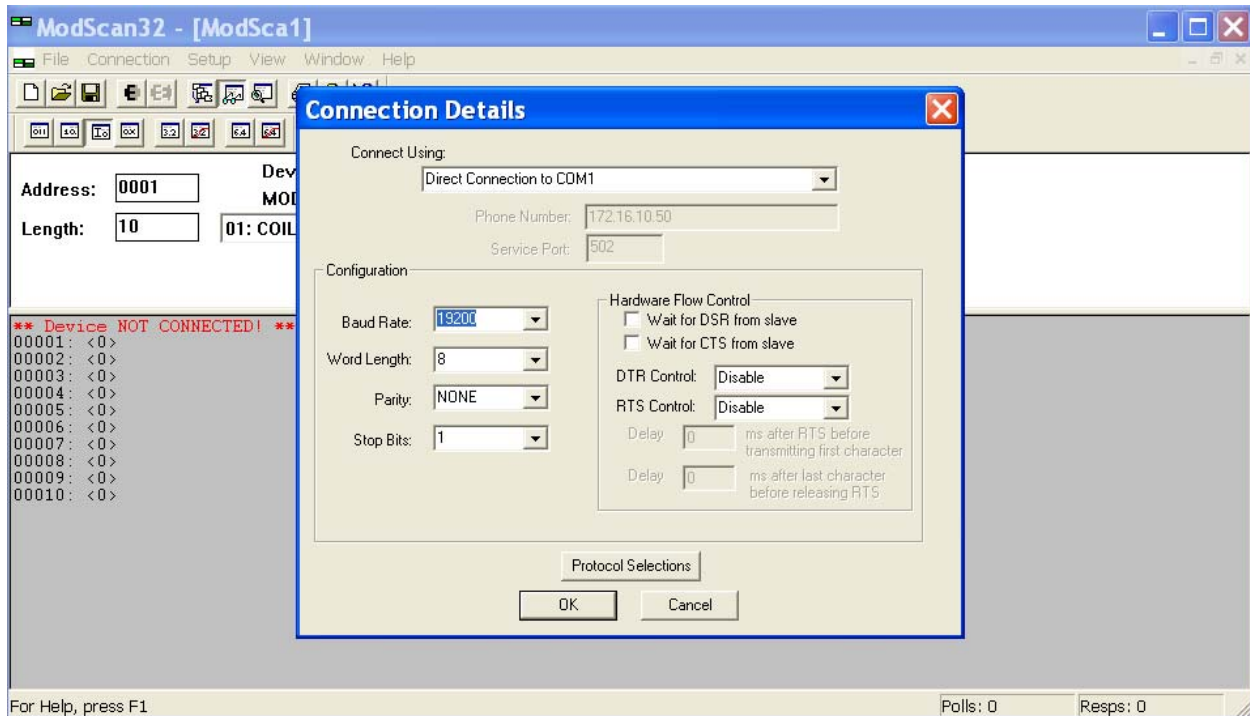


## Product Support

### MODBUS RTU

1.) Utilize any Modbus diagnostic utility and a RS485 converter to establish a connection with the Modbus card. The computer port settings and converter must be set for 19200 baud rate, set the diagnostic utility connection settings likewise. Confirm communication utilizing the **E<sup>2</sup>** BMS Table, demo versions of Modscan may be obtained from WinTECH Software Design, free of charge.

<http://www.win-tech.com/html/demos.htm>



Note: Connect the RS485 converter to the communication card +/- terminals



## pCOWeb Clock Configuration

- 1.) Configure the pCOWeb card integers (123-127)\* to maintain date & time after power cycles, change the variables as reflected below and click submit to save card settings.

\*Not used with STULZ DESICaIR *E<sup>2</sup>* series controllers.

Information

Configuration

Events

Tests

Customer Site

Info & Contact

!!TAKE CARE!!

The application software on board of pCOx has to be configured to transmit clock variables to pCOWeb using 5 integer supervisor variables, otherwise clock synchronizer and logger will not work. Please, contact EasyTools or 1Tool Customer Care for further information.

Actual date: 2012-10-29 12:43

**Clock Configuration**

Enable Clock Syncer ☐ Disabled ☒ Enabled

Synchronization type ☒ Every Minute ☐ Only at start

Choose integer variables with date and time:

Day variable index

Month variable index

Year variable index

Hour variable index

Minute variable index

System is using:  
User parameters:  
Firmware Release:  
AL4.2 - B1-B1

Web Address:  
00.01.01.10.71.77

pCOWeb's date:  
2012-10-29 12:43

W3C HTML 4.01

BTL

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## E<sup>2</sup> BMS Table Integer Variables

[illegible]



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## Product Support

### C6000 MIB

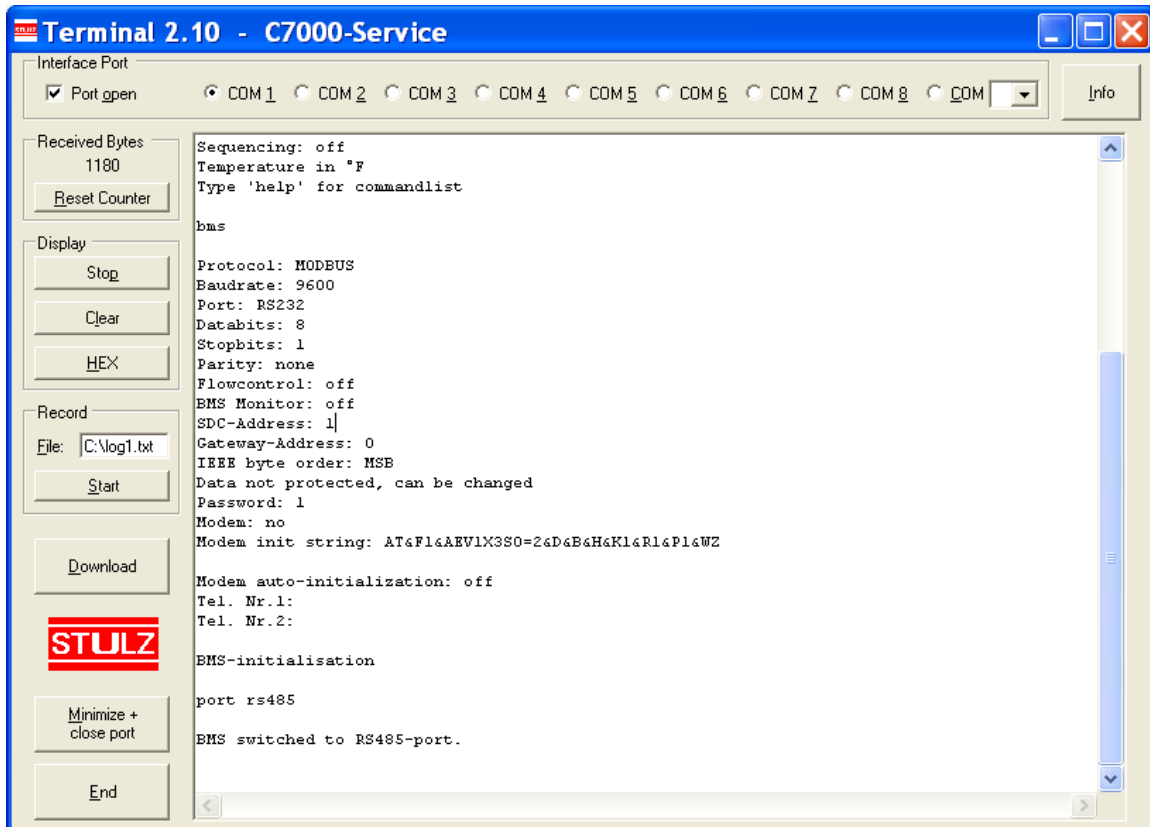
1.) To utilize MODBUS poll or MODSCAN configure your port for RS485; connect your RS485 converter to MIB terminals 13 & 14.

Converter Terminal A – MIB terminal 14

Converter Terminal B – MIB terminal 13

2.) Contact Stulz Product Support for the C7000 service program for MIB setup, hyper terminal may also be used to configure the MIB.

3.) Set the protocol (Modbus), baud rate and port settings to be utilized with the customers BMS.





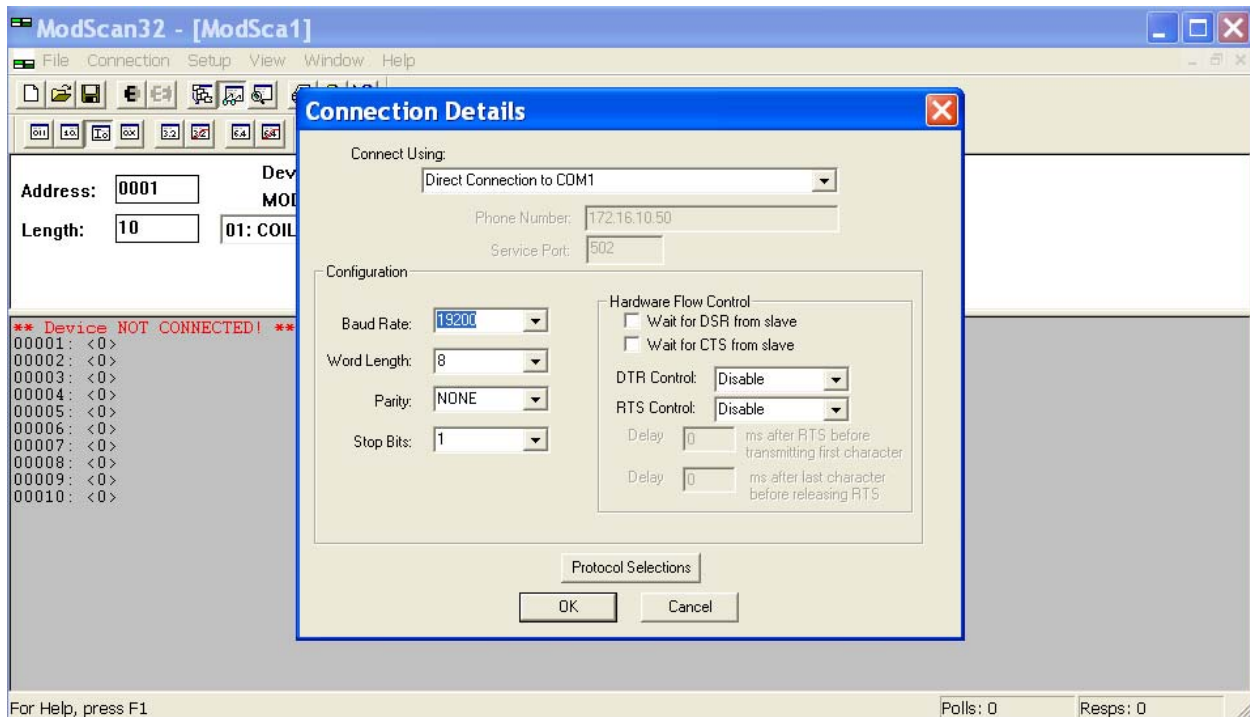
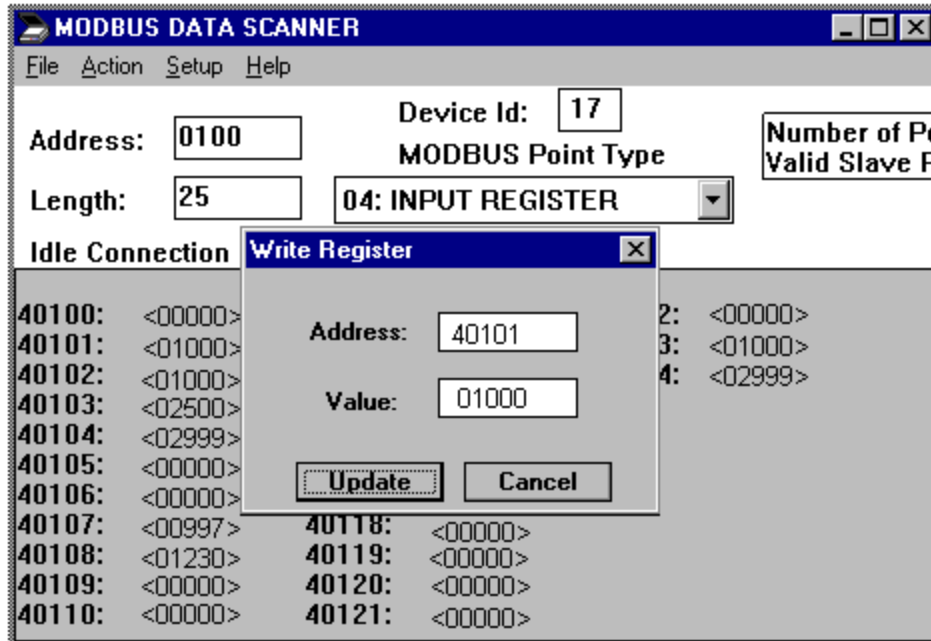
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## Product Support

4.) Modscan may be used to simulate a BMS interface to verify communication with the CRAC units.

<http://www.win-tech.com/html/demos.htm>





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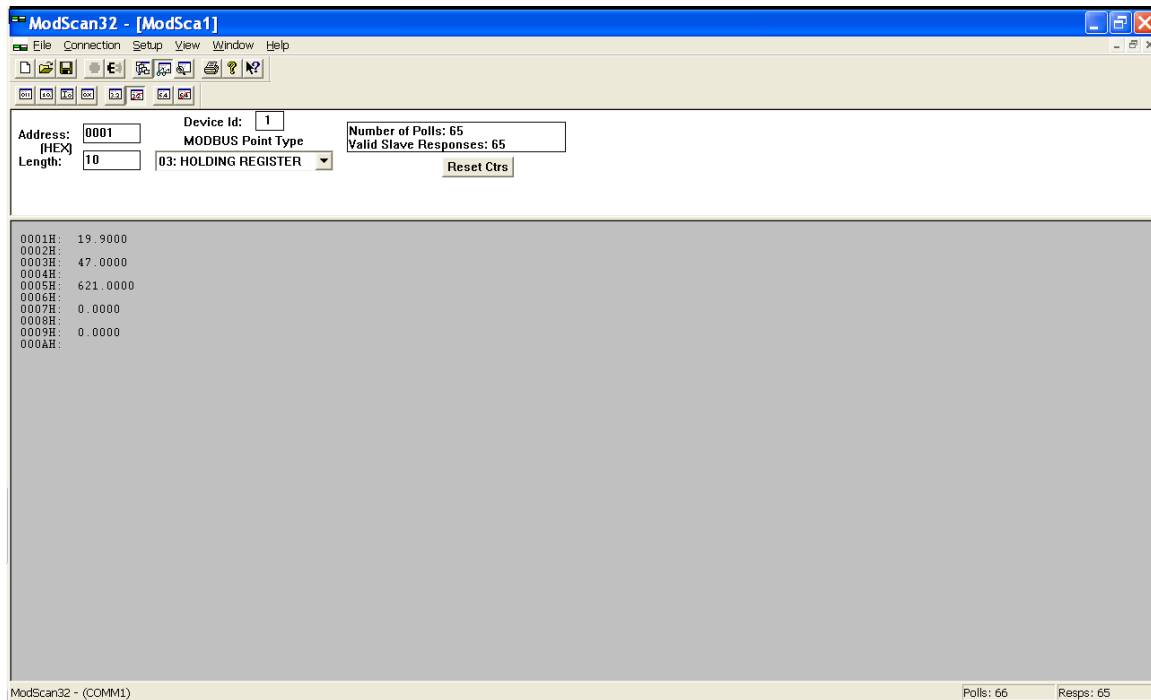
## Product Support

5.) The MIB C6000 only supports the following Modbus registers, reference Stulz documentation “before” system integration!

The STULZ gateway supports the following ModBus functions

- 01 Read coil status
  - 02 Read input status
  - 05 Force single coil
  - 08 Loop back test
  - 03 Read holding registers
  - 04 Read input registers
  - 16 Preset multiple registers (only single access supported)
- \\ Analog values in format IEEE-754 (32 bit)  
>> Lower ModBus-Address high order *word* of IEEE-value  
// Higher ModBus-Address low order *word* of IEEE-value

Note: MIB communication confirmed via MODSCAN32





globally close to you



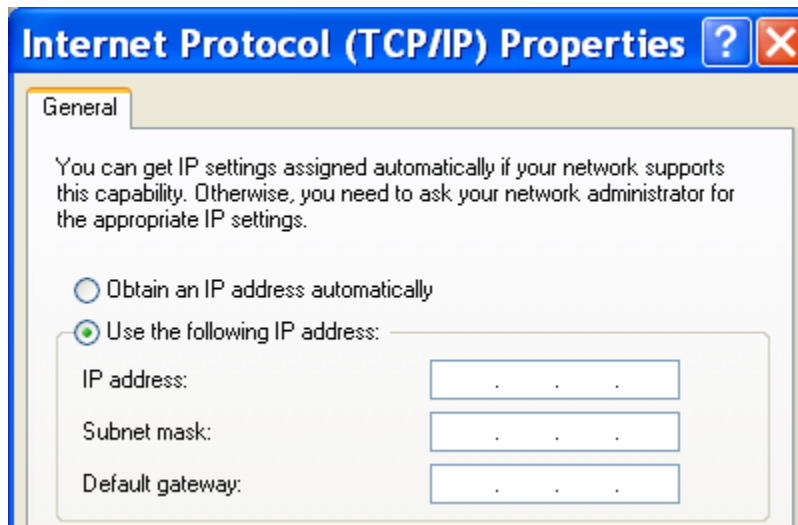
## Product Support

### Field Server

1.) Download the field server utility: <http://www.fieldserver.com/techsupport/utility/downloads.php>

Software	Size	Description
All FieldServers		
<a href="#">Install.zip</a>	9.3Mb	<i>The Install.zip file contains all of the software and manuals needed to configure, analyze, monitor and operate the FieldServer and it is provided with all FieldServers on the Utility Installation Memory Stick. The latest version will always be available here on the website. If you already have the FieldServer Utilities loaded on your computer, you should remove the old files before installing the new ones.</i>
<a href="#">Discovery.zip</a>	7.1Mb	<i>The Discovery.zip file contains the "Discovery Utility" that is used to discover all FieldServers at a specific IP address network.</i>

2.) Set the computer IP address and NetMask, the wireless connection should be off during testing.





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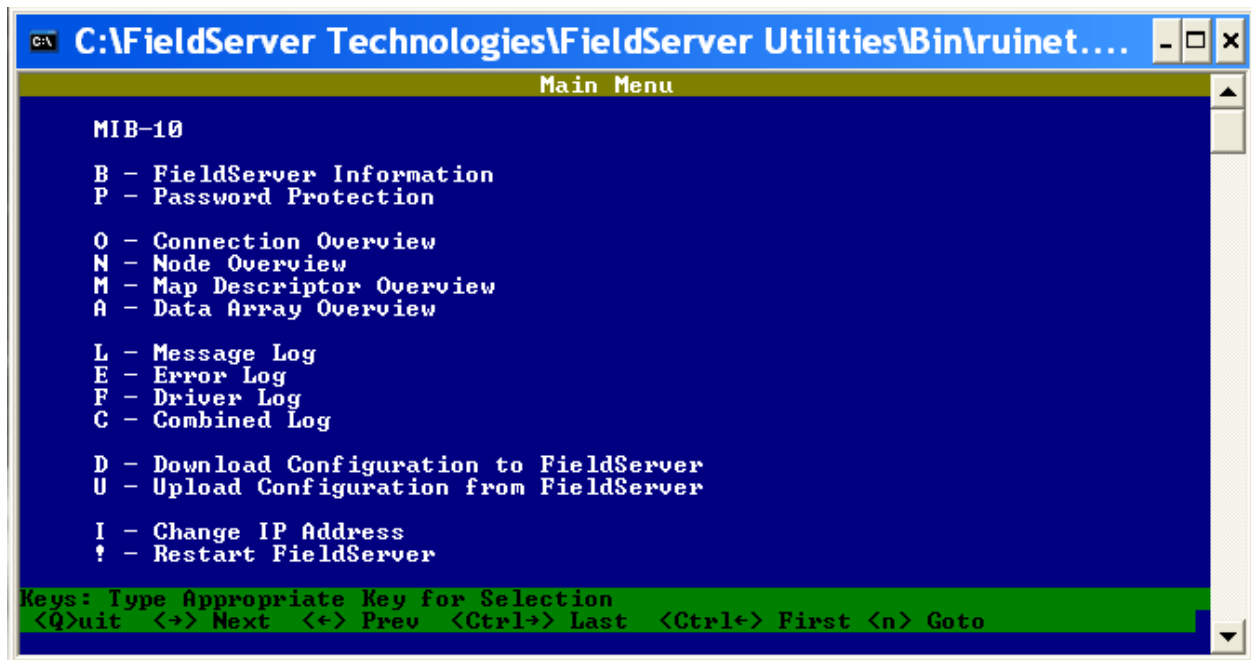


## Product Support

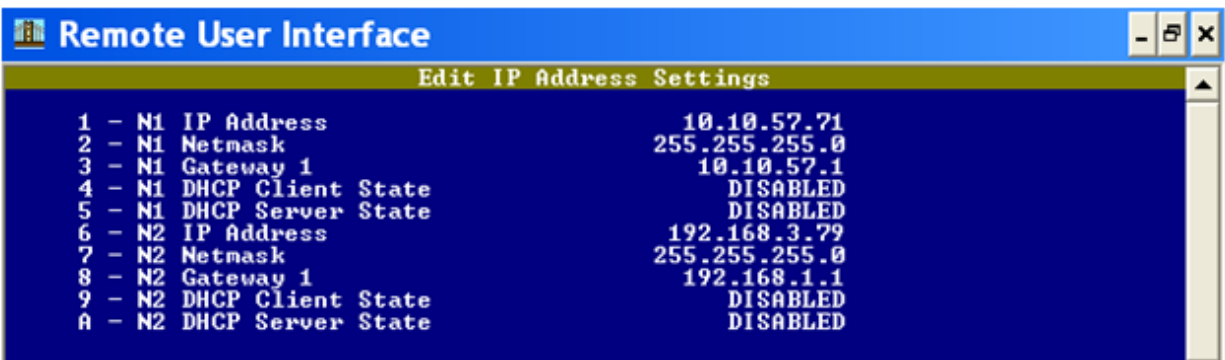
3.) Open the field server remote user interface for bridge access.



Remote User Interface  
Shortcut  
2 KB



Note: The default gateway address must be set as assigned per the network!





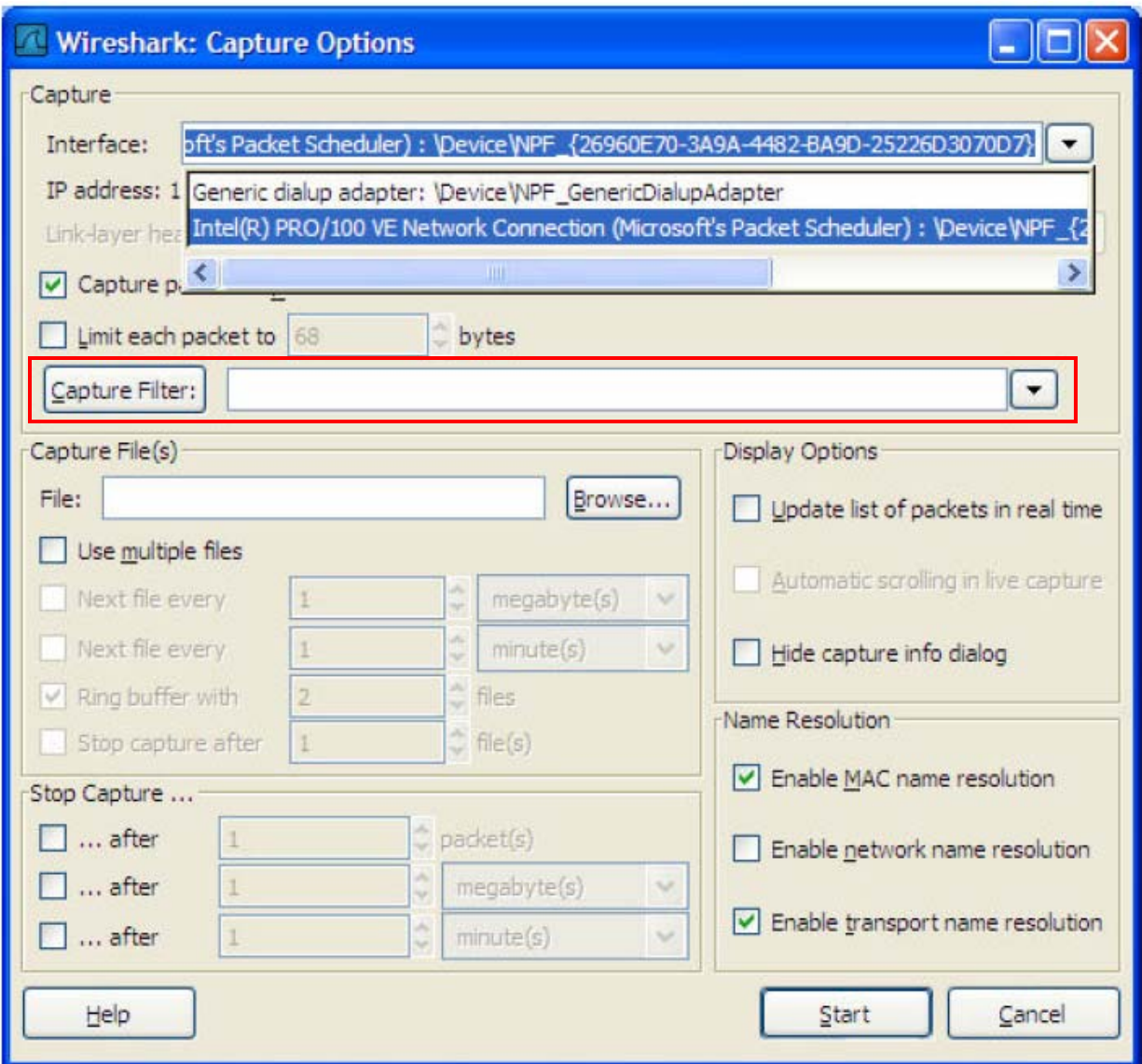


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## Product Support

4.) Wireshark captures may be obtained to determine communication conflicts, in the filter section enter “port not 1024” to capture all Ethernet traffic.





## NOTICE

### Flash Memory Life

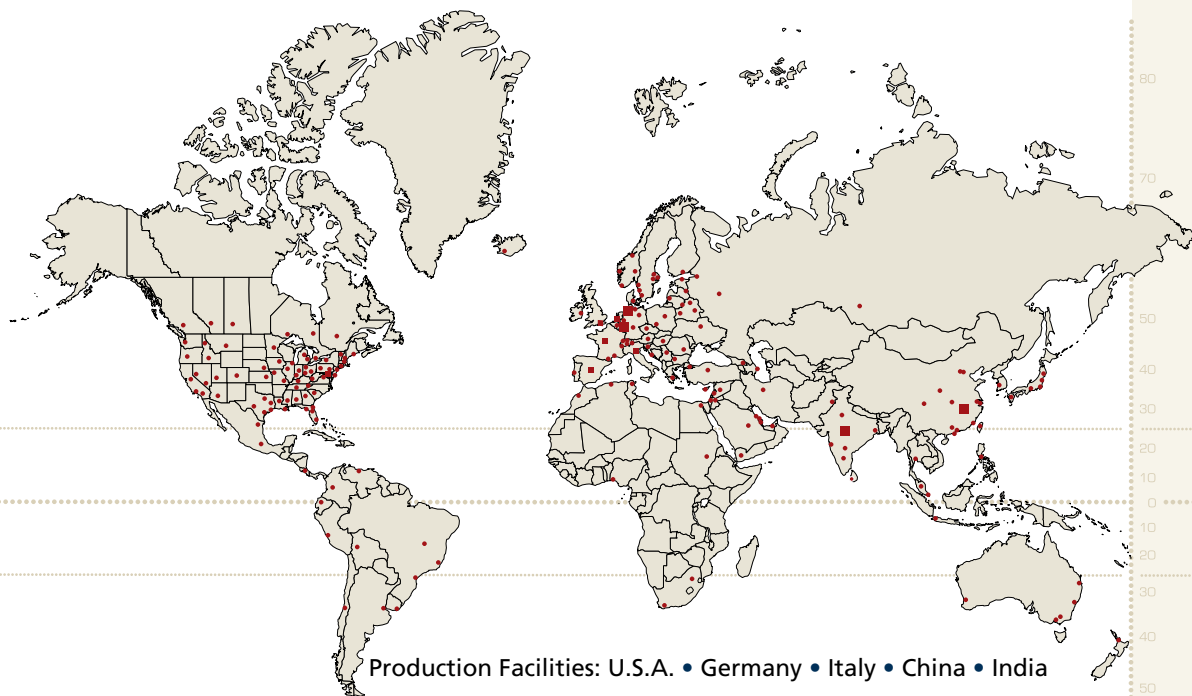
No matter how recent the hardware is in a controller, any flash memory has a limited number of write cycles before it fails. A typical number is 1 million cycles (1,000,000) which if someone is writing to every 10 seconds, can be reached rather quickly. The unit will fail in 115 days, i.e. less than 3 months.

60 seconds per minute, 60 minutes per hour = 3600 seconds

Seconds per hour	Write cycle (seconds)	# of writes per hour	# of writes per day	Days to reach 1 million	Years
3600	10	360	8640	115.7	0.3
3600	20	180	4320	231.5	0.6
3600	30	120	2880	347.2	1.0
3600	60	60	1440	694.4	1.9
3600	120	30	720	1388.9	3.8
3600	300	12	288	3472.2	9.5
3600	600	6	144	6944.4	19.0







*STULZ mission is to be the premier provider of energy efficient temperature and humidity control solutions for mission critical applications.*

STULZ Air Technology Systems, Inc.  
1572 Tilco Drive, Frederick, Maryland 21704  
Phone: 301.620.2033, Fax: 301.662.5487  
E-mail: [info@stulz-ats.com](mailto:info@stulz-ats.com)

[www.STULZ.com](http://www.STULZ.com)



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