



**COMETH-EMBD  
COMETH-EMBD-EVAL  
COMETH-EMBD-ETH  
USER GUIDE**



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# I. INTRODUCTION

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## I.1 Purpose of this manual

This manual provides instructions to easily integrate the COMETH-EMBD-xxx component on your PCB. (xxx indicate suffix ETH, suffix EVAL, or no suffix).

Chapter II “Package checklist” allows you to check if your package was complete when delivered.

Chapter III “Product specifications” describes the fundamental possibilities of the product.

Chapter IV “Ethernet PCB routing rules and constraints” gives some background required to install the COMETH.

Chapter V “Getting started” is a step-by-step description of a typical COMETH installation in a simple application context.

Chapter VI “Troubleshooting” gives hints on what to do when the installation fails.

Chapter VII “Advanced configuration” describes all the configuration parameters you can use, and how to use them.

Chapter VIII “Addressing in Network protocols” gives some background in networking, required to install the COMETH.

It is expected that the reader of this manual has some background knowledge of TCP/IP and how to setup and use TCP/IP on a Windows-based PC. As well, anyone installing a COMETH should know how his/her network is organized.

## I.2 The software

The COMETH FLASH EPROM can contain up to six different firmwares, including client and server software, tunnelling, modbus support, etc. New firmwares can be developed by ACKSYS to meet specific needs. To list all firmwares flashed in the COMETH FLASH EPROM, a dedicated administration command (show prog list) can be run (see chapter VII.4)

See [download firmware user guide\(DTUS040\).pdf](#) documentation to understand in details the software architecture.

All the embedded firmwares have an administration system relying on a Command Line Interpreter. The administration system is accessible through the serial port as well as through the network. It's also accessible with windows browser.

Administration commands common to all firmwares are documented in chapter VII.4 "Commands list".

The commands specific to other firmwares (SERVERCOM, MODBUS TCP, MULTIPOINT, TCPCLIENT...) are documented in a dedicated manual (See the ACKSYS CDROM or acksys web site: <http://www.acksys.fr>)

Upon delivery, the default firmware enabled is "SERVERCOM", which enables two main functionalities :

- TCP server: To use COMETH in raw mode with a network (socket) application
- Telnet RFC2217: To use COMETH with a com application (needs a COM port redirector like VIP)



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## II. PACKAGE CHECKLIST

---

The **COMETH-EMBD** package contains the following components :

- One COMETH-EMBD device
- ACKSYS CD-ROM

The **COMETH-EMBD-EVAL** package contains the following components :

- One COMETH-EMBD device
- One separate Ethernet RJ45 transformer/connector
- One 9 pins double row female connector
- One 5 pins double row female connector
- ACKSYS CD-ROM

The **COMETH-EMBD-ETH** package contains the following components :

- One COMETH-EMBD-ETH device with built-in Ethernet RJ45 interface
- ACKSYS CD-ROM

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## III. PRODUCT SPECIFICATIONS

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### III.1 Characteristics

Serial (TTL) single channel server over Ethernet TCP/IP (10 BASE T)  
 Printed circuit model (embedded applications)  
 High density connectors  
 External power supply 4.5 VDC to 5.5 VDC or 3.3 VDC

#### III.1.1 COMETH-EMBD

OEM version without its transformer and RJ45 connector

#### III.1.2 COMETH-EMBD-EVAL

OEM version with transformer and additionnal connector in separate package

#### III.1.3 COMETH-EMBD-ETH

OEM version with its transformer and RJ45 connector and 3 LEDs mounted  
 Ethernet isolation 1.5 KV

### III.2 Pinout description

#### III.2.1 J5 Connector (not mounted on COMETH-EMBD-ETH version)

PIN	NAME	TYPE	FUNCTION
1	TX_P	OUPTPUT	Ethernet positive side differential output
2	GND	GROUND	GROUND
3	TX_M	OUTPUT	Ethernet negative side differential output
4	DLLINK	OUTPUT	Ethernet Link Present LED, active high
5	RX_P	INPUT	Ethernet positive side differential input
6	DLCOLL	OUTPUT	Collision LED (not used in standard software)
7	RX_M	INPUT	Ethernet negative side differential intput
8	DLTXRXRS	OUTPUT	UART Activity LED (Tx/RxRS LED), active high
9	GND	GROUND	GROUND
10	GND	GROUND	GROUND

### III.2.2 J6 Connector

PIN	NAME	TYPE	FUNCTION
1	IOVDD	INPUT POWER	POWER 3.3Vdc <sup>note 1</sup> <b>(IF VCCIN NOT USED)</b>
2	GND	GROUND	GROUND
3	/TSS	INPUT	Target SPI Slave Select (used only for in-system programming)
4	TSI	INPUT	Target SPI Serial Data Input (used only for in-system programming)
5	TCLK	INPUT	Target SPI Clock (used only for in-system programming)
6	TDO	OUTPUT	Target SPI Serial Data Output (used only for in-system programming)
7	RITTL	INPUT	RI UART signal, active low
8	VCCIN	INPUT POWER	POWER 5Vdc <sup>note 1</sup> <b>(IF IOVDD NOT USED)</b>
9	CTSTTL	INPUT	CTS UART signal, active low
10	GND	GROUND	GROUND
11	DSRTTL	INPUT	DSR UART signal, active low
12	RTSTTL	OUTPUT	RTS UART signal, active low
13	DCDTTL	INPUT	DCD UART signal, active low
14	DTRTTL	OUTPUT	DTR UART signal, active low
15	JPADMIN	INPUT	Administration mode jumper, active high. To provide this function, the asynchronous serial interface must support some way to connect a console.
16	TXTTL	OUTPUT	TXdata UART signal, active high <sup>note 2</sup>
17	DLADMIN	OUTPUT	Administration (Diag) LED. This pin is HiZ to turn on the LED, and it is GND to turn off the LED. This allows the led to turn on at boot time until the software takes control.
18	RXTTL	INPUT	RXdata UART signal, active high <sup>note 2</sup>

Note 1 : use IOVDD or VCCIN pin. NEVER use both.

Note 2 : GND = bit set to zero, VCC/VDD = bit set to one. Use an inverter to generate RS232 polarity.

### III.2.3 Ethernet connector cabling (COMETH-EMBD-ETH version)

RJ45 connector (8 pins)		
PIN	Signal name	Direction
1	TxD+	Output
2	TxD-	Output
3	RxD+	Input
4	N.C.	Not Connected
5	N.C.	Not Connected
6	RxD-	Input
7	N.C.	Not Connected
8	N.C.	Not Connected

### III.3 Electrical characteristics

#### III.3.1 Absolute maximum rating

Parameter	Minimum	Maximum	Units
Ambient temperature	0	70	°C
Storage temperature	-40	85	°C
Voltage on IOVDD	-0.5	4.5	V
Voltage on VCCIN	4.2	6	V
Voltage on TSCK, TSI, /TSS, RITTL, DSRTTL, CTSTTL, DCDTTL, RXTTL	-0.5	5.7	V
Voltage on RX_M, RX_P	-0.5	3.5	V

#### III.3.2 DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
IOVDD	Supply voltage <sup>note 1</sup>	3	3.3	3.6	V
VCCIN	Supply voltage VCCIN <sup>note 1</sup>	4.5	5	5.5	V
IDD	Supply current		130	160 <sup>note 2</sup>	mA
VIH	Input high voltage RITTL, DSRTTL, CTSTTL, DCDTTL, RXTTL	1.8	3.3	5.5	V
	Input high voltage RX_P, RX_M	1.8	3.3	5.5	V
	Input high voltage TSCK, TSI, /TSS	2.25	3.3	5.5	V
VIL	Input low voltage RITTL, DSRTTL, CTSTTL, DCDTTL, RXTTL			1	V
	Input low voltage RX_P, RX_M			1	V
	Input low voltage TSCK, TSI, /TSS			1.05	V
VOH	Output high voltage TXTTL, RTSTTL, DTRTTL, TX_P, TX_M, TSO, DLLINK, DLADMIN, DLCOLL, DLTXRXRS at IOH = 8 mA	2.4			V
VOL	Output low voltage TXTTL, RTSTTL, DTRTTL, TX_P, TX_M, TSO, DLLINK, DLADMIN, DLCOLL, DLTXRXRS at IOH = 6 mA			0.4	V
IOH	Output high current from TXTTL, RTSTTL, DTRTTL at VOH=2.4V	11	24	39	mA
	Output high current from TX_P, TX_M at VOH = 2.4V	27	60	96	mA
	Output high current from TSO at VOH = 2.4V	11	24	39	mA
	Output high current from DLLINK, DLADMIN, DLCOLL, DLTXRXRS at VOH = 2.4V	8	18	29	mA
IOL	Output low current from TXTTL, RTSTTL, DTRTTL at VOL=0.4V	9	10	20	mA
	Output low current from TX_P, TX_M at VOL = 0.4V	25	40	48	mA
	Output low current from TSO at VOL = 0.4V	9	16	20	mA
	Output low current from DLLINK, DLADMIN, DLCOLL, DLTXRXRS at VOL = 0.4V	6	11	14	mA

Note 1 : use IOVDD or VCCIN pin

Note 2: depending of user UART interface

### III.4 Power input

Connect a 3.3V power supply on IOVDD pin or a 5V power supply to VCCIN pin

Do not connect IOVDD and VCCIN simultaneously

Power consumption : 800 mW

Maximum current 160 mA at 5V

### III.5 LAN interface

Ethernet 10 BASE T

Ethernet II, IEEE 802.3

Ethernet speed 10 Mbps

IP Protocols: TCP, IP V4, Telnet, ICMP, RFC 2217, MODBUS-TCP, DHCP

One TCP port (port 23) reserved for remote TELNET administration, one UDP port (port 68) when DHCP is used, other TCP and UDP ports available and configurable for data exchange

**COMETH-EMBD-ETH:** RJ45 Ethernet connector and transformer connected

**COMETH-EMBD:** RJ45 Ethernet connector and transformer not included. You should use a connector with integrated transformer

**Integrated connector manufacturer part list recommended**

[www.bothand.com](http://www.bothand.com) : LF1S028

[www.xfmrs.com](http://www.xfmrs.com) : XF10BASEA-COMBO1-4S

Those connectors are also available with 2 integrated LEDs

**COMETH-EMBD-EVAL:** COMETH-EMBD with RJ45 Ethernet connector and integrated transformer provided

### III.6 Serial interface

Control signals: TxD, RxD, RTS, DTR, CTS, DSR, DCD and RI signals

Speed: 10 to 230400 bps

Parity: none, even, odd, space or mark

Data bits: 7 or 8

Stop bits: 1 or 2

RITTL, DSRTTL, CTSTTL, DCDTTL, RTSTTL and DTRTTL : active low. 0V means signal is active (on/closed), +Vcc means signal is inactive (off/open)

TXTTL and RXTTL : +Vcc means MARK state (stop bit/1 bit), 0V means SPACE state (start bit/0 bit)

You can connect directly an interface to those pins. Example : for RS232 interface, you can use a MAX3243ECAI (3 output, 5 input)

### III.7 JPADMIN signal

**COMETH-EMBD:** Connect a pull up resistor from JPADMIN to IOVDD. (10 to 47 Kohms)

**COMETH-EMBD-ETH:** Do not connect JPADMIN

### III.8 In System Programming signals

Those pins are only necessary for COMETH-EMBD-xxx software maintenance.

Connect a pull up resistor from /TSS, TSCK, TSI to IOVDD (10 to 47 Kohms) for normal operation

Specific cable and software are necessary

### III.9 Led indicators

**COMETH-EMBD-ETH:** Three LEDs indicators

Ethernet LINK active indication

General-purpose mode / error detection / reboot indicator

Asynchronous interface Rx/Tx activity

**COMETH-EMBD:** Three LEDs driving signal

**Ethernet LINK active indication :** a standard LED (with no integrated resistor) can be driven directly.

Connect DLLINK to the anode of the LED , and connect a resistor (220 to 470 Ohms) between the cathode of the LED and GND signal.

**General-purpose mode / error detection / reboot indicator :** a standard LED (with no integrated resistor) can be driven directly.

Connect DLADMIN to the anode of the LED.

Connect a resistor (220 to 470 Ohms) between IOVDD and the anode of the LED.

Connect the cathode of the LED to GND.

**Asynchronous interface Rx/Tx activity :** a standard LED (with no integrated resistor) can be driven directly.

Connect DLTXRXRS to the anode of the LED , and connect a resistor (220 to 470 Ohms) between the cathode of the LED and GND signal.

### III.10 Environmental limitations

Operating temperature: 0°C to 65°C ; tested up to 140 °C on sample pieces

Storage temperature: -40°C to +85°C

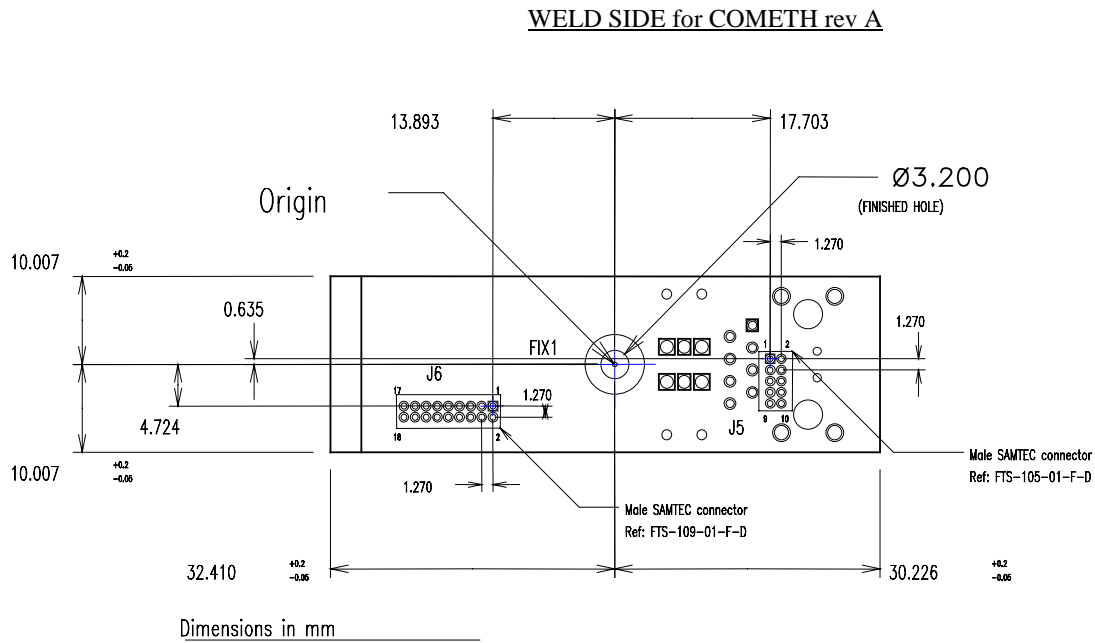
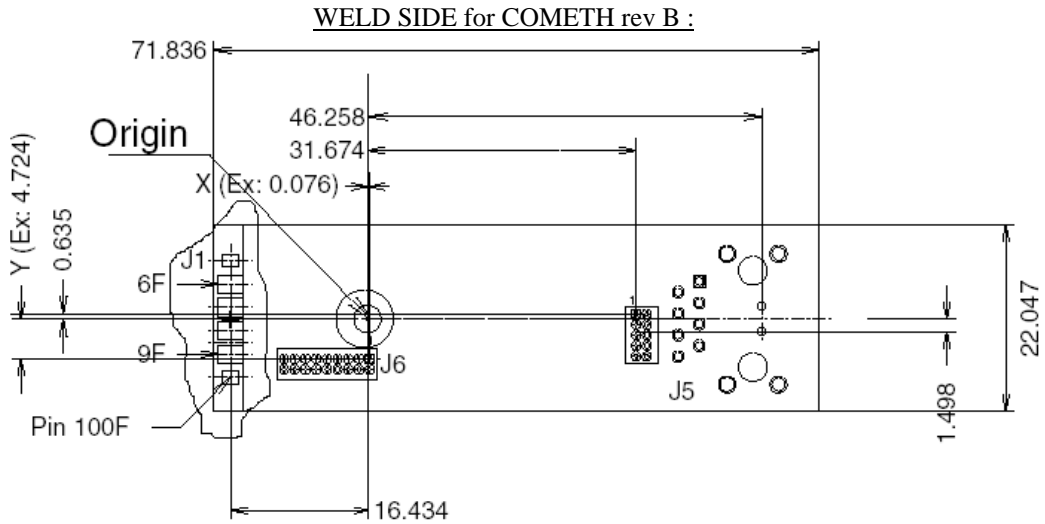
Humidity: 0-95% RH (without condensation)

### III.11 Product information label

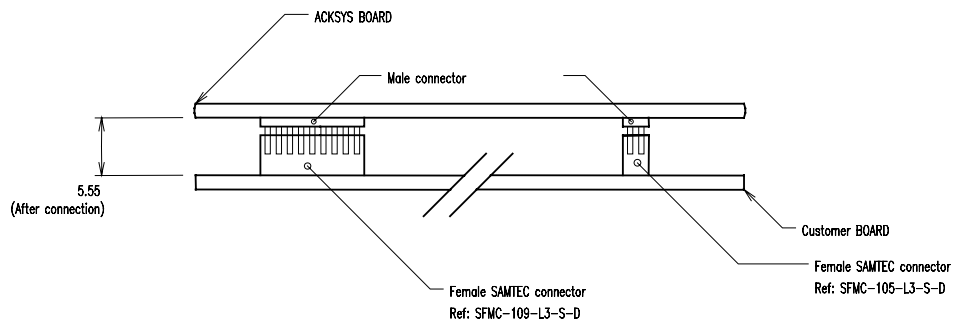
Located on the underside of the COMETH, it contains the following information:

- Product name
- Ethernet MAC Address (Also used as product serial number)

### III.12 COMETH-EMBD mechanical characteristics

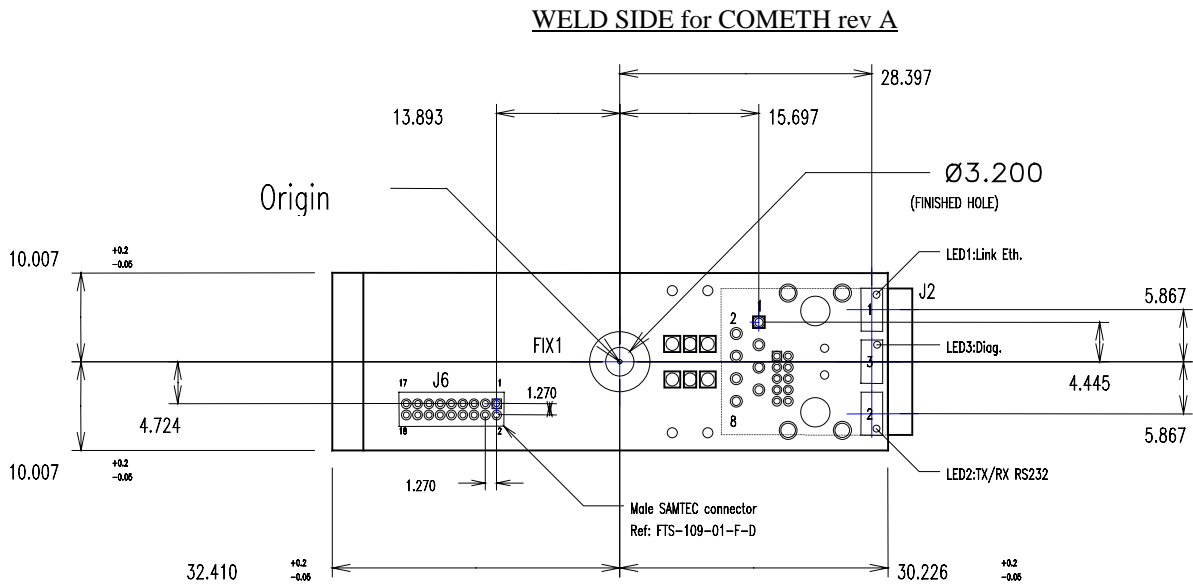
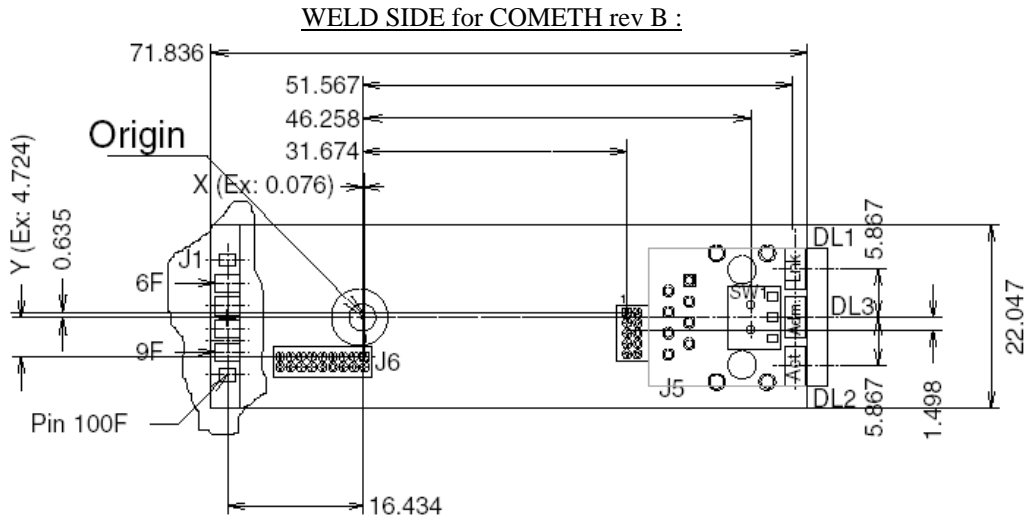


#### SIDE WAYS



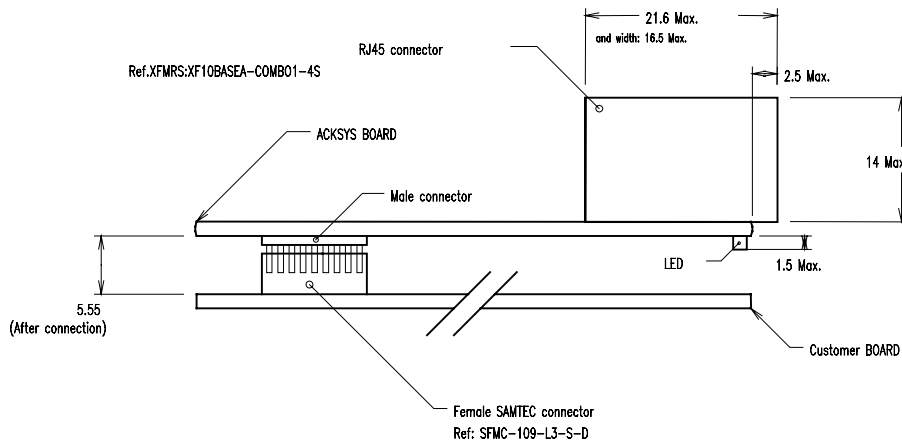


### III.13 COMETH-EMBD-ETH mechanical characteristics



Dimensions in mm

#### SIDE WAYS



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## **IV. ETHERNET PCB ROUTING RULES AND CONSTRAINTS**

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Host PCB routing of the Ethernet & RJ45 is very sensitive and requires the several precautions given below :

### **IV.1 TX and RX pairs**

RX\_P and RX\_M signals must have controlled impedance: 100 Ohms

TX\_P and TX\_M signals must have controlled impedance: 50 Ohms

Signals of the same pair must be routed exactly in a the same way, far from the other signals, on the same side, with the same length, width and thickness.

TX and RX pairs must be separated by a ground wire, or separated by a ground level.

Keep TX an RX pairs far from noisy signals (high speed signals, clock, ...)

### **IV.2 Terminating resistor**

The terminating resistor is already connected on the COMETH-EMBD board.

No more resistors are necessary.

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## V. GETTING STARTED

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This chapter describes the required steps to get COMETH device on-line and working.

### V.1 Determine the needs of your application

- Serial data format and baudrate
- Serial control signals driving source
- Electrical type of your serial interface
- What kind of application will use the COMETH. This will determine the COMETH firmware to use, as follows:

#### Firmware selection criterions

Firmware	use
DOWNLOAD	to upgrade the other firmwares.
MODBUS	for MODBUS/TCP or MODBUS tunnelling.
SERVERCOM	for COM port redirection or raw data tunnelling.
TCPCLIENT	allows a serial device to call in a network server, or raw data tunnelling.
MULTIPOINT	for multidrop applications and master/slave replacement

#### If you want to use the MODBUS protocol:

- in any case you can use the COMETH MODBUS firmware;
- if there is only one serial master, and one serial slave or several serial slaves all connected on the same shared serial cable, you can also use a couple of SERVERCOM and TCPCLIENT;
- if the masters are on the network, not on a serial link (they use MODBUS/TCP) you must use the COMETH MODBUS firmware on the slave side only;
- if the slaves are scattered among several access points in the network, you must use the COMETH MODBUS firmware on each slave side.

#### If you want to access a remote serial device in the same manner as a local port (including control signals):

- usually COMETH SERVERCOM on the device side and a COM port redirector on the computer will do that;

#### If you want to exchange serial data (no control signals) between two or more devices through a LAN:

- use COMETH MULTIPOINT on all the serial attachments involved.
- if you have only two devices, and not loosing data is more important than speed and network bandwidth, you must use COMETH SERVERCOM on one side, COMETH TCPCLIENT on the other side.

#### If you want to write a SOCKET application to access remote devices:

- use COMETH SERVERCOM in raw mode (TCP) to handle unrelated devices;
- use COMETH MULTIPOINT (UDP) to broadcast to several devices at the same time.

#### If you want a remote serial device to call into your application:

- COMETH TCPCLIENT is what you need.

## V.2 Collect network characteristics

You will need at hand the following information about your LAN:

Will the COMETH use DHCP :	<input type="checkbox"/>		
If DHCP is used:			
• Does the network administrator (or the DHCP server) require a specially crafted Client ID (DHCP option 61)?	<input type="checkbox"/>	client identifier:	_____
• Does the network administrator (or the DHCP server) require a Client Host Name (DHCP option 12)?	<input type="checkbox"/>	hostname identifier:	_____
If DHCP is not used:			
• IP address for the COMETH (see below):			____.____.____.____
• Does your LAN need use of a netmask?	<input type="checkbox"/>	Netmask value :	____.____.____.____
• Will the data connection or the admin connection cross a gateway?	<input type="checkbox"/>	Gateway address:	____.____.____.____

**COMETH IP address:** You must assign an IP address to the COMETH. **YOU CANNOT JUST PICK ONE AT RANDOM** and wish it will work! The chosen address must meet the following requirements :

- Its network part must match the network part of other devices on the same LAN,
- Its host part must be different from any other devices on the same LAN (beware of printers, routers and gateways),
- Its host part must not be a reserved value like 0 or 255.

**NETMASKS:** If no netmask applies, it can be deduced from the IP address class:

- Class A netmask 255.0.0.0
- Class B netmask 255.255.0.0
- Class C netmask 255.255.255.0

If in doubt, please ask to the local Network Administrator.

## V.3 Connect power supply

Connect the power supply to the COMETH.

Notice COMETH has no ON/OFF switch. It turns on automatically when power supply is connected.

## V.4 Administration by LAN

The default IP address of the COMETH is 192.168.1.253. You can install the COMETH for the first time by LAN only if your network can match this requirement. Only one new COMETH can be plugged on the LAN at a given time, until you have assigned a different IP address on each COMETH. Otherwise conflicts will result.

### V.4.1 Computer configuration

No switch is needed.

Configure a computer with 192.168.1.x IP address where  $x \neq 253$  and  $x \neq 255$  and  $x \neq 0$  and  $x \neq$  any address already assigned.

Check that the computer is connected to the same LAN than the COMETH.

### V.4.2 Run Telnet

```
C:\> telnet 192.168.1.253
```

Telnet displays a banner and a prompt from the COMETH

```
Type : login root
```

```
Password : root
```

## V.5 TCP/IP configuration

The IP address of the COMETH must be unique on the network. You can statically specify the address you want by means of the administration commands, or you can use an existing DHCP server on the network to give you an available address. If you define both DHCP and static IP address, the DHCP configuration will override the static IP.

### V.5.1 Static IP address configuration

In the following lines, replace XXX.YYY.ZZZ.TTT by the IP address and netmask you chose for the COMETH :

```
root> set net ip XXX.YYY.ZZZ.TTT
root> set net mask XXX.YYY.ZZZ.TTT
```

Now you should save the configuration changes :

```
root> save
root> reset
```

**Example:** this sample session will reinstall factory values:

```
root> set net dhcp off
OK
root> set net ip 192.168.1.253
OK
root> set net mask 255.255.255.0
OK
root> save
OK
root> reset
COMETH SERVERCOM version 2.12.0.0, Administration
mode ready
```

### V.5.2 Static router / gateway configuration

If the COMETH and the network application using it, are not on the same Ethernet LAN (i.e., if they are separated by one or more gateways (also caller routers), you must set the nearest gateway address into the COMETH, and you must set the maximum number of gateways to cross (if the factory default of 10 is not enough).

The following line is required only if you will cross more than ten gateways:

```
root> set net metric n
```

“n” is the number of gateways to cross. If you use a DHCP server that provides gateway information to the COMETH, you won’t need the following command. Otherwise, the following command is required if you need to cross one or more gateways :

```
root> set net gateway XXX.YYY.ZZZ.TTT
```

“XXX.YYY.ZZZ.TTT” is the address of the gateway closest to the COMETH (here, ‘closest’ means that it is on the same Ethernet LAN).

Do not forget to save the configuration changes :

```
root> save
root> reset
```



### V.5.3 Dynamic IP address and gateway configuration with DHCP

**Note:** DHCP is not available in early revisions of the firmwares. On a COMETH delivered in 2002, check the existence of the ‘show dhcp’ command to know if you need a firmware upgrade.

**Diag LED blink in DHCP mode:** When the diagnostic LED (red LED) is blinking once per second, the COMETH is requesting a network configuration to DHCP server.

#### **Functionality of the DHCP client:**

- supports all kinds of IP configuration (Manual, Automatic, Dynamic) (see RFC 1541).
- supports option 12 of RFC 2132 (Host name).
- supports option 61 of RFC 2132 (client ID). The default client ID used is the MAC address of the COMETH, or a ClientID configured by the “set net dhcp clientid” command. The MAC address is used if ClientID is empty.
- supports DHCP agent or BOOTP agent specified in RFC 2134.
- supports the infinite lease.

#### **Limitation of DHCP client in COMETH**

- the lease of DHCP server must be less than 24,9 days.
- RFC 2136 (DNS update with DHCP information) is not supported on the COMETH side. So, you need a DHCP server which supports RFC 2136. (for example, the Windows 2000 DHCP server).
- the COMETH has no IP address as long as the diag LED blinks.
- only the IP address, subnet mask, gateway address and lease time are used in the configuration information returned by the DHCP server.

In order to give an IP address to a COMETH, the DHCP server must be able to uniquely identify the requesting device (i.e. the COMETH). Hence the COMETH must provide a unique identification to the DHCP server.

Usually the MAC address is used for this purpose. Some administrators or DHCP servers require other kinds of identification. Hence you can either set up manually the “Client ID” (DHCP option 61), else the MAC address will be used as a string identifier. If you need, you can also set up a “Host Name” (DHCP option 12). The “Client ID” is always sent to the server. The “Host Name” is sent only if set manually.

**Example 1:** this sample session will use only the MAC address :

```
root> set net dhcp on
OK
root> show net dhcp clientid
undefined client id
root> show net dhcp hname
undefined host name
```

Now you should save the configuration changes :

```
root> save
root> reset
```

**Example 2:** use a network administrator-provided name ‘cometh-b12a27’ for the COMETH device:

```
root> set net dhcp on
OK
root> set net dhcp clientid cometh-b12a27
OK
root> show net dhcp
DHCP on
root> show net dhcp clientid
cometh-b12
root> show net dhcp hname
undefined host name
```

Now you should save the configuration changes :

```
root> save
root> reset
```

**Example 3:** use the MAC address for client id, and also a network administrator-provided host name “cometh12.mydomain.com”:

```
root> set net dhcp on
OK
root> set net dhcp clientid
OK
root> set net dhcp hname cometh12.mydomain.com
OK
root> show net dhcp
DHCP on
root> show net dhcp clientid
undefined client id
root> show net dhcp hname
cometh12.mydomain.com
```

Now you should save the configuration changes :

```
root> save
root> reset
```

## V.6 Activate the relevant firmware

In the first installation step you chose the COMETH firmware that most suited your needs. Now it is time to activate this firmware and set its own parameters.

Say that you determined that you need to activate the MULTIPOINT firmware. Connect to the administration (either through the network or the serial interface), identify yourself, then display the list of available firmwares:

```
root> show prog list
```

file	status	name	version	update...
/0	valid	DOWNLOAD STD	2.6.0.1	2.2
/1	valid	DOWNLOAD STD	2.6.0.1	2.2
/2	valid	SERVERCOM	3.4.0.0	2.6
/3	valid	MULTIPOINT	1.0.0.0	2.6
/4	valid	MODBUS-TCP	2.4.0.0	2.6
/5	valid	TCPCLIENT	1.2.0.0	2.6

OK

Now check the currently active firmware:

```
root> show prog enable
enable software :2
loading software : 2
```

In the list you can see the number of the file holding the desired firmware: the MULTIPOINT firmware is in file /3. Until now the active firmware was 2, which is SERVERCOM. You must now activate the desired firmware:

```
root> set prog enable 3
root> save
root> reset
```

Other informations about firmware download, installation and selection is given in :

[download firmware user guide\(DTUS040\).pdf](#)

## V.7 Install the COMETH in its final location

Now you can unplug the COMETH from the administration PC.

Check the cabling of your device against the cabling of the COMETH (see section III "Product specifications").

Plug the Ethernet jack from your HUB into the COMETH. The COMETH does not normally require a crossing cable. If the Ethernet cable is good and correctly inserted on both ends, the LINK signal should go on on the COMETH (and also on the HUB if it has a LINK led).

## V.8 Other configuration

Many other configuration options are available. You can enforce some setup or behavior of the asynchronous serial interface, change more network parameters like the data TCP port, set up security options, and so on. Please refer to the « Advanced configuration » section. Check also the “parameters settings” section of the relevant firmware document (i.e. SERVERCOM, MODBUS, MULTIPOINT...).

To use the SERVERCOM mode, see documentation:

[\*\*SERVERCOM UserGuide \(DTUS043\).pdf\*\*](#)

To use the MODBUS TCP mode, see documentation:

[\*\*MODBUS-TCP UserGuide \(DTUS041\).pdf\*\*](#)

To use the MULTIPOINT mode, see documentation:

[\*\*MULTIPOINT UserGuide \(DTUS056\).pdf\*\*](#)

To use the TCPCLIENT mode, see documentation:

[\*\*TCPCLIENT UserGuide \(DTUS045\).pdf\*\*](#)

*You are now ready to use the COMETH.*

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## VI. TROUBLESHOOTING

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Please check the following thoroughly before calling for support. If you must call, we will need complete information about your network topology, IP addresses of intervening devices, description of your device's serial connector, model of the computer and operating system.

**The checks should be done in the order given below.**

### VI.1 Checking the hardware

Three signals (LEDs) allow hardware diagnostic.

#### **Diag :**

- In Administration mode, this LED flashes twice per second, unevenly (bip bip... bip bip...)
- In Exploitation mode, this LED flashes when an error is detected in characters received on the asynchronous interface
- When resetting, this LED stays lighted until the COMETH is ready to use (usually in less than one second, or in about 10 seconds if you issued a "set prog enable" command before)
- Shortly after reset, if DHCP is enabled, the LED flashes once per second until network parameters are acquired
- The TCPCLIENT firmware flashes this LED five times per second whenever it is not connected to a server.

If the DIAG LED stays lighted at power up, it means that the COMETH is out of order. Try to power it down, then up again after a few seconds.

If the DIAG LED flashes to indicate Administration mode, push firmly the « Adm » switch in the opposite position (OFF).

#### **Tx/RxRS :**

- this LED flashes when sending or receiving data on the asynchronous serial interface.

If the Serial Tx/RxRS LED stays off while your device is sending data, it means that the RS cable is bad, improperly connected, or some kind of flow control forbids transmission.

If the Serial Tx/RxRS LED stays off while you are sending data to your device, it means that some kind of flow control forbids transmission, or the COMETH does not receive Ethernet data frames.

#### **Link Eth :**

- this led lights up when the COMETH is correctly attached to the LAN.

If the LINK LED stays off, it means that your cable is bad, incorrectly inserted in the HUB or in the COMETH, or the HUB is crossing the cable, or the cable is crossed.

## VI.2 Checking the network topology

In the following examples the COMETH IP address is 192.168.1.253 ; the computer used for the tests has IP address 192.168.1.244.

- First you must ensure that the COMETH has a unique IP address on the local network. Disconnect the COMETH from the LAN, then try to PING the COMETH address from a computer connected to the local network. This should result in an error or timeout :

```
C:\>arp -d 192.168.1.253
C:\>ping 192.168.1.253
Pinging 192.168.1.244 with 32 bytes of data :
Request timeout.
Request timeout.
Request timeout.
Request timeout.
```

The « Request timeout » error messages are normal and expected in this case. If this is not the case, another host has the same IP address. Correct the problem.

If the answer is some message like « no route to host », the computer you are using for the test has no access to the COMETH's LAN, or the network part of the IP address of the COMETH is incorrect.

- Now reconnect the COMETH to the LAN and try to PING it :

```
C:\>arp -d 192.168.1.253
C:\>ping 192.168.1.253
Pinging 192.168.1.244 with 32 bytes of data :
Answer from 192.168.1.253 : bytes=32 time<10ms TTL=64
Answer from 192.168.1.253 : bytes=32 time<10ms TTL=64
Answer from 192.168.1.253 : bytes=32 time<10ms TTL=64
Answer from 192.168.1.253 : bytes=32 time<10ms TTL=64
```

If there is no answer, the IP address of the COMETH is not this one. Correct the problem with the administration system. Be sure to save the changed configuration.

- Then, if you need to cross a gateway, PING the COMETH from a computer installed on the other side of the gateway.

DO NOT just move the above-mentioned computer from one LAN to the other ! You must set a new, appropriate IP address in the computer when you move it from one LAN to another.

If there is no answer, the gateway IP address or the netmask is improperly set in the COMETH or in your computer. Correct the problem with the administration system. Be sure to save the changed configuration and reset the COMETH.

Also the gateway itself may be improperly set. Check with your network administrator.

Did you set the gateway address (if any) in the COMETH ? Else the COMETH can receive the PING but does not know where to send the answer.

### **VI.3 Checking the configuration**

When you can PING the COMETH, you should be able to use remote administration. Try to connect to the administration system :

```
C:\> telnet 192.168.1.253
```

If the connection is refused, another TELNET is already connected to the COMETH.

You can also use the asynchronous port administration. Please refer to the installation guide to do this.

### **VI.4 Checking the software**

At this step, the COMETH network parameters are correctly set.

Any other problem remaining must come from either the remote side configuration, driver or software, or from mismatched configuration between the COMETH firmware in use and the remote side.

So please now refer to the relevant COMETH firmware user guide for further troubleshooting.

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## VII. ADVANCED CONFIGURATION

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### VII.1 Access to administration commands

You can access the administration system by one mean : TELNET through the LAN.

The TELNET administration is activated by TELNETing to the IP address of the COMETH, on port 23 (which is the default port for TELNET). In this way data transfer can proceed in parallel. This is useful for probing the configuration without changing it.

When TELNETing to one out of many COMETH, you can wonder where is the device you are accessing. There is a field called « location » that you can set up and display, to reflect the physical location of the device.

### VII.2 Security

The access to the administration system through TELNET is protected with a username (login) and password. The default setting is:

- login **root**
- password **root**

You can change these settings. You can display the COMETH configuration without logging in, but you cannot change it. This behavior can be changed to NOT displaying the configuration as well, without the proper password.

You can forbid administration from the network. **WARNING : DOING THIS WILL FORBID FURTHER ADMINISTRATION.** After you have forbidden administration from the network, any change in the COMETH configuration can only be achieved in one of two ways :

- by administering through serial port if it is accessible from a terminal and if the administration switch is available.
- by sending it back to ACKSYS for factory reset (WARRANTY DOES NOT APPLY TO THIS SERVICE).

**BEWARE!** If you are using a COMETH-EMBD with no console access to the serial interface, forbidding network administration will effectively disable EVERY means to configure the COMETH!

### VII.3 Handling disconnections in TCP

Some COMETH firmwares use the TCP protocol to communicate with its client application. While this protocol provides reliable data transfers, it requires the client to establish a “virtual link” with the COMETH and to relinquish this link in order to allow another client to call in the COMETH.

If the client software crashes, it has no time to relinquish the link and the COMETH keeps thinking that the link is established with a client that has disappeared. Now, if the client application is restarted and tries to connect, the COMETH will reject the call because it thinks it’s already connected.

Two features of the COMETH allow the management of such cases.

**Note:** These features were not available in early revisions of the firmwares. On a COMETH delivered in 2002, check the existence of the 'show net reconnect' command to know if you need a firmware upgrade.

**Keep-alive and segment timeout:** These features allow a COMETH device to detect a possible loss of connection with the remote client, thus relinquishing the obsolete link and allowing a new connection request to be accepted.

When no data exchange takes place between the client and the COMETH, the **keep-alive** feature will wait for a defined amount of time (say, the activation delay). Then it will probe the client several times, waiting a bit (say, the interval delay) between each probe for an answer from the client. If none of the probes is answered, the COMETH closes the TCP connection. In the process, it may also drop control signals on the asynchronous serial port, depending on the serial dtr and rts settings.

The "set net keepalive..." and "show net keepalive..." series of commands allow you to set up this mechanism.

When data sent from the COMETH is not acknowledged by the remote client, the COMETH will retransmit. By default it will retry indefinitely. The optional **data segment timeout** feature defines a maximum delay, after which the TCP connection will close, dropping the current data and possibly control signals on the asynchronous serial port, on the assumption that the client will reestablish the connection when it detects that it was lost.

The "set net keepalive..." command also sets the segtmo parameter for a corresponding amount of time. The "set net segtmo..." and "show net segtmo..." commands allow you to set up this parameter independantly.

**Forced reconnection:** The 'reconnect' feature, as an alternative to the keep-alive mechanism, allows the Cometh to accept unconditionally, at any time, a new connection request emanating from the same IP address as the currently opened connection (this one is then closed immediately).

The "set net reconnect..." and "show net reconnect..." series of commands allow you to set up this mechanism.

**Security note:** Although the "forced reconnection" method seems more attractive than keep-alive, it may lead to security weakness that should be carefully considered in sensitive environments (since connection request packets may be forged by a malevolent user on an open network, a denial of service to the legitimate user can be induced when this feature is used).

## VII.4 Commands list

### General-purpose commands :

<b>login</b> <i>username</i>	start the administrator identification sequence. Ask password.
<b>save</b>	save the current configuration to the permanent configuration memory which is used after reboot and remains when the COMETH is powered off.
<b>reset</b>	close the administration session and reboot the COMETH, to ignore parameters changed but not saved, or to reload saved parameters.  The following parameters do not need a reset to take effect: location, id2217, showperm, netconfigperm, serial termtype.
<b>quit</b>	close administration session (TELNET only).

### General parameters changes :

<b>set login</b> <i>username</i>	change administrator name. 8 bytes max. Upper and lower cases.
<b>set password</b> <i>password</i>	change administrator password. 8 bytes max. Upper and lower cases.
<b>set location</b> <i>location</i>	change location description. 30 bytes max. Upper and lower cases.
<b>set showperm allow</b> <b>set showperm deny</b>	allow or deny the right to display configuration information without entering the administrator password.
<b>set netconfigperm allow</b> <b>set netconfigperm deny</b>	allow or deny the right to use the administration system from the network.

### firmwares parameters changes : (See [download firmware user guide\(DTUS040\).pdf](#))

<b>set prog enable</b> <i>Seg</i>	Enable firmware located in segment Seg.
-----------------------------------	---

### Network parameters changes :

<b>set net ethernet</b> <i>XX:XX:XX:XX:XX:XX</i>	change COMETH Ethernet address. 6 hex digits separated by columns. DO NOT CHANGE if you don't know exactly the consequences.
<b>set net dhcp on</b> <b>set net dhcp off</b>	These two commands turn on or off the DHCP client. When DHCP is on, the manually specified IP address is not used.
<b>set net dhcp clientid</b> <i>ident</i>	replace the standard client ID (MAC address as a string) by the custom string <i>ident</i> . 15 bytes max, upper and lower cases allowed.
<b>set net dhcp clientid</b>	delete the custom client ID and use the standard client ID.
<b>set net dhcp hname</b> <i>hostname</i>	provide the DHCP server with the supplementary Host Name option, with value <i>hostname</i> . 19 bytes max, no spaces allowed, upper and lower cases allowed.
<b>set net ip</b> <i>aaa.bbb.ccc.ddd</i>	change COMETH IP address in dotted decimal notation.
<b>set net mask</b> <i>aaa.bbb.ccc.ddd</i>	change the subnet mask.

<b>set net gateway</b> <i>aaa.bbb.ccc.ddd</i>	change the default gateway IP address.
<b>set net metric</b> <i>mmm</i>	number of gateway hops. <i>mmm</i> is <b>1</b> to <b>255</b> .
<b>set net keepalive</b> <i>n t1 t2</i>	<i>n</i> defines the number of probes to send before closing the connection. <i>t1</i> defines the time in seconds before sending the first probe since the connection is inactive (the “activation delay” mentioned earlier). <i>t2</i> defines the time in seconds between each probes (the “interval delay” mentioned earlier). <i>n</i> ranges from 1 to 255. <i>t1</i> and <i>t2</i> range from 1 to 65535.
<b>set net keepalive 0 0 0</b>	disables use of the keep-alive feature.
<b>set net segtmo</b> <i>nsec</i>	<i>nsec</i> is the retransmission timeout (in seconds). Set to 0 to retransmit indefinitely.
<b>set net reconnect on</b> <b>set net reconnect off</b>	These two commands turn on or off the “forced reconnection” feature.

**Setting/displaying a group of parameters :**

The following commands allow to retrieve and set globally the COMETH configuration.

**Security note:** sensitive data, like login and password information, are conveyed in clear text by the following commands. You must take any step to protect these data from disclosure. As a basic protective step, the commands themselves can only be used by a logged-in operator.

**Usage note:** Some data conveyed by these commands should be kept unique to a COMETH. This applies especially to the IP and MAC addresses in the ‘common’ parameters. You should either avoid to change this unique data or to restore them after using the ‘set’ commands.

**Usage note:** Some parameters take effect immediately, as specified elsewhere. Beware that the parameters you change do not affect the COMETH at the moment you set them. For example, if you change the DHCP Client Id, this will take effect at the next lease expiration, which could happen soon. If you change the MAC address, it could adversely affect ARP responses if such a request is received. For these reasons a ‘set common’ command should be followed by a ‘save’ and a ‘reset’ command.

**set default** restore factory defaults, except the MAC address, the save count, the current firmware and the next firmware to run.

**set common** *offset hex:hex:hex...* insert the specified values in the data area which holds all the configuration parameters common to all firmwares in the COMETH.

This command should be copied and pasted from the output of the corresponding ‘show’ command below. Its purpose is to copy exactly a COMETH’s configuration in another COMETH, or to restore a lost configuration.

**show common** *offset* display all the configuration parameters common to all firmwares in the COMETH. *offset* must be **0**.

The purpose of this command is to display the ‘set common’ commands (see above) necessary to fully restore common parameters in a COMETH.

**set local** *offset hex:hex:hex...* insert the specified values in the data area which holds all the configuration parameters specific to one of the firmwares in the COMETH.

This command should be copied and pasted from the output of the corresponding 'show' command below. Its purpose is to copy exactly a COMETH's configuration in another COMETH, or to restore a lost configuration.

BEWARE! There are as many parameter sets as firmware segments in the COMETH FLASH EPROM. The same firmware can be downloaded in several segments in the COMETH; for example for testing purpose. In this case there will be several parameter sets for this firmware

**show local** *offset* display all the configuration parameters specific to one of the firmwares in the COMETH. *offset* must be **0**.

The purpose of this command is to display the 'set local' commands (see above) necessary to fully restore common parameters in a COMETH.

**Parameters display :**

Displaying the configuration parameters is allowed if the **showperm** parameter is set to « allow ». If it is set to « deny », the configuration parameters can only be displayed by the administrator after logging in..

Some parameters can be displayed for your information but cannot be changed.

<b>show version</b>	firmware version
<b>show location</b>	physical location of the COMETH
<b>show showperm</b>	is anybody allowed to display configuration ? <b>allowed / denied</b>
<b>show netconfigperm</b>	is it allowed to administer from the network ? <b>allowed / denied</b>
<b>show savecount</b>	number of times the 'save' command has been used
<b>show net ethernet</b>	assigned ethernet address
<b>show net dhcp</b>	DHCP use: on/off
<b>show net dhcp clientid</b>	value enforced on DHCP option 61, if any.
<b>show net dhcp hname</b>	value assigned to DHCP option 12, if any.
<b>show net ip</b>	assigned IP address
<b>show net mask</b>	local subnet mask
<b>show net gateway</b>	default gateway IP address
<b>show net configport</b>	administration port (telnet = 23)
<b>show net txsize</b>	max. size of sent frames
<b>show net rxsize</b>	max. size of received frames
<b>show net metric</b>	number of allowed gateway hops for outgoing traffic. <b>0-255</b> .
<b>show net keepalive</b>	keepalive parameters as <b>n probes, t1/t2 sec</b> ; else "Keepalive off".
<b>show net segtmo</b>	segment retransmission timeout in seconds.
<b>show net reconnect</b>	forced reconnection feature use: on/off
<b>show prog info</b> <i>Seg</i>	Display informations about firmware located in segment Seg.
<b>show prog data</b> <i>Seg</i>	same, in computer-readable format.
<b>show prog list</b>	Display informations about all 6 firmwares.
<b>show prog enable</b>	Display the currently running firmware and the one that will run after the next reset.

## VII.5 Factory settings common to all firmwares

<b>prog enable</b>	SERVERCOM firmware located in segment /2 Functionnalities : Raw TCP server, TELNET & TELNET 2217
<b>login</b>	root
<b>password</b>	root
<b>location</b>	unknown location
<b>showperm</b>	allowed
<b>netconfigperm</b>	allowed
<b>net ethernet</b>	device serial number written on the label
<b>net dhcp</b>	off
<b>net dhcp hname</b>	empty (not sent)
<b>net dhcp clientid</b>	empty (MAC address sent as string)
<b>net ip</b>	192.168.1.253
<b>net mask</b>	255.255.255.0
<b>net gateway</b>	0.0.0.0 (no gateway/router)
<b>net configport</b>	23
<b>net txsize</b>	576
<b>net rxsize</b>	576
<b>net metric</b>	10
<b>net keepalive</b>	off
<b>net segtmo</b>	off
<b>net reconnect</b>	off

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## VIII. ADDRESSING IN NETWORK PROTOCOLS

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### VIII.1 TCP/IP network layers

TCP/IP is the name of the protocols used by Internet and many Intranets.

In a device participating in a TCP/IP network, there are four software layers: the **application layer**, the **transport layer** (TCP or UDP), the **network layer** (IP), the **LAN layer** (Ethernet, Wifi, point-to-point modems, etc.)

The **LAN layer address** allows a device to send data to another device connected to the same LAN. But there is not enough information in a LAN address to send to a device connected on another LAN through a router.

The **Network (IP) address** solves this problem by defining addresses which can be subject to routing. When the source and destination devices are not on the same LAN, the source device can send data to an intermediate gateway (also called router). The gateway has routing tables which allows it to forward data to the destination device, maybe through other gateways.

The a **transport layer address**, called a “port”, is used inside a destination device to deliver data to the correct application process.

### VIII.2 Ethernet Address

The Ethernet address is also referred to as the hardware address or MAC address. The first three bytes are fixed to Hex 00 09 90 and identify an ACKSYS product. The last three bytes are specific to each COMETH product. This address is assigned at the factory and should not be changed.

An Ethernet LAN can be made of hubs, switches, bridges. These must not be confused with IP gateways (see below).

### VIII.3 IP address

The IP address is a 4 bytes number unique to each device on the network, which hosts can use to communicate.

IP addresses can be private or public. Public ones are reserved to devices that require to send data over a public network, such as internet. They are usually purchased or leased from a local ISP.

The IP address is usually represented in the “decimal dotted notation” which consists of the decimal value of each of the four bytes, separated by dots.

The IP address is divided into two parts : network and host. To support different needs, three network classes have been defined. In the following, ‘x’ stands for the host part of the IP address.

A host part with all bits set to 1 is the broadcast address, meaning for « for every device ».

A host part with all bits fixed to 0 addresses the network as a whole (for example, in routing entries).

Class A network : IP address 1.x.x.x to 127.x.x.x

The first byte defines the network and the last three bytes define the host. Only 127 different class A networks exist, and each consist of up to 16.777.216 devices

Class B network : IP address 128.0.x.x to 191.255.x.x

The first two bytes define the network and the last two bytes define the host. Class B networks are typically used for large company networks, and each can consist of up to 65,534 devices.

Class C network : IP address 192.0.0.x to 223.255.255.x

The first three bytes define the network and the last byte defines the host. Class C networks are the most common and are often used in smaller company, and each network can consist of up to 254 devices.

More complex classes can be defined by manipulating the IP netmask associated with the IP address. See the [www.ietf.org](http://www.ietf.org) documentation.

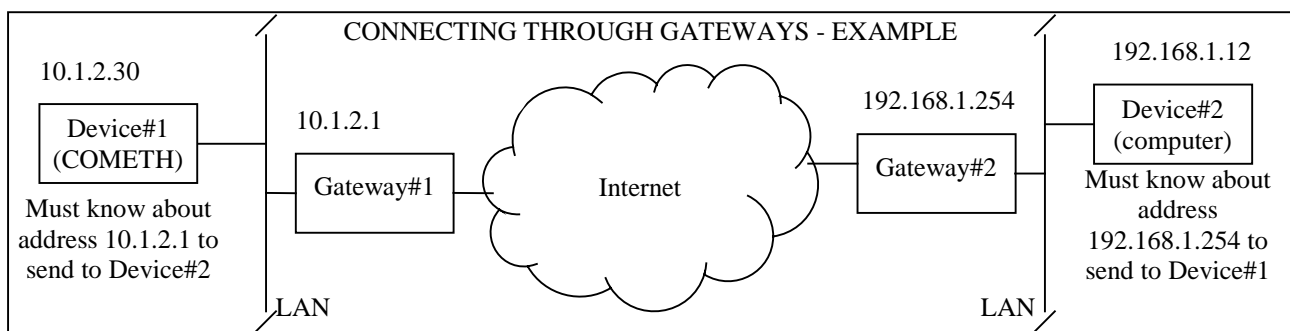
The bits set to one in the IP netmask define the bits of the associated IP address to be taken as the network part.

Network class	Network bits	Host bits	Netmask
A	8	24	255.0.0.0
B	16	16	255.255.0.0
C	24	8	255.255.255.0

Each COMETH has one user-assigned IP address. Its factory-assigned default value is the Class C address “192.168.1.253”.

### VIII.4 Gateways

Each network device communicating through gateways MUST know the IP address of the gateway nearest to it. It will use this gateway to forward data to farther LANs. If a device does not know its gateway, it may receive data but may not return an answer. For example this can forbid answering a PING even if the PING request makes its way to the device.



### VIII.5 TCP port number

Every TCP connection is defined by a source and destination IP address and port number. For example, a TELNET application commonly uses destination port number 23.

To support its two application processes, the COMETH, uses TCP port 23 to allow remote administration and one more TCP or UDP port, depending on the firmware, for data exchange with the asynchronous port.



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## IX. REFERENCES

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COM port redirection

<http://www.ietf.org/rfc/rfc2217.txt>

DHCP

<http://www.ietf.org/rfc/rfc1541.txt>

<http://www.ietf.org/rfc/rfc2132.txt>

<http://www.ietf.org/rfc/rfc2134.txt>

<http://www.ietf.org/rfc/rfc2136.txt>

Keep-Alives

<http://www.ietf.org/rfc/rfc1122.txt>

ACKSYS documentations

For the latest versions please check the download section of <http://www.acksys.fr>

CD-ROM documentations:

[download firmware user guide\(DTUS040\).pdf](#)

[SERVERCOM UserGuide \(DTUS043\).pdf](#)

[MODBUS-TCP UserGuide \(DTUS041\).pdf](#)

[MULTIPOINT UserGuide \(DTUS056\).pdf](#)

[TCPCLIENT UserGuide \(DTUS045\).pdf](#)





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