

COMETH-FIELD-RD USER'S GUIDE



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I. INTRODUCTION

I.1 Purpose of this manual

This manual provides instructions to easily install and configure the COMETH product on your network.

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

Chapter III “Connectors” describes the Serial and LAN connectors of the COMETH.

Chapter IV “Cabling recommendations” 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 the ACKSYS web site at <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)

II. PRODUCT SPECIFICATIONS

II.1 Characteristics

RS232 or RS422/RS485 to Ethernet 10/100 BASE T (excepted for COMETH-FIELD-RD rev A: 10 BASE T only) adapter with high frequency filter and surge protection

Din Rail metal housing including DB9 male connector on the RS232 side, DB9 female on the RS422/RS485 side and RJ45 on the Ethernet side

RS232, RS422/RS485 Master or Slave selection by software (built-in automatic turn-around in RS422 and RS485 mode)

External power supply 9 to 36 VDC

Power supply protection by current limitation

RS422/RS485 protection against temporary line voltage surges by peaks : 300 W (8/20 μ s), breakdown voltage +/-6.5V in common and differential mode, high surge capability (40A-8/20 μ s), ESD protection up to 15kV.

RS232 15 kV ESD protection

Ethernet isolation 1.5 KV

II.2 Power

External power 9 to 36 VDC

DC POWER via 3 pins screw terminal connector

For COMETH-FIELD-RD rev A

Maximum current 125 mA at 9 VDC

Power consumption : 1.1W max

For COMETH-FIELD-RD rev B

Maximum current 220 mA at 9 VDC

Power consumption : 2W max

II.3 LAN interface

RJ45 Ethernet connector Ethernet 10/100 BASE T (excepted for COMETH-FIELD-RD rev A : 10 BASE T only)

Ethernet II, IEEE 802.3

IP Protocols: ARP, IPv4, ICMP, UDP, TCP, DHCP, Telnet, RFC 2217

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

II.4 Serial interface

The serial interface mode is selectable by the COMETH administration mode. You can use RS232 or RS422/RS485 but not both simultaneously.

II.4.1 RS232

Full RS232 EIA/TIA 574 Serial interface
DB9 male connector with DTE pinout
Control signals: TxD, RxD, RTS, DTR, CTS, DSR, DCD and RI signals
Maximum RS232 distance : 15 meters
Speed: 10 to 230400 bps
Parity: none, even, odd, space or mark
Data bits: 7 or 8
Stop bits: 1 or 2

II.4.2 RS422/RS485

EIA RS422/RS485 – CCITT V11 Serial interface
DB9 female connector
Control signals: TxD, RxD
Built-in automatic turn-around
Line polarization selection by strap
Terminating resistor selection by jumper
Maximum load in RS422 : 10 receivers
Maximum load in RS485 : 32 receivers
Maximum transmission distance : 1200 meters at 115200 bps
Speed: 10 to 230400 bps
Parity: none, even, odd, space or mark
Data : 7 or 8 bits – 1 or 2 stop bits

II.5 Led indicators

Five LED indicators :
For COMETH-FIELD-RD rev A :
Power
Diagnostic / general-purpose mode / error detection / reboot indicator
Asynchronous interface Rx/Tx activity
Ethernet LINK active indication
Lan interface Rx/Tx activity
For COMETH-FIELD-RD rev B :
Power
Diagnostic / general-purpose mode / error detection / reboot indicator
Asynchronous interface Rx/Tx activity
10 Base T Link and interface Rx/Tx activity
100 Base Tx Link and interface Rx/Tx activity

II.6 Switches

One switch allows asynchronous serial interface mode selection
(Administration / Data)

II.7 Environmental limitations

Operating temperature: 0°C to 65°C
Storage temperature: -40°C to +85°C
Humidity: 0-95% RH (without condensation)

II.8 Product information label

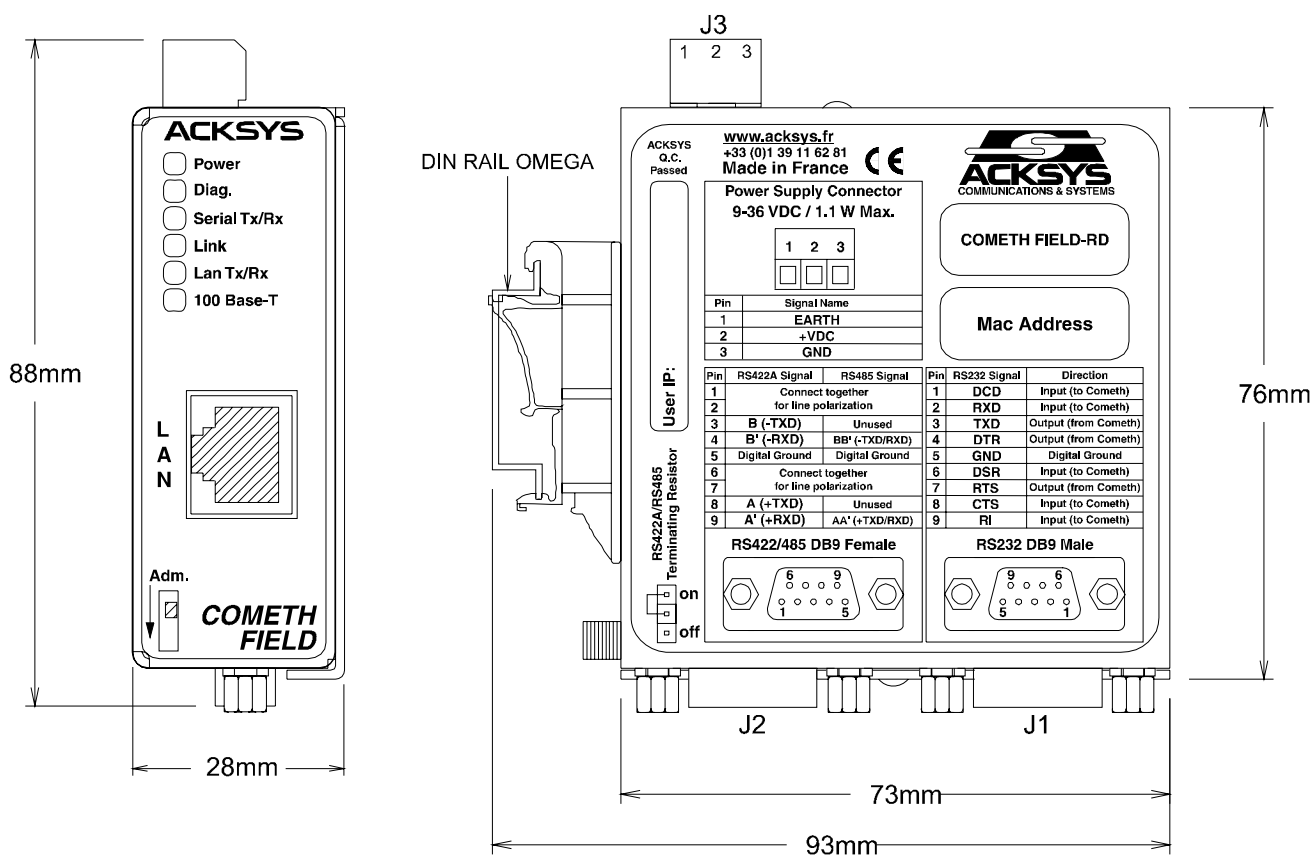
Located on the underside of the COMETH, it contains the following information:

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

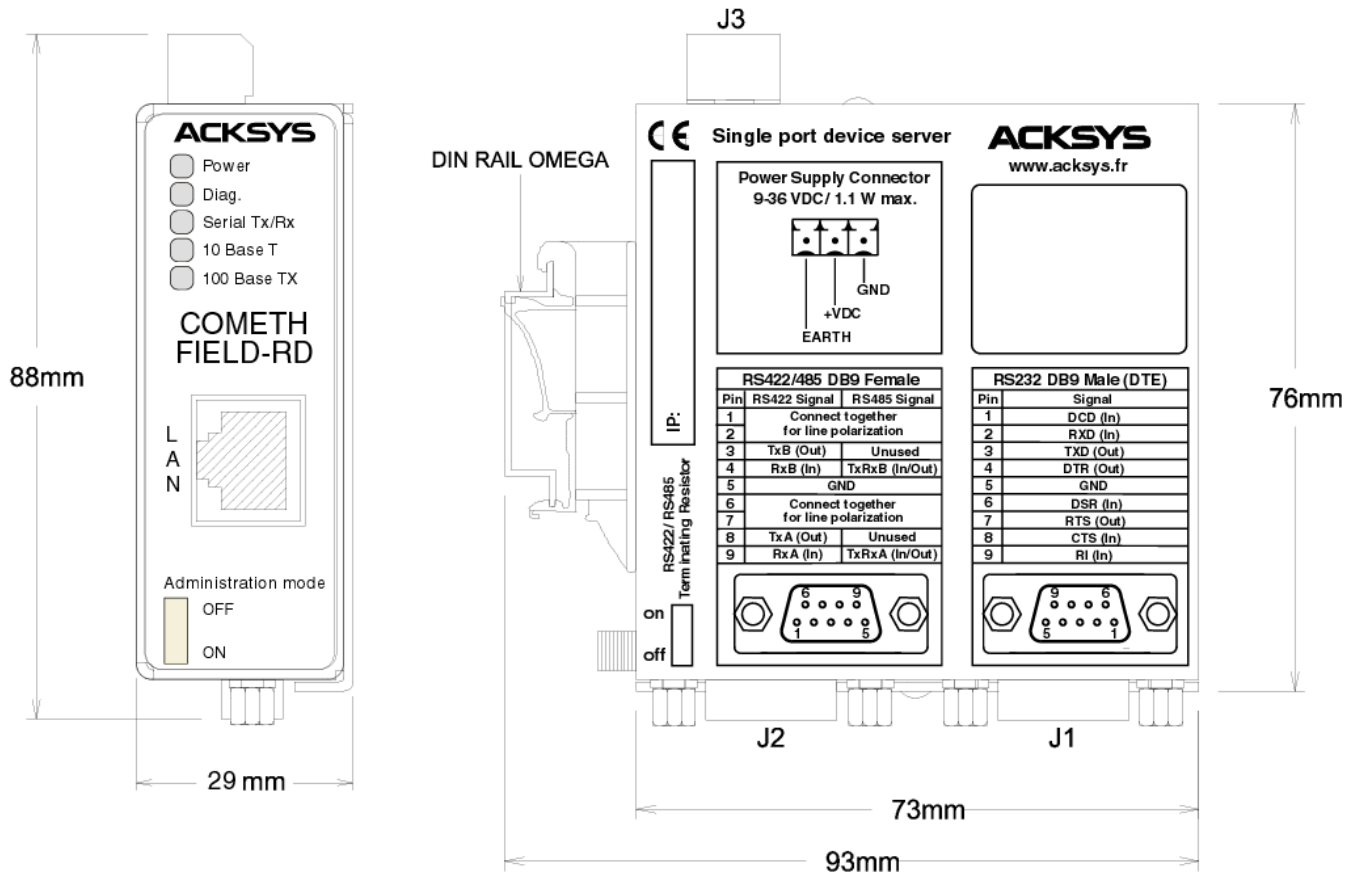
II.9 Mechanical characteristics

Metal housing
Weight : 0.120 Kg

For COMETH-FIELD-RD rev A



For COMETH-FIELD-RD rev B



II.10 Differences between COMETH-FIELD-RD rev A and rev B

Two versions of the COMETH-FIELD-RD device exist. COMETH-FIELD-RD rev A and COMETH-FIELD-RD rev B. The differences are :

	COMETH-FIELD-RD rev A	COMETH-FIELD-RD rev B
Consumption max.	1.1W	2W
Ethernet link	10 BASE T	10/100 BASE T
2* LEDs for Ethernet	1* Led for 10 Base T link 1* Led for Tx/Rx activity	1* Led for 10 Base T link and activity 1* Led for 100 Base Tx link and activity
Terminating resistor for RS422/485	A jumper	A switch
Dimensions (L*W*H)	93.00 x 73.00 x 28.00 mm	93.00 x 73.00 x 29.00 mm

III. CONNECTORS

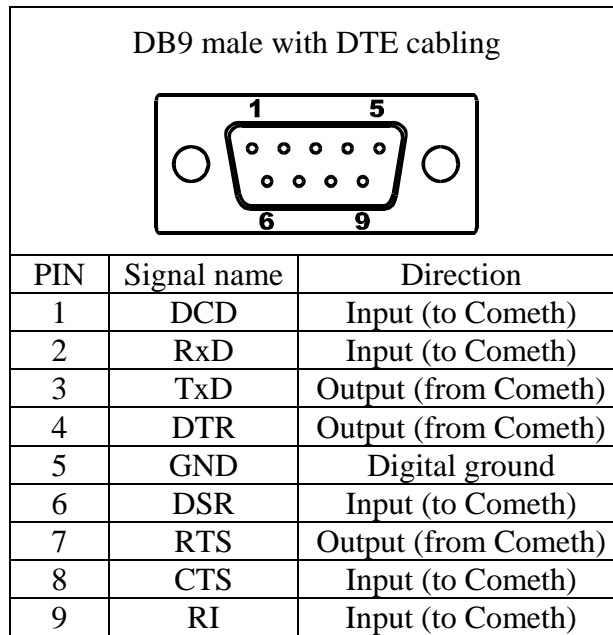
III.1 POWER connector cabling J3

Screw terminal connector (3 pins)		
PIN	Signal name	Description
1	EARTH	Protective ground
2	+VDC	Positive power supply
3	GND	Ground power supply

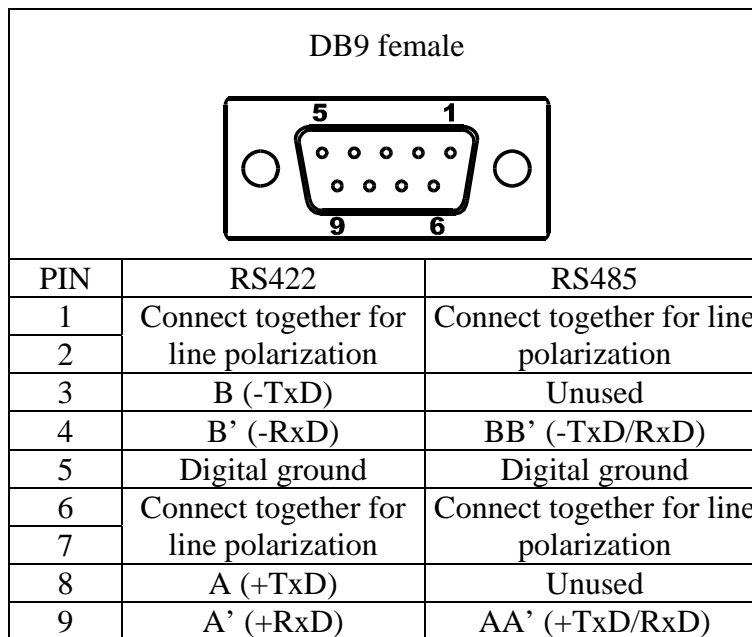
III.2 Ethernet connector cabling J6

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 RS232 connector cabling J1



III.4 RS422/RS485 connector cabling J2



For COMETH-FIELD-RD rev A :

Terminating resistor enable Connect the jumper to ON position
Terminating resistor disable Connect the jumper to OFF position or left unconnected

For COMETH-FIELD-RD rev B :

Terminating resistor enable Switch to ON position
Terminating resistor disable Switch to OFF position

IV. CABLING RECOMMENDATIONS

IV.1 Ethernet cabling recommendations

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 light should go on on the COMETH (and also on the HUB if it has a LINK led).

IV.2 RS232 cabling recommendations

In RS232 mode, the 9-pins male connector is a standard (EIA/TIA574) Data Terminal Equipment (DTE) connector.

To connect COMETH to a DTE peripheral, use a crossover (null-modem) cable

To connect COMETH to a DCE peripheral (for example a modem), use a straight cable.

IV.3 RS422/RS485 cabling recommendations

To avoid any cable inversion caused by using the non-standard + and – convention (one manufacturer will describe as + what another will describe as -), make up your cable as follows:

Software configuration:

Check section VII “Advanced configuration” to select your electrical interface

In RS422 mode :

Identify A, A', B & B' signals on the equipment side. Some equipments document these signals with other names as follows:

A	=	Tx+
A'	=	Rx+
B	=	Tx-
B'	=	Rx-

The points A, B, A' and B' are as defined in the EIA-422 and V11 recommendations, such that: $V_A < V_B$ and $V_{A'} < V_{B'}$ when idle, state also called MARK or OFF (Transmission/Reception of stop bits).

Connect signal A of the COMETH to signal A' of the equipment.

Connect signal B of the COMETH to signal B' of the equipment.

Connect signal A' of the COMETH to signal A of the equipment.

Connect signal B' of the COMETH to signal B of the equipment.

In RS485 mode :

Identify AA' & BB' signals equipment side
The points AA' and BB' are as defined in the EIA-485 and V11 recommendations,
such that: $V_{AA'} < V_{BB'}$ when idle, state also called MARK or OFF (Transmission/Reception of stop bits).
Connect signal AA' of the COMETH to signal AA' of the equipment.
Connect signal BB' of the COMETH to signal BB' of the equipment.

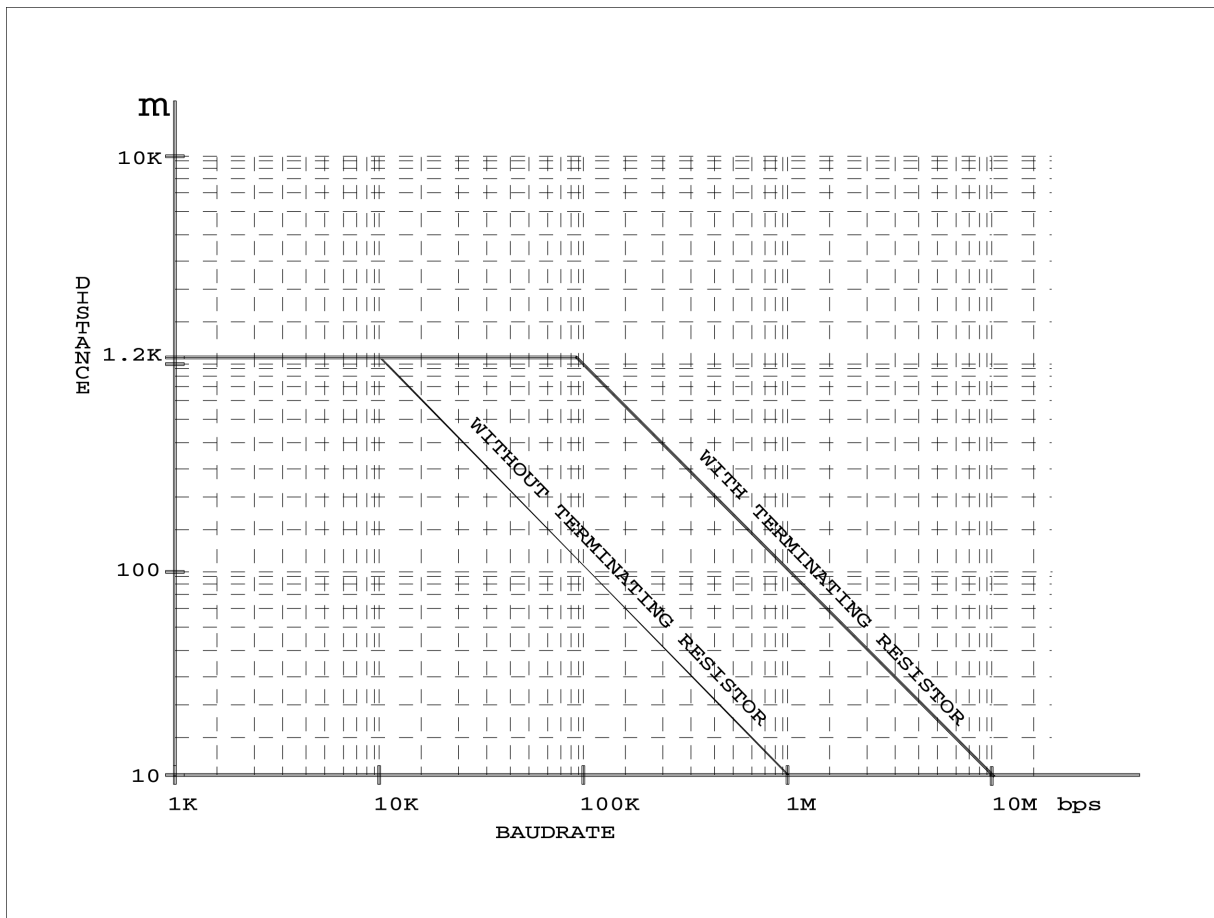
Line polarization

Line polarization is needed for stability in RS485 mode and RS422 mode in multidrop Master / Slave set-up (also called RS485 4 wires).
Line polarization is integrated to the COMETH and can be connected by cabling 2 straps on the DB9 female connector (1-2 & 6-7).
A single polarization is necessary on the bus.

Terminating resistor :

The terminating resistor for RS422/RS485 line reduces reflections created by long lines at high speeds. It is not required in noise-free environment and if the distance and the rate are within 1000 meters at 9600 bps or 100 meters at 115200 bps.
Terminating resistor is integrated to the COMETH and can be connected by a jumper.

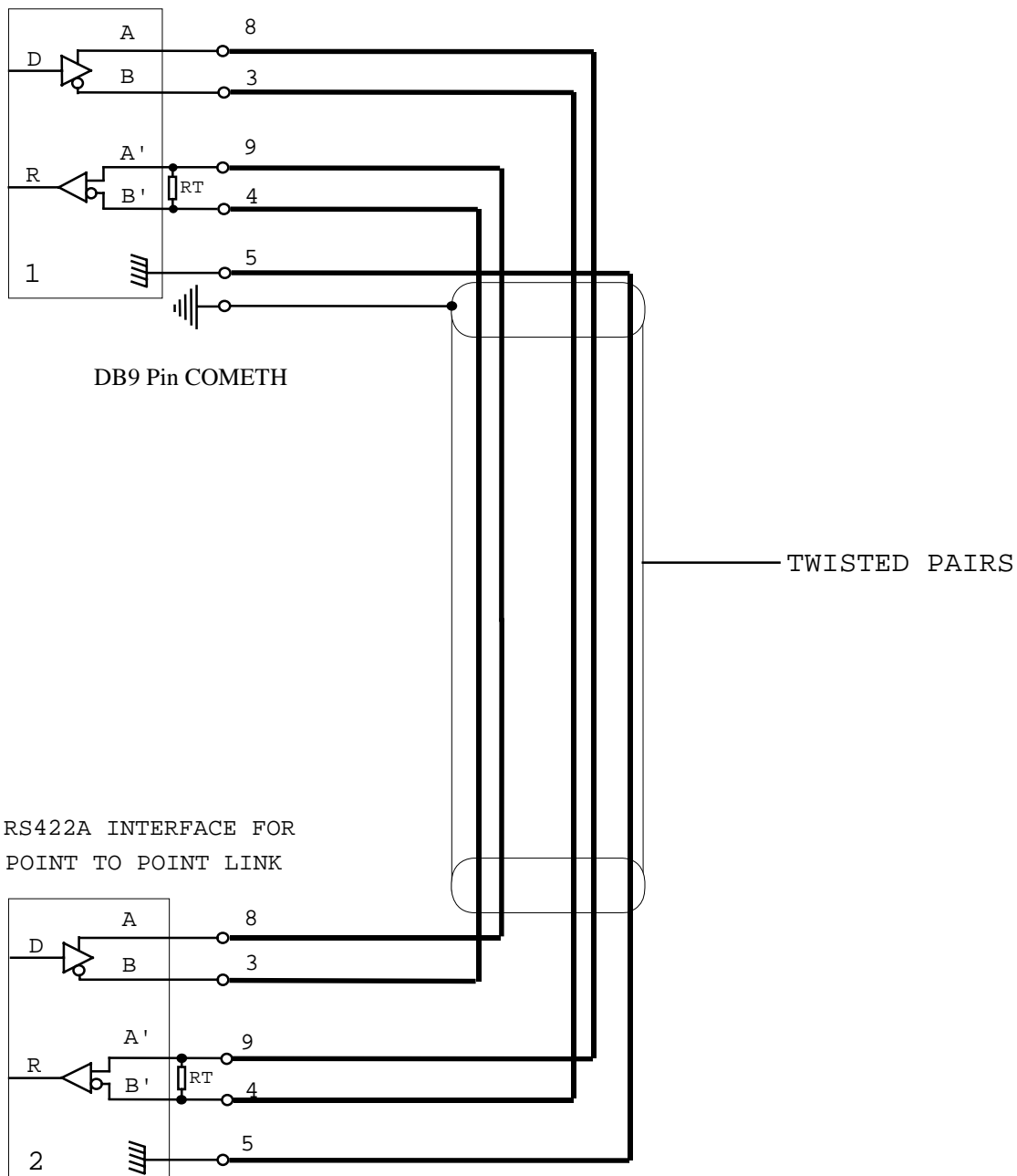
IV.4 Cable length for RS422 and RS485



IV.5 RS422 Cabling example

RS422A FULL-DUPLEX POINT TO POINT CABLING

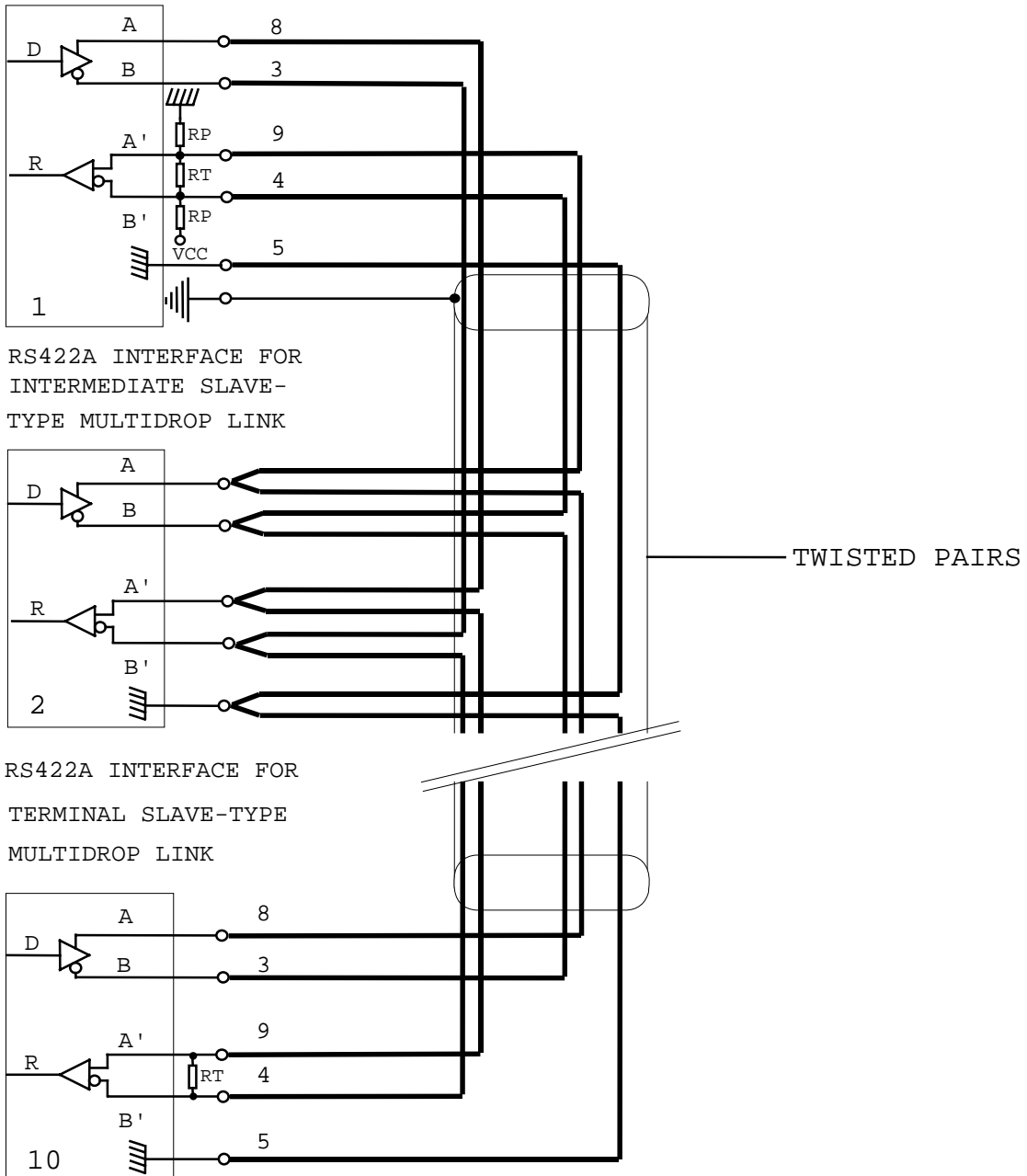
RS422A INTERFACE FOR
POINT TO POINT LINK



RS422A INTERFACE FOR
POINT TO POINT LINK

RS422A FULL-DUPLEX MULTIDROP CABLING

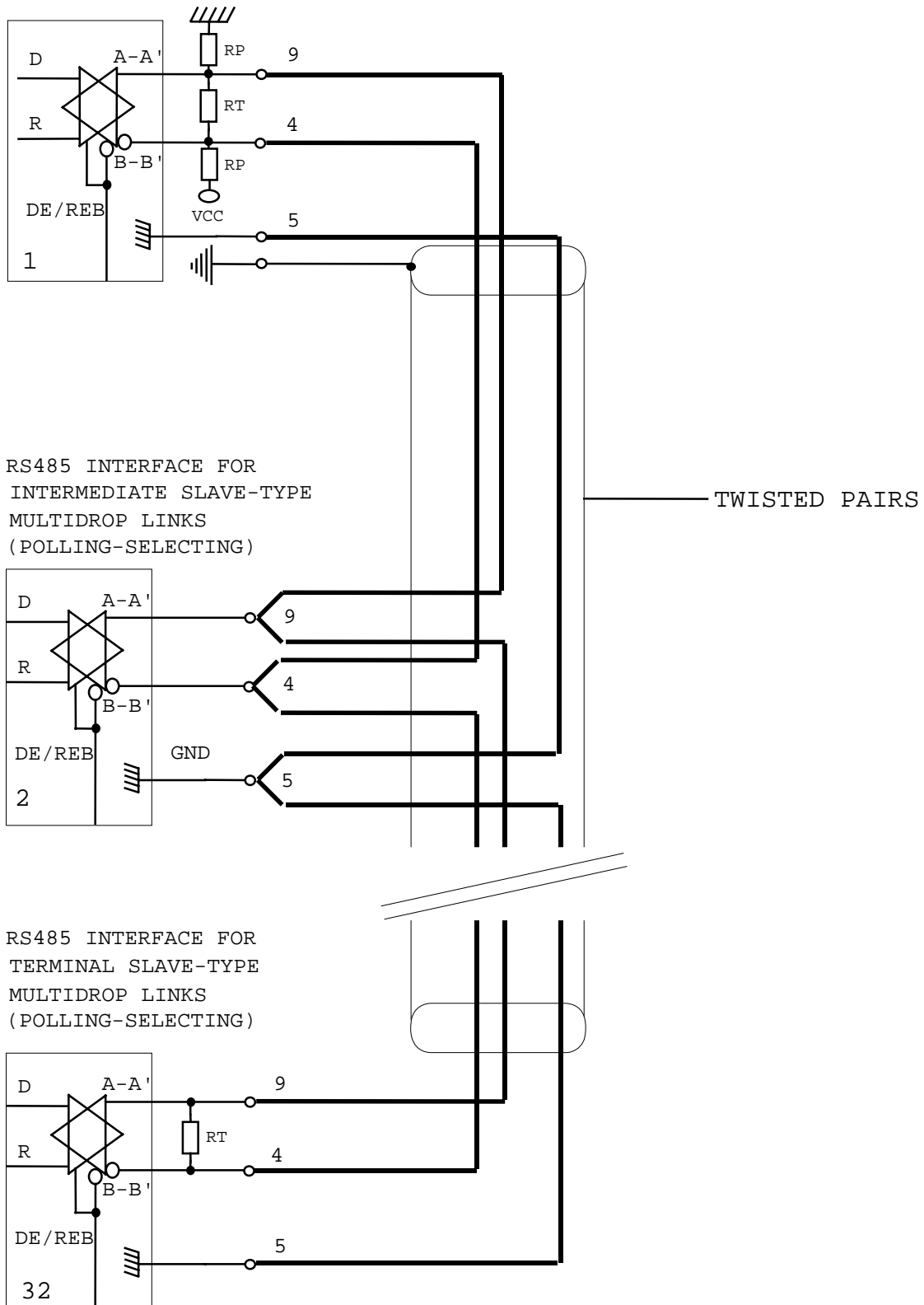
RS422A INTERFACE FOR
MASTER-TYPE MULTIDROP LINK
(POLLING SELECTING)



IV.6 RS485 cabling example

RS485 HALF-DUPLEX MULTIDROP CABLING

INTERFACE RS485 FOR MASTER-
TYPE MULTIDROP LINK
(POLLING-SELECTING)



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V. GETTING STARTED

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 emulation 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 RS485 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:			
<ul style="list-style-type: none"> Does the network administrator (or the DHCP server) require a specially crafted Client ID (DHCP option 61)? 	<input type="checkbox"/>	client identifier:	_____
<ul style="list-style-type: none"> 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:			
<ul style="list-style-type: none"> IP address for the COMETH (see below): 			____.____.____.____
<ul style="list-style-type: none"> Does your LAN need use of a netmask? 	<input type="checkbox"/>	Netmask value :	____.____.____.____
<ul style="list-style-type: none"> 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 adapter

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 RS232 serial port

This is the recommended procedure to install a new COMETH. In some cases you can install a new COMETH through the LAN (refer to paragraph V.5 “Administration by LAN”)

V.4.1 Select Administrator mode

Push the switch towards the « Adm » position. The red (DIAG) light should blink twice per second. If it is not the case, try pushing the switch in the opposite direction.

V.4.2 Connect to a serial port

This step is required to set up the COMETH IP address. Below we describe how to do this with a PC with Windows. Other devices (ANSI console...) or operating systems (Linux with “minicom” or “cu”...) can be used, but this is beyond the scope of this manual.

The COMETH FIELD has one male DB9 RS232 connector with DTE cabling. You can use the provided null modem cable and plug it directly, into a standard DB9 male connector (PC COM port for example)

V.4.3 Run Hyperterminal

When asked to choose a modem or port, select a direct connection to COMx (COMx being the COM port on which you plugged the COMETH).

Select the following port parameters : 2400 bauds (bits/second), 8 bits, parity none, 1 stop bit, no flow control.

Hyperterminal now displays a blank window. Hit the « ENTER » key to display the admin prompt.

V.4.4 Proceed to paragraph V.6 “TCP/IP configuration”

V.5 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.5.1 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.5.2 Run Telnet

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

Telnet displays a banner and a prompt from the COMETH

```
Type : login root
```

```
Password : root
```

V.5.3 Proceed to paragraph V.6 “TCP/IP configuration”

V.6 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.6.1 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.6.2 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 called 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.6.3 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-b12a27
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.7 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	2.6.0.0	2.6
/5	valid	TCPCLIENT	2.2.0.3	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 information about firmware download, installation and selection is given in :

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

V.8 Install the COMETH in its final location

Now you can unplug the COMETH from the administration PC.

If administration by serial mode has been selected push the mode switch on the other side (thus allowing data to go from Ethernet to the asynchronous interface).

Check the cabling of your device against the cabling of the COMETH (see section « III Connectors »).

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 light should go on on the COMETH (and also on the HUB if it has a LINK led).

V.9 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.

VI. TROUBLESHOOTING

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

Five LEDs allow hardware diagnostic.

Power :

- this led lights up when the COMETH is correctly powered.

If the POWER LED stays off, it means that your power supply is bad, or incorrectly connected.

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).

Serial Tx/Rx :

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

If the Serial Tx/Rx 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/Rx 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.

If the serial Tx/Rx LED stays on while you are not sending data to your device and your device is not sending data, it means that the RS cable is bad, improperly connected, A & B or A' & B' are inverted, line polarization is required in RS422 multidrop and RS485 mode.

For COMETH-FIELD-RD rev A :

Link :

- 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.

Lan Tx/Rx :

- this LED flashes when sending or receiving data on the LAN.

If the Lan Tx/Rx LED stays off while your device is sending data, it means that your cable is bad, the COMETH IP address is not correct, Serial IP is not properly installed or the COMETH is not connected to the same LAN than your device.

If the Lan Tx/Rx LED stays off while you are sending data to your device, it means that your cable is bad, the COMETH IP address is not correct, Serial IP is not properly installed or the COMETH does not receive data on the asynchronous serial interface.

For COMETH-FIELD-RD rev B:

10 Base-T :

- This led lights up when the COMETH is correctly attached to the LAN and if you use a 10 Base T Ethernet link.

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

This LED flashes when sending or receiving data of the LAN.

100 Base-Tx :

- This led lights up when the COMETH is correctly attached to the LAN and if you use a 100 Base Tx Ethernet link.

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

This LED flashes when sending or receiving data of the LAN.

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 section V.4 “Administration by RS232 serial port” 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.

VII. ADVANCED CONFIGURATION

VII.1 Access to administration commands

You can access the administration system by two means : the RS232 interface, or TELNET through the LAN.

The RS232 administration is activated by pushing the « ADM » switch to the ON position. This forbids parallel use of the COMETH for data transfer.

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

By default, using the administration system through TELNET allows you to display the COMETH configuration without logging in, but you cannot change it. Changing the configuration is protected with a username (login) and password, which you can change at will. The default setting is:

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

Optionally you can require the administrator to log in before he is allowed even to display the configuration.

You can forbid administration from the network, after which the COMETH configuration can only be achieved by administering through serial port.

VII.3 Handling disconnections in TCP

Some COMETH firmwares use the TCP protocol to communicate with their 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 independently.

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 :

login <i>username</i>	start the administrator identification sequence. Ask password.
save	save the current configuration to the permanent configuration memory which is used after reboot and remains when the COMETH is powered off.
reset	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, serial interface.
quit	close administration session (TELNET only).

General parameters changes :

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

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

- set prog enable** *Seg* Enable firmware located in segment ‘*Seg*’.

Network parameters changes :

- set net ethernet** *XX:XX:XX:XX:XX:XX* change COMETH Ethernet address. 6 hex digits separated by columns. DO NOT CHANGE if you don’t know exactly the consequences.
- set net dhcp on** These two commands turn on or off the DHCP client.
set net dhcp off When DHCP is on, the manually specified IP address is not used.
- set net dhcp clientid** *ident* replace the standard client ID (MAC address as a string) by the custom string *ident*. 15 bytes max, upper and lower cases allowed.
- set net dhcp clientid** delete the custom client ID and use the standard client ID.
- set net dhcp hname** *hostname* provide the DHCP server with the supplementary Host Name option, with value *hostname*. 19 bytes max, no spaces allowed, upper and lower cases allowed.
- set net ip** *aaa.bbb.ccc.ddd* change COMETH IP address in dotted decimal notation.
- set net mask** *aaa.bbb.ccc.ddd* change the subnet mask.
- set net gateway** *aaa.bbb.ccc.ddd* change the default gateway IP address.
- set net metric** *mmm* number of gateway hops. *mmm* is **1** to **255**.
- set net keepalive** *n t1 t2* *n* defines the number of probes to send before closing the connection. *t1* defines the time in seconds before sending the first probe since the connection is inactive (the “activation delay” mentioned earlier). *t2* defines the time in seconds between each probes (the “interval delay” mentioned earlier). *n* ranges from 1 to 255. *t1* and *t2* range from 1 to 65535.
- set net keepalive 0 0 0** disables use of the keep-alive feature.
- set net segtmo** *nsec* *nsec* is the retransmission timeout (in seconds). Set to 0 to retransmit indefinitely.
- set net reconnect on** These two commands turn on or off the “forced
set net reconnect off 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.

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

VII.5 Factory settings common to all firmwares

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

VIII. ADDRESSING IN NETWORK PROTOCOLS

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 **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 documentation.

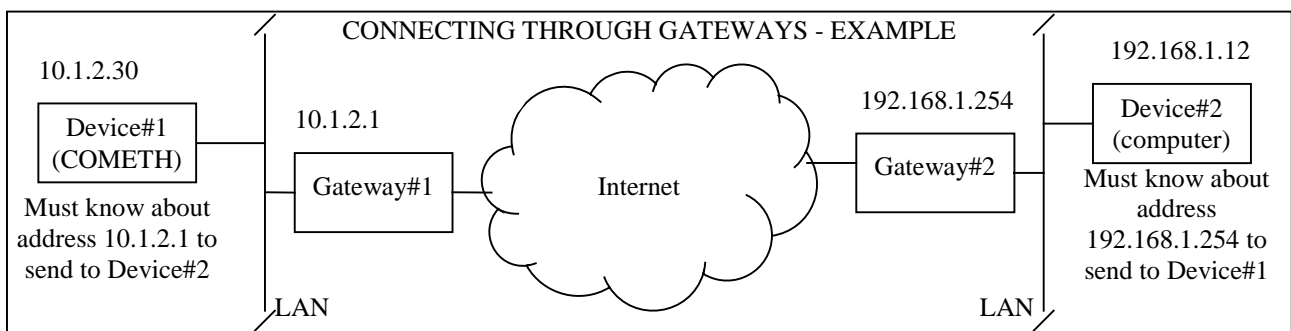
The bits set to one in the IP netmask define the bits of the associated IP address to be taken as the network part.

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.

IX. REFERENCES

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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