

User's Manual

PowerTALK 101 - Ethernet to Serial converter



PowerTALK 101

Configuration, usage and testing guide for PowerTALK 101 communications equipment.

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PowerTALK 101 Firmware release 1.00

PT.EXE Configuration software, release 1.01

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Table of Contents

TABLE OF CONTENTS	3
FOREWORD	5
INTRODUCTION	7
BRIEF DESCRIPTION	7
PC CONFIGURATION TOOL PT.EXE & PT98.EXE	7
YEAR 2000	7
ORDERING OPTIONS	8
<i>Default specifications for PowerTALK 101:</i>	8
<i>Custom specifications for PowerTALK 101:</i>	8
AVAILABLE POWER TALK 101 MODELS	8
DISCLAIMER	8
POWERTALK 101 OVERVIEW	9
FEATURE OVERVIEW	9
FUNCTIONAL OVERVIEW OF POWERTALK 101	10
SCHEMATIC OVERVIEW OF POWERTALK 101	11
NETWORK TOPOLOGY OVERVIEW OF POWERTALK 101	12
PHYSICAL PROPERTIES	13
POWERTALK 101 PICTURE	13
LED, PLUG AND SWITCH LAYOUT.....	13
DEVICE AND TERMINAL IDENTIFICATION	14
DIMENSIONS	14
REAR DIN RAIL	14
ADDITIONAL POWER SUPPLY OUTPUTS	14
FACE PLATE CARE & MAINTENANCE	14
INTERNAL CONNECTIONS AND LAYOUT	15
FUSES & LINKS	16
BATTERY REPLACEMENT	16
JUMPER SETTINGS.....	17
<i>Power supply board</i>	17
<i>Communications processor board</i>	18
ELECTRICAL CONNECTION TO POWERTALK	19
EXTERNAL WIRING	19
EARTH WIRING.....	19
ISOLATION IN THE POWER TALK 101 BOX	20
POWERTALK 101 SPECIFICATIONS	21
MAIN PROCESSOR COMPONENT	21
MAIN POWER SUPPLY	21
POWER TALK 101 SPECIFICATIONS	22
POWER TALK 101	22
CONNECTING POWERTALK 101 TO A NETWORK.....	25
QUICK START GUIDE	25



<i>Power Supply</i>	25
<i>Networking</i>	25
CHANGING MORE ADVANCED PARAMETERS USING PT.EXE.....	26
PASSWORDS.....	27
PT.EXE – POWERTALK COMMAND LINE INTERFACE	28
PT.EXE EXAMPLES	28
<i>Confirm your PC IP address</i>	28
<i>List all available PowerTALK units</i>	29
<i>Set a PowerTALK unit name</i>	29
<i>Change some parameters</i>	29
<i>Change a port/channel allocation</i>	29
<i>Accept all changes</i>	29
POWER TALK 98 – WINDOWS GUI SOFTWARE.....	30
POWER TALK 98 EXAMPLES	31
NETWORK TOPOLOGY	32
POWER TALK 101 CONFIGURATION.....	34
PRE-CONNECT CONFIGURATION.....	34
<i>Serial connection cables</i>	34
<i>Network connection: IP address setting</i>	35
<i>Other settings on PowerTALK 101</i>	36
CONNECTING TO THE PHYSICAL NETWORK.....	36
<i>10-BASE-T</i>	36
COMMISSIONING AIDS.....	37
LED INDICATIONS.....	37
<i>Normal LED indications on face plate:</i>	37
<i>Indications on inside of box, only visible when cover is removed:</i>	37
TESTS	38
<i>Tests using standard networking protocols:</i>	38
<i>Tests available using PT.EXE</i>	38
<i>Tests available using PowerTALK 98 under Windows 95 or NT</i>	38
TESTING PROCEDURE.....	39
EASY FUNCTIONALITY TEST - LOOPBACK TEST:	40
SETTING AND CONFIGURING POWER TALK 101	42
PRACTICAL CONNECTION EXAMPLE – ADDRESS TYPE SERIAL DEVICES	43
PRACTICAL CONNECTION EXAMPLE – NON ADDRESS (OLD) TYPE SERIAL DEVICES	44
PRACTICAL MULTI NODE EXAMPLE.....	45
TECHNICAL DETAIL.....	47
SETTINGS FOR POPULAR SIEMENS & GE MULTILIN EQUIPMENT	47
CHANNELS.....	47
POTENTIAL POWER TALK LOCK-UPS	48
<i>Endless loop</i>	48
<i>Loss of communication to configure PowerTALK 101</i>	48
TESTING SYSTEM WATCHDOG.....	49
USING POWER TALK 101 WITH BRIDGES AND ROUTERS	49
POWER TALK 101 PROTOCOL	50
OTHER PRODUCTS AVAILABLE IN THE POWERTALK FAMILY.....	51
HISTORY OF CHANGES TO THIS MANUAL, FROM RELEASE 1	52
<i>Release 2</i>	52
NOTES.....	53

Foreword

The PowerTALK product family, available from www.cocoon-creations.com, is a *modular* set of tools that enable engineers and process controllers to *centralise* the monitoring and management of proprietary industrial equipment.

COCOON has recognised that there is legacy equipment in production today that is robust, reliable and relatively inexpensive, however, such equipment often comes with limited ability on-board for centralised monitoring and management.

The PowerTALK tool set provides the intelligence needed to connect such equipment with modern IT networks enabling central control and management of the device.

PowerTALK conforms to industry standards, for example:

- ❑ Industry standard, routable, communication protocol: TCP/IP (The international standard)
- ❑ Industry standard connectivity: 10BASET Ethernet as default (others available)
- ❑ Industry standard lower level protocols: RS-232, RS-485
- ❑ No restriction to higher level protocols passed through

Introduction

Brief description

PowerTALK 101 is an *Ethernet-to-Serial Converter* that packages serial data into TCP/IP packets that are transmitted through a standard Ethernet port and onto the corporate or industrial network / Intranet / Internet.

It simultaneously also does the inverse: TCP/IP packets that are addressed to PowerTALK 101's IP Address (user definable) is accepted by the device and repackaged into the original stream of serial data and is sent to the appropriate serial port.

The distance between any two PowerTALK 101 devices is irrelevant, as long as the TCP/IP packets do not time out in transit, and the user application can accept such delays introduced by the carrier network route. Given effective communication links, one PowerTALK 101 may, hypothetically, be on one side of the globe, while the other may be in the same office block.

Each PowerTALK 101 device has 2 serial ports that may both be connected to conventional serial links / separate serial communication networks on site. In combination with other equipment such as the PowerTALK 103 RS-485 converter, each serial port may further be expanded to more serial devices.

PC configuration tool PT.EXE & PT98.EXE

PowerTALK/DOS and PowerTALK 98 are supplied free of charge. This software is used to track PowerTALK 101 connections, to functionally test the system, to configure Ethernet type information, to configure serial ports and set up Ethernet connections remotely.

PowerTALK 98 and PowerTALK/DOS (PT.EXE) have the same configuration abilities, but PowerTALK 98 has easier testing features. PowerTALK 98 makes use of the advantage of the GUI interface of Windows while PowerTALK/DOS makes use of a command line interface. PowerTALK 98 connects via the PC serial port, PT.EXE via the PC Ethernet port.

Information on this software can be found in the on-line help in both PowerTALK 98, and PT.EXE v1.01 on the distribution disk. (Run PT.EXE -h). Also see complete options and examples on page 28.

Year 2000

The PowerTALK tool set is Y2K compliant – third party software used to control devices may not be and therefore it is recommended that tests are conducted by clients to ensure interoperability on critical Y2K or subsequent dates.

Ordering options

Default specifications for PowerTALK 101:

Power Supply: 230VAC
 Network Connection: 10-BASE-T Ethernet
 Serial Connectors: 2 off 9-pin D-type serial connectors,
 Broadcast mode: UDP

The PowerTALK unit is marked at the back with the relevant information, including the standard fixed IP address. See page 14 for Device and terminal identification.

Custom specifications for PowerTALK 101:

The following options may be specified for PowerTALK 101 at time of order: At our discretion, larger orders may justify more options than those stated below.

PT101□ - 2 3 0 A - □□□ - □□□□	230 VAC isolated power supply
PT101□ - 2 3 0 B - □□□ - □□□□	Additional 10VDC output, ext. use
PT101□ - 2 2 0 D - □□□ - □□□□	220 VDC isolated power supply
PT101□ - 1 1 0 D - □□□ - □□□□	110 VDC isolated power supply
PT101□ - □□□ E - □□□ - □□□□	Additional 10VDC output, ext. use
PT101□ - □□□□ - 1 0 0 - □□□□	Firmware version, eg. 1.00
PT101□ - □□□□ - □□□ - N □□□	No internal GPS clock
PT101□ - □□□□ - □□□ - □ A □□	DB9, DB9 serial connections
PT101□ - □□□□ - □□□ - □ B □□	DB-25, DB-25 serial connections
PT101□ - □□□□ - □□□ - □□ 0 □	No on-board printer
PT101□ - □□□□ - □□□ - □□□ A	RJ-45 10-Base-T
PT101□ - □□□□ - □□□ - □□□ B	BNC 10-Base-2
PT101□	Model number A,B, ...

Available PowerTALK 101 models

- 101 UDP type IP protocols, broadcast mode
- 101B UDP type IP protocols, broadcast mode, peer to peer
- 101C TCP/IP type protocols, broadcast mode, peer to peer, packet numbering, error detection

Disclaimer

COCOON Creations cc cannot be held responsible for the ability or inability of operators and / or software tools to manage specific devices properly. Neither can COCOON Creations cc be held responsible for any network, carrier or equipment not performing as anticipated. COCOON Creations cc can not be held responsible for any direct, indirect or subsequent damages or losses due to the operation or lack there-of, of any device or software obtained from us.

PowerTALK 101 overview

Feature overview

- PowerTALK 101 can transport any serial protocol over standard Ethernet networks using standardised transmission methods
- PowerTALK 101 can be Installed at any point on an Ethernet network
- Communication parameters can be changed from any port: local, remote or networked
- PowerTALK 101 is delivered with a standard IP to which it always respond.
- PowerTALK 101 can be configured with a second IP to fit into your network scheme.
- Configuration parameters such as IP and baud rate are stored in non-volatile memory
- Any port can be moved, replaced or upgraded without disruption to the network
- Data is available anywhere on the network - across campus or across countries
- Supports full or half duplex connections
- Data can be addressed to one port or to all ports simultaneously, depending on the configuration
- Individually configurable PowerTALK device passwords are implemented for network access control
- Individual local serial port passwords fixed for local access

PowerTALK 101 re-establishes each logical connection upon restart after a network or power failure. PowerTALK 101 controls remote equipment. PowerTALK 101 gives Ethernet sites total system uniformity. Now you can manage connections between non-Ethernet equipment with the ease of Ethernet.

Functional overview of PowerTALK 101

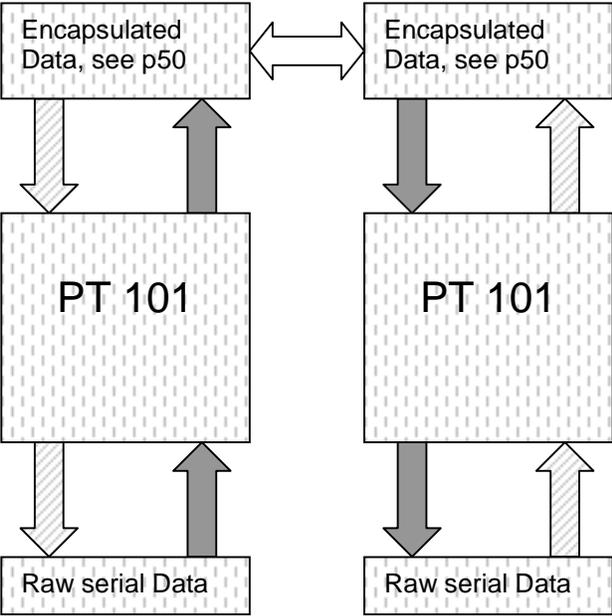
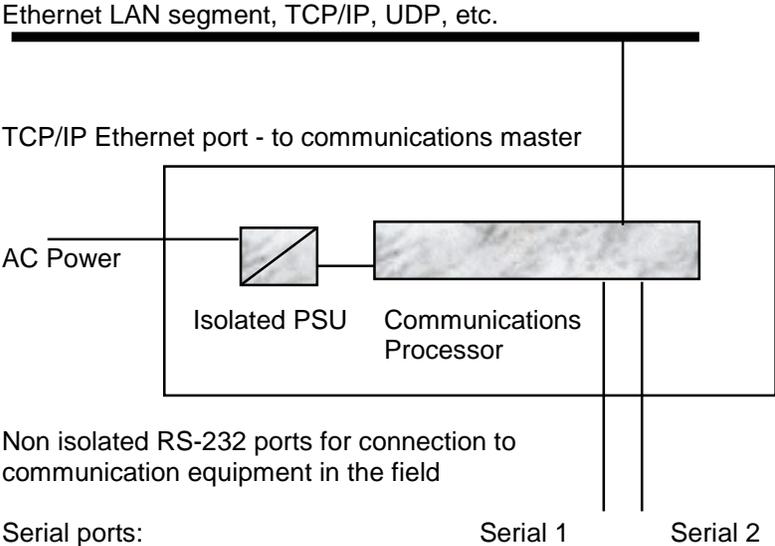
PowerTALK 101 is a network protocol converter, one unit having at least a serial port and an Ethernet port. All PowerTALK 101 models utilise the TCP/IP protocol suite for communication and configuration.

PowerTALK 101 uses UDP broadcast packets to effectively combine a campus wide Ethernet network into one virtual RS-232 multi-drop network. Each port on each PowerTALK 101 device is assigned to a virtual **channel**, and all data received on this port will be transmitted into this channel, and all other ports connected to this **channel**, will receive all data traffic. UDP broadcast packets will normally not be carried by routers and bridges, and can only be used on a single or virtual segment.

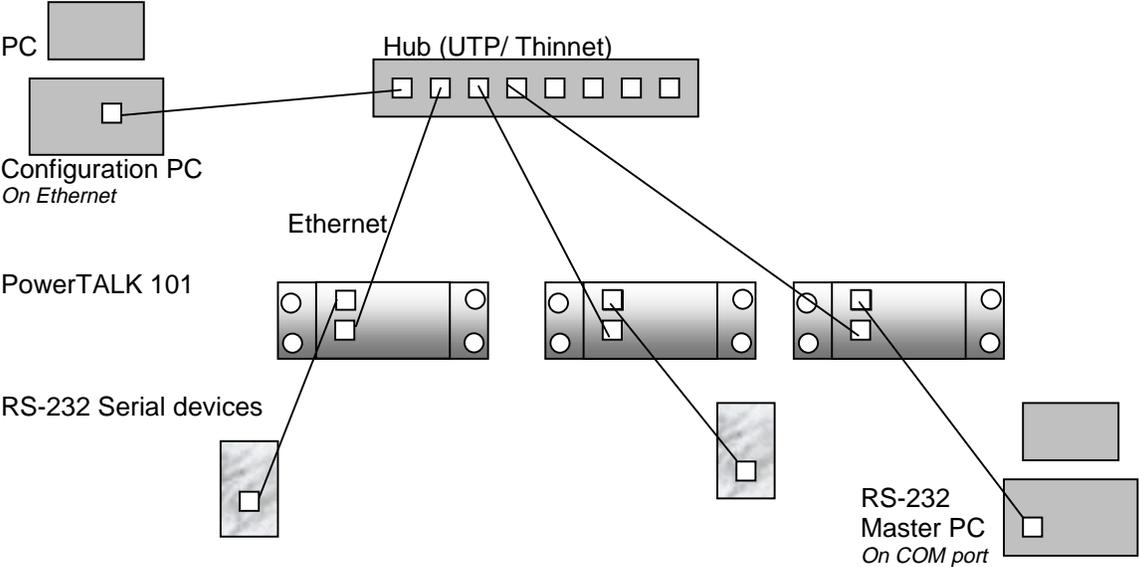
PowerTALK 101B additionally has UDP peer to peer routed packets for one-to-one communication. PowerTALK 101C also adds TCP peer to peer connections, for one-to-one communication over unreliable and changing links.

PowerTALK 101 / 101B / 101C	Data	UDP broadcast	single virtual segment
PowerTALK 101 / 101B / 101C	Configuration	UDP peer to peer	across router
PowerTALK 101B / 101C	Data	UDP peer to peer	across router
PowerTALK 101C	Data	TCP peer to peer	across router, advanced

Schematic overview of PowerTALK 101



Network topology overview of PowerTALK 101



Physical properties

PowerTALK 101 picture



Front view



Rear view

LED, plug and switch layout

Reset	Green: ON	Red: PowerTALK Failed
Serial 1	Green: Transmit	Red: Receive
Serial 2	Green: Transmit	Red: Receive
Ethernet	Green: Transmit	Red: Receive



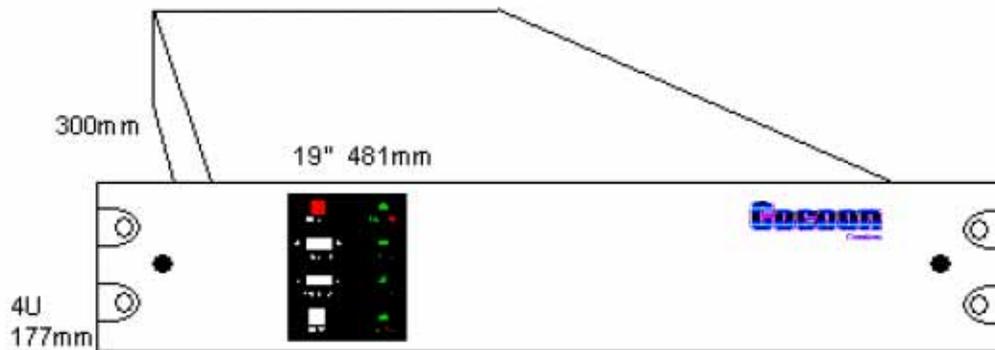
Reset	Press to restart all on-board processors in case of suspected system malfunction, or LED test	
Serial 1	Serial Port 1: 1200 – 19200 bps, 5,6,7,8 bits, NOE parity, 1,2 stop bits	DB-9
Serial 2	Serial Port 2: 1200 – 19200 bps, 5,6,7,8 bits, NOE parity, 1,2 stop bits	DB-9
Ethernet	Ethernet medium – 10 Mbps 10-BASE-T	RJ-45

Device and terminal identification

Typical label for the 230VAC model, mounted on rear of PowerTALK 101:



Dimensions



PowerTALK 101 maximum dimensions.

Above dimensions exclude the terminal rail at the back of the PowerTALK 101 box.

Rear DIN rail

The 35mm DIN rail is provided for convenience, to mount up to two PowerTALK 103 RS-485 converters or other third party rail mount equipment such as power supplies, etc.

Additional power supply outputs

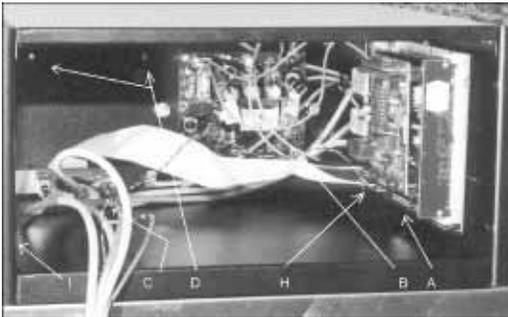
An additional power supply unit for external equipment with mounting holes 90mm x 90mm may be mounted inside or outside the box, using the 4mm diameter holes provided. Such power supply may be obtained from third parties, or from COCOON. See pages 8, 17 and 21.

Face plate care & maintenance

The front surface is of brushed stainless steel, and shows fingerprints easily on the textured finish. To remove, use a cloth with alcohol or spirits. Take care not to allow the volatile fluid to come into contact with the vinyl stickers on the surface of the front plate.

When wiping the front panel surface, wipe horizontally; in the same direction as the brush finish texture for the best results.

Internal connections and layout



PowerTALK 101 seen from the front, with its faceplate removed

The main elements of PowerTALK 101 can be seen as follows:

A	Communications processor	80486
B	Power Supply	5V 4A isolated
C	LED plug	DB-25
D	Spare power supply mounting holes	90 x 90 mm
H	Reset button	Reset
I	Spare communications processor card slot for future expansion	80486 or Pentium

Fuses & links

- One PC board mounted 5mmx20mm fuse, 1A rating, fast blow

This fuse is for PSU overload protection

- Between terminals X1:2 and X1:6, a fuse with 3A rating, slow blow

This fuse is for short circuit protection against possible short circuit inside the box

- Between terminals X1:1 and X1:5, a link terminal

A link is used to isolate the Neutral or Negative power supply if needed.

- Between terminals X1:3 and X1:7, a link terminal

A link is used to connect the signal ground to the chassis ground.

Battery replacement

The PowerTALK 101 unit has a built in battery for the purpose of keeping time when the power supply is removed. The lithium battery is expected to last for at least 10 years.

It is easily replaced by opening the front cover. The battery location is shown on page 17, indicated as "BAT".

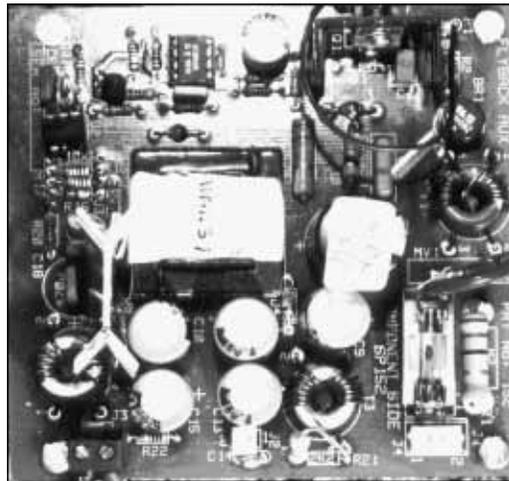
Jumper settings

PowerTALK 101 contains two printed circuit boards:

Power supply board

No jumpers or options on board

- A. One 2-pin, 0.3" spaced connector connected to power input
This connection is connected to terminals X1:1,5 and X1:2,6.
- B. One 2-pin, 0.1" spaced connector with output 12VDC, 50mA
This supply is not needed by PowerTALK 101, but can be used by the user's equipment
- C. One set of screw terminals for output 5VDC, 4A. N.B. Observe polarity:
The RED bootlace lug is +5V, whilst the BLUE bootlace terminal is 0V.
The communications common signal, 0V, can be switched to earth by
the disconnect terminal between X1:3 and X1:7



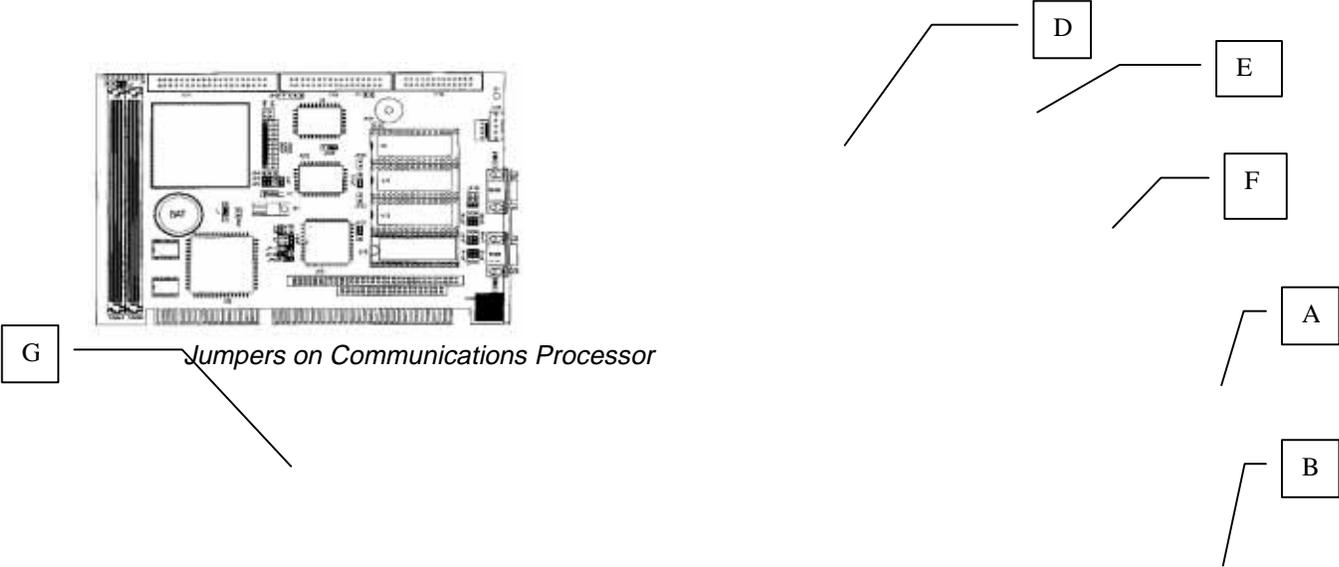
-5VDC +5VDC 12VDC 230 VAC
C B A
PowerTALK 101 230VAC power supply

Communications processor board

Jumper settings are not user configurable, and are to be as per diagram below:

Connections

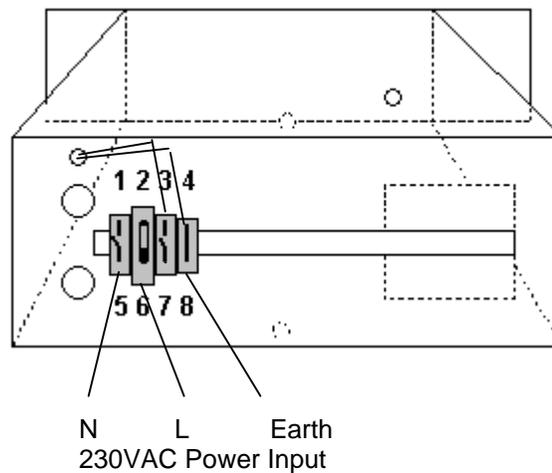
- A. Port 1 to SERIAL 1 (green CAT-5 UTP cable) to front plate connector
- B. Port 2 to SERIAL 2 (blue CAT-5 UTP cable) to front plate connector
- C. RJ-45 to ETHERNET (yellow CAT-5 UTP cable) on front plate
- D. 2-pin J3 to reset button on front plate
- E. LED lead connector inside box
- F. 4-pin 5VDC input power connector
- G. Observe polarity according to board markings "+5V 0V".
Lithium battery



Electrical connection to PowerTALK

External Wiring

PowerTALK 101 only needs three power connections, i.e. earth, L and N. In the case of the DC powered model, it is earth, V+ and V-.

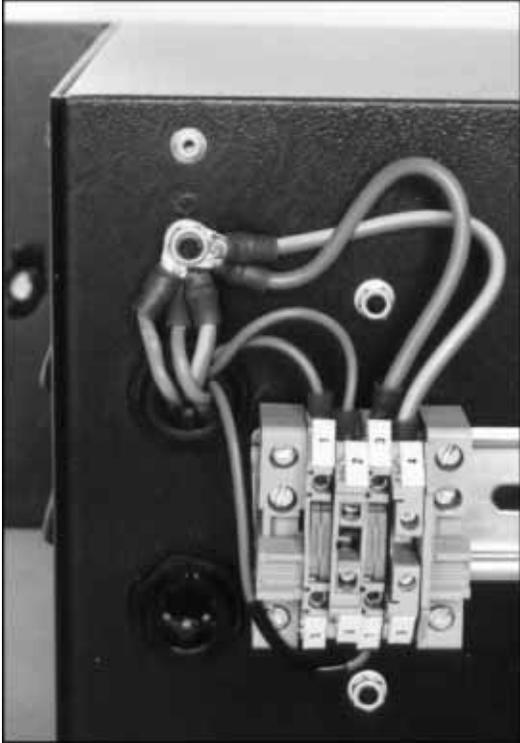
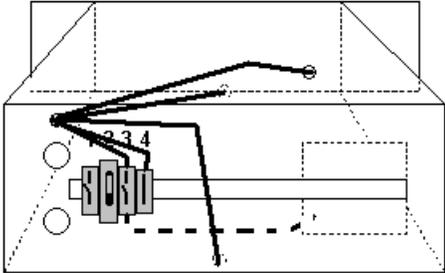


Earth Wiring

All metal panels in the PowerTALK 101 box are earthed to the star point at the back of the box.

The logical earth (low noise earth point) used by the internal PowerTALK 101 electronic cards, can optionally be connected to the system earth. The blade disconnect terminal switch between terminals X1:3 and X1:7 performs this function.

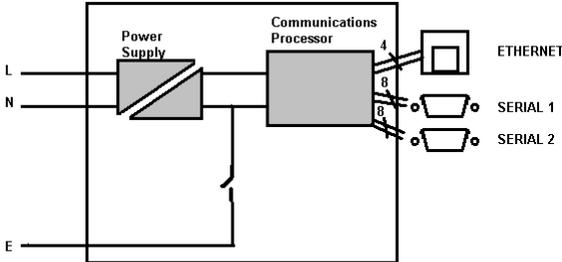
The blade disconnect earth link is shown below:



Clean earth connection can be connected to earth via link switch

Isolation in the PowerTALK 101 box

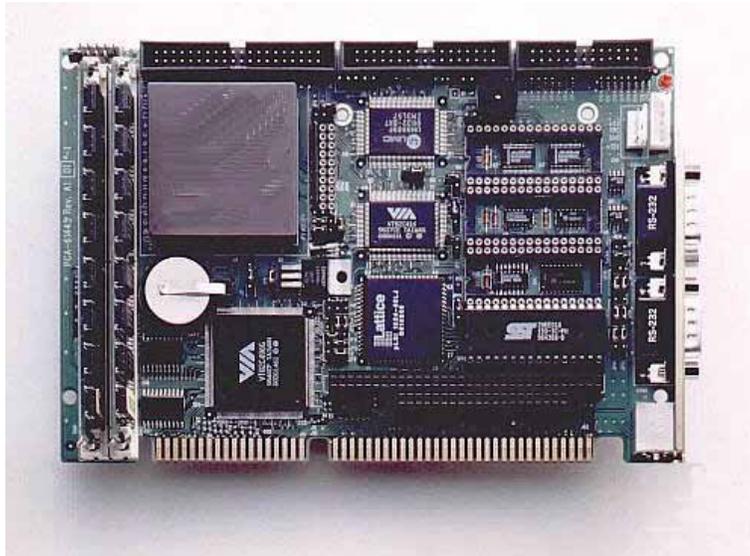
Below a schematic diagram of the electrical isolation barriers as implemented:



PowerTALK 101 box

PowerTALK 101 specifications

Main processor component



Advantech processor unit configured as protocol converter card.

Main power supply

The main power supply is designed to exceed the requirement of the load by at least 100%. This ensures low operating temperatures through the entire temperature range and guarantees longer equipment life.

Optional power supplies

PowerTALK 101 has one open power supply mounting position, in which a power supply for external use could be mounted. 2.5kV isolated power supplies available are:

230VAC, 220VDC, 110VDC
230VAC

2A 5V or 9V output
4A 5V or 9V output

PowerTALK 101 specifications

Item	PowerTALK 101	PowerTALK 101B
Serial ports	2x RS-232, DB-9 male	Ditto
Serial port settings	1200-19200 bps, 5,6,7 or 8 bits, N/O/E parity, 1,2 stop bits	Ditto
Serial port signals supported	Tx, Rx Handshake signals high	Ditto Also DTR and flow control
Maximum recommended 3 wire serial port speed	19200 baud	Ditto
Ethernet standard	IEEE-802.3 CSMA/CD	Ditto
Ethernet speed	10 MB/s	Ditto
Ethernet medium	10 Base-T unless otherwise specified Optional 10 Base-2 Optional 10BASE-5 or 10BASE-FOIRL	Ditto
IP address	Unique fixed IP & user definable IP	Ditto
Ethernet mode	UDP broadcast only	Ditto Also UDP peer to peer
Network traffic burden	Depending on settings: From 8kbps (3840 packets/s) to 1Mbps (30packets/s) for a 19200 bps serial data flow	Ditto
Supervision	Watchdog timer checks for continuous program execution	Ditto
Isolation: PSU Input voltage to earth	2.5 kV RMS	Ditto
Isolation: PSU Output voltage to earth	2.5 kV RMS	Ditto
Isolation: RS-232 to earth	2.5 kV RMS	Ditto
Electrical terminals	Phoenix Contact terminals MTK-P/P, UK5-N, UK4-TG	Ditto
Processor type	Intel 486	Ditto
Processor memory type	DRAM modules, FLASH RAM chips	Ditto
Processor mode	Protected mode	Ditto
Energy saving (radiated heat reduction)	Processor normally used or switched to standby mode	Ditto
Configuration	User set by PT.EXE, using	Ditto

	either a network connected or serially connected PC.	
Configuration storage	Non-volatile memory on board	Ditto
Firmware upgrade	In Flash memory	Ditto
Power supply voltage	230VAC, unless otherwise specified	Ditto
Power supply current	0.2A typical at input of 230VAC	Ditto
Power supply output	20W, regulated 5V 0.6W, unregulated 12V	Ditto
Internal PSU fuse	1A 5mmx20mm fast blow	Ditto
External fuse	3A 5mmx20mm slow blow	Ditto
Enclosure	All metal (steel) case, 19", 4U, maximum depth of 340mm, including the protruding terminals on the back of the unit.	Ditto
Material of top & bottom plates	1mm mild steel, powder coated	Ditto
Material of central part	2mm galvanised steel, powder coated	Ditto
Material of front plate	0.9mm brushed stainless steel	Ditto
Environmental	0 to 50 degrees C	Ditto

Connecting PowerTALK 101 to a network

Quick start guide

The following is a procedure to quickly get multiple PowerTALK 101 units running, and configured for a test case:

Power Supply

Connect L to terminal X1:6, N to X1:5 and Earth to 8.
Open link between 7 and 3 (to isolate grounds)
Insert included fuse holder / key into terminals 2/6

Networking

PowerTALK 101 units are delivered with both port settings 9600 8N1, a fixed IP address as marked on back of unit, channel 1 connected to Port 1 and channel 2 connected to Port 2. The system is delivered, tested, set up with all serial ports 1 as logical links, and serial ports 2 also as logical links.

1. Power up each unit and check that after a waiting period of approximately 30 to 45 seconds, the LEDs cycle through a start-up pattern and finally stabilise thereafter.
 - 1.1 Within 10 to 15 seconds after start-up or RESET, it should beep
 - 1.2 After about 45 seconds after start-up or RESET, it should show the LED test pattern, and beep.
 - 1.3 After the second beep, the functionality of the PowerTALK 101 is set
2. Connect all the units (at least two) to a single network segment or hub.
3. Connect your master device (normally PC) to one port on channel 1 (e.g. Port 1 on PowerTALK unit A) using a Laplink cable.
4. Connect your slave device (typically printer or modem) to the same port on another PowerTALK 101.

Set the PowerTALK unit to match the printer or device baud rate, if the default setting does not comply.

5. Send data, and check for successful operation.

Changing more advanced parameters using PT.EXE

1. Connect a PC serial port set for 9600 baud, 8, N, 1 (or actual port settings if changed from default) to any PowerTALK port using a Laplink serial cable (Tx and Rx swapped).
2. Run either PT98 (PowerTALK 98 for Windows 95/NT GUI) or PT (PowerTALK for Windows 95/NT command line). Only PT will be covered here. PT98 is graphical, and perform similar functions with the known Windows look and feel.
3. To get a list of PT's capabilities, run "PT.EXE -h". See printout below.
4. To display all units on line, PT.EXE can simply be run from a command line prompt. Notice that the firmware version number is displayed for all the units. It is best if they are all the same version - contact your distributor in case of query.
5. The unit can now be configured. The default configuration is 9600 8N1, Transmit delay is 0, SERIAL 1 ports connected to channel 1 and all SERIAL 2 ports connected to channel 2. The password is always 'jovian' if PowerTALK is accessed from the local serial port, and the factory default password is 'martian' for access from the network port. PowerTALK 101 units have standard IP addresses, printed on the sticker on the back of the unit. You may also enter a custom IP address for the unit, an IP address for the default gateway, and the network subnet mask. Enter IP numbers as follows: 158.152.46.132
6. To save any changes, "PT.EXE -I10.1.1.7 martian commit aa.bb.cc.dd".
7. Make a link between any pair of units (101B only) or allocate units that are connected to the same network segment to a channel, by programming the channel set-up using PT.EXE:

PT.EXE password broadcast port channel.

Remember to "commit" after changing any configuration.

8. An easily achievable first attempt is to link port 2 on the local unit to port 2 on another unit. Make two wire links on the chosen remote units serial port 2 - DB9 pin 2 to 3 (data loop back). You can then leave your PC/terminal connected to your local port 2 and then type characters which should echo back onto your screen, having been looped back by the remote unit.
9. Whenever you are configuring or linking to units on remote sub-nets, you must use IP numbers, not names.

Passwords

Two different passwords are kept on the PowerTALK 101 units. One is variable and can be used for access from a remote network location, and the other fixed but only for access from the local serial port.

The password for network access can be changed, and can also be forgotten. The password for local access using the local serial port is fixed, for the eventuality a user forgets his password.

The standard serial port (master) password is: 'jovian'
The default network (changeable) password is: 'martian'

PT.EXE – PowerTALK command line interface

The command line interface under W95 DOS or WNT command line, connects to PowerTALK units via the TCP/IP Ethernet port and network.

Command line options for PT.EXE are given below:

```
PowerTALK 101 configuration utility version 1.01. Type pt -h for help.
  Copyright 1998
  For distribution with PowerTALK 101 by Cocoon Creations CC.
Usage:
PT [options]
PT [options] password command hst [arguments]
hst is the hostname or IP address.
Options:
  -h          Display help screen
  -w          Do not quit after OK or ERROR, wait for 1 second inactivity.
  -i#         Use Local IP number #, as detected above.
  -In.n.n.n  Use specified local IP number.
  -Bn.n.n.n  Use specified local broadcast, defaults according to IP class.
Commands:
  hostip      hst IP          Set the user-definable IP address
  hostname    hst newname     Specify a new hostname
  netmask     hst netmask     Set the netmask address
  gateway     hst gateway     Set the gateway address
  broadcast   hst prt chn     Set the port to broadcast to a specific channel

  disconnect  hst prt         Disconnect this port from the network
  speed       hst prt spd     Set the port speed in bits per second.
  parity      hst prt prt     0/1/2 sets none/odd/even parity.
  stopbits   hst prt bits    selects stopbits, 1 or 2.
  databits   hst prt bits    set 8,7,6 or 5 data bits.
  txdelay    hst prt n       Wait for n character periods before transmit.
  password    hst password   Set the password.
  commit     hst             Makes config changes effective.
  rollback   hst             Cancels config changes.
  config     hst             Report the current configuration.
  reset      hst             Performs a hard reset.
```

If PT.EXE is able to detect the Windows NT IP address, it will display and use it automatically. It can still be overridden by the `-I` command.

PT.EXE examples

Confirm your PC IP address

From a command prompt in Windows 95/98/NT, type:

IPCONFIG (in the case you are running NT), or
WINIPCFG (in the case you are running W95/98)

The PC will respond with it's IP address(es), in this example this will be assumed to be 10.1.1.7.

Confirm that the IP address(es) thus obtained corresponds with the values as set on page 35 (Network connection: IP address setting).

List all available PowerTALK units

From a command prompt in Windows 95/98/NT, type:

```
PT -I10.1.1.7
```

A list will be displayed with the connected PowerTALK units, for this example 10.121.3.85 is the PowerTALK 101 unit assumed to be connected.

Set a PowerTALK unit name

From a command prompt in Windows 95/98/NT, type:

```
PT -I10.1.1.7 martian hostname 10.121.3.85 OUTSTN1
      where "martian" is the default network password,
      where "hostname" is the item to change command and
      where "OUTSTN1" is the new unit name.
```

Change some parameters

From a command prompt in Windows 95/98/NT, type:

```
PT -I10.1.1.7 martian speed OUTSTN1 2 4800
      where "2" is the port number on OUTSTN1
```

Change a port/channel allocation

From a command prompt in Windows 95/98/NT, type:

```
PT -I10.1.1.7 martian broadcast OUTSTN1 2 34
      where "34" is the new channel number of port number "2" on OUTSTN1
```

Accept all changes

From a command prompt in Windows 95/98/NT, type:

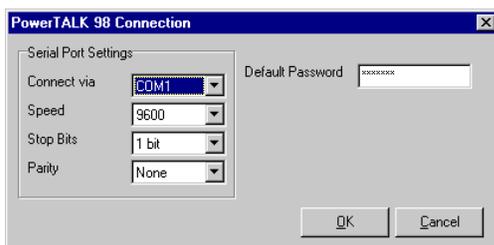
```
PT -I10.1.1.7 martian commit OUTSTN1
      to store changes into non-volatile memory
```

PowerTALK 98 – Windows GUI software

PowerTALK 98 is the 32 bit Windows interface to PowerTALK 101. The Windows software connects to a serial port on PowerTALK 101.

PowerTALK 98 is developed to simplify the process of setting up a number of PowerTALK 101 units locally or from remote. PowerTALK 98 requires one serial connection from a PC running Windows 95, 98 or NT to a PowerTALK 101 unit. Over such serial link, all PowerTALKs including the Ethernet connected ones can be configured, and re-configured.

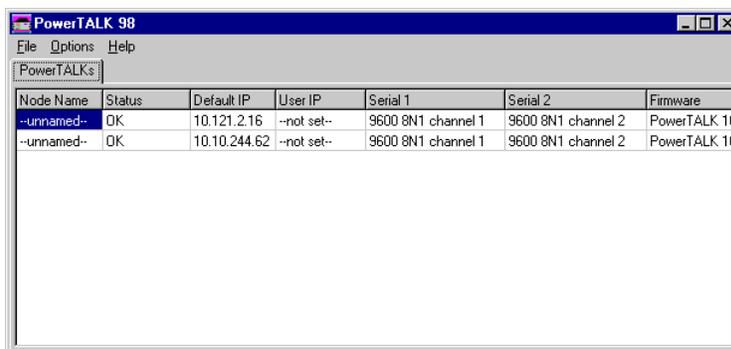
Upon start-up PowerTALK 98 needs to establish serial communication with any PowerTALK 101 unit. The first screen asks for the serial port details previously set up on the PowerTALK 101 units. Factory defaults on PowerTALK 101 units are 9600 baud, 8 bits, no parity, 1 stop bit.



First PowerTALK 98 setup screen

The *Default Password* on PowerTALK 98 is set as “martian”. The system is delivered in the open state, i.e. the default password enables changing of any networked PowerTALK 101 unit. Should the user want to password protect the system, the passwords on each PowerTALK 101 unit may be changed, and the default password on the screen below may also be changed.

Once communication to the serially connected PowerTALK 101 unit is achieved, all networked PowerTALK 101 units will be listed. Any PowerTALK units located across a network bridge or router (101B or 101C models) will not be seen by this list until their IP addresses are manually set up in PowerTALK 98.



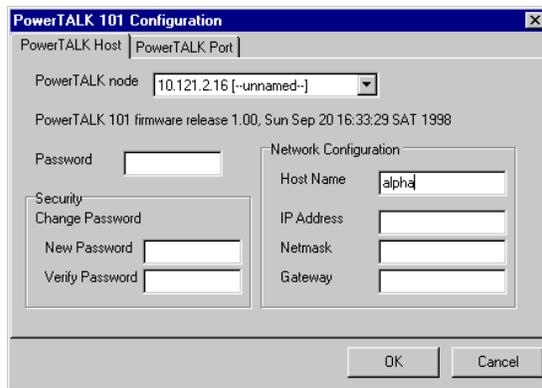
All connected PowerTALK 101 units listed

PowerTALK 98 examples

Double clicking on a selected PowerTALK 101 unit on the main screen results in either of the following screens to pop up. These screens may be used to set up both network and serial port parameters.

Note the password must be set correctly for any change to take effect:

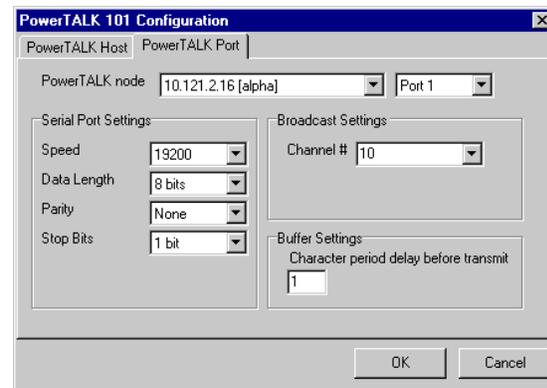
Change TCP/IP network configuration



The dialog box shows the following fields and options:

- PowerTALK Host: PowerTALK Port
- PowerTALK node: 10.121.2.16 [-unnamed-]
- PowerTALK 101 firmware release 1.00, Sun Sep 20 16:33:29 SAT 1998
- Password: []
- Security: Change Password, New Password [], Verify Password []
- Network Configuration: Host Name: alpha, IP Address [], Netmask [], Gateway []
- Buttons: OK, Cancel

Change serial port details



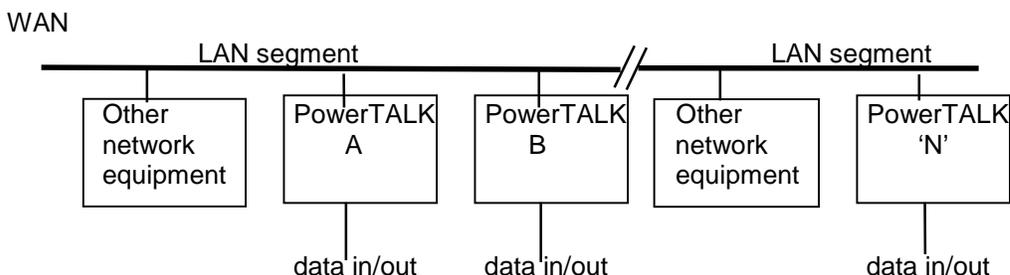
The dialog box shows the following fields and options:

- PowerTALK Host: PowerTALK Port
- PowerTALK node: 10.121.2.16 [alpha]
- Port: Port 1
- Serial Port Settings: Speed: 19200, Data Length: 8 bits, Parity: None, Stop Bits: 1 bit
- Broadcast Settings: Channel #: 10
- Buffer Settings: Character period delay before transmit: 1
- Buttons: OK, Cancel

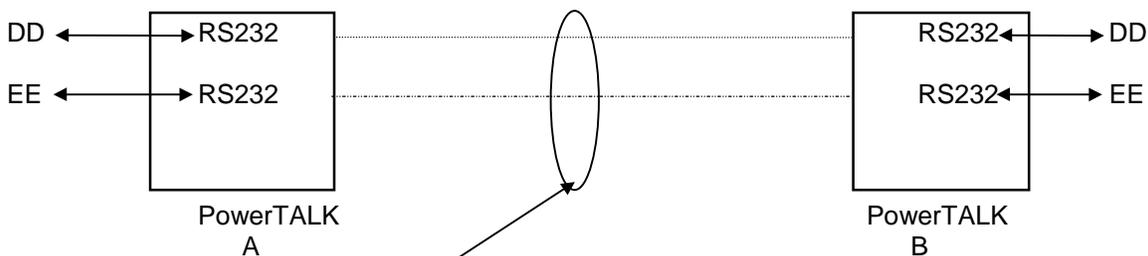
- A **Password** needs to be set according to the password previously set on the PT unit
 - A **New Password** on the unit may be set
 - An arbitrary **Host Name** may be assigned to a unit
 - A second **IP address, Netmask & Gateway** may be configured as used in the user network
- A connected unit and port may be selected
- Serial Port Settings** such as baud rate, word length, etc. may be changed
- The port may be assigned to a **channel number**, see p47 for details
- The unit's **Buffer Settings** may be changed. A TCP/IP packet will be transmitted after a delay time equivalent to the max. transmission time of the specified number of bytes (at 10 bits per byte at the current baud rate).

Network Topology

PowerTALK 101 allows your Ethernet system to be used for control data transport tasks without interfering with normal network operations. The units are 802.3 compliant and use protocols from the TCP/IP suite, so they are fully routable and because they only use Ethernet capacity when carrying data – they have very little affect on network performance.

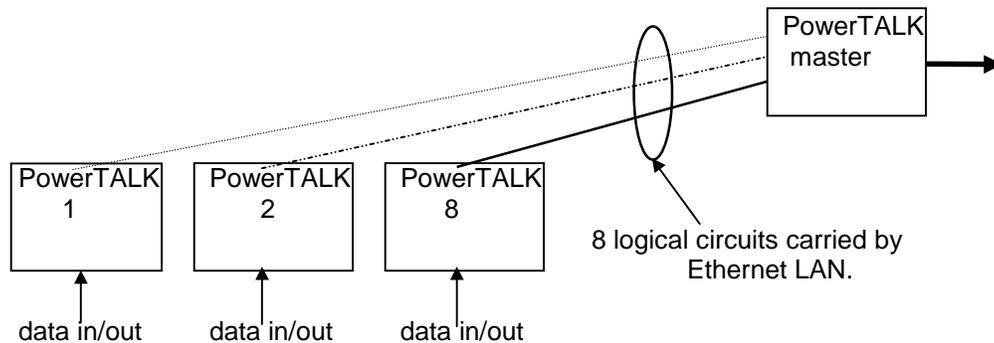


Each unit has two RS232C ports and a network port. Normally DB-9 connectors and 10-BASE-T are assumed, but DB-25, 10-BASE-2 and 10-BASE-5 is also available. You may connect as many units as you wish to the network and establish logical connections between units with complete flexibility. For example, imagine two units each connected to a network, but at some distance from each other. The two ports could be set up as shown below so that they all carry data simultaneously -



2 logical circuits carried by Ethernet LAN.

PowerTALK 101 allows its two ports to be individually linked to any port of any other PowerTALK 101 unit (the above example shows them linked in a one-to-one fashion just for simplicity). You can connect as many PowerTALK units as you wish to your network, obeying normal Ethernet rules, and set up connections between units with complete freedom. For example, set one unit to accept data from several other units -



These and many other configurations can be easily set up, monitored and changed at will from any unit on the network serially connected to a PC. PT.EXE allows you to make and break logical links between units, examine and change configurations, unit names, IP numbers etc. of any PowerTALK 101 on the network. Security is provided by a password for every unit.

PowerTALK 101C provides error corrected, self-repairing logical links. Every network packet is error checked and sequence numbered to ensure all your data is delivered and is error free.

Should the network or the power fail, all PowerTALK models will automatically re-link when the problem is resolved.

PowerTALK 101 configuration

Pre-connect configuration

You can make a few minor configuration changes to each unit before you connect them to your network. The most important thing is to give each unit a unique name and or IP number. Each unit has storage for all user configurations and these configurations are reloaded each time the unit is powered up.

PowerTALK 101 can be connected to the network in its default configuration. The default name and IP number parameters are based on the unique MAC address of the PowerTALK unit.

Typical default IP address	10.121.1.147
Typical constant part of IP address	10.121.xx.yy
Typical custom IP address	100.100.100.3

PowerTALK 101 is configured by PT.EXE or PT98.EXE. Both packages can use either the network port or a serial port for configuration.

Serial connection cables

In the case of serial configuration, a Laplink (swapped over) cable is required for communication between the PC and PowerTALK 101. The serial ports are configured as DTE so a Laplink PC serial cable can be used with crossovers.

Network connection: IP address setting

In the case of network configuration, the host PC must be configured to be able to speak to the network ports on the PowerTALK 101s. Using Windows NT, one must “add” another IP address to its configuration. Using Windows 95, only one IP address is allowed per PC, forcing the user to change his network settings each time he changes networks from the normal office network to the PowerTALK Ethernet network.

Below, the screens used for changing the IP addresses correctly are shown. Should no networking be set up on your machine, contact your network administrator to set your Windows machine up for networking.

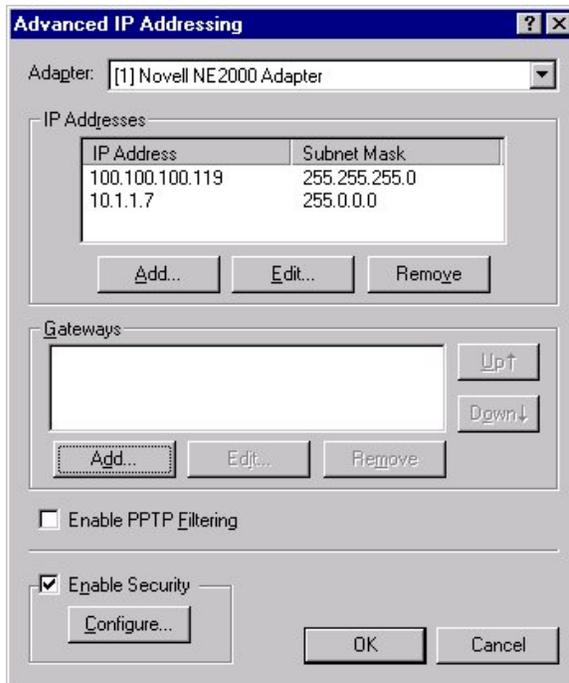
The IP address shown on the screen prints below is used throughout this document, and can also be used on your Windows machine, provided the example IP address 10.1.1.7 does not exist already.

Windows NT

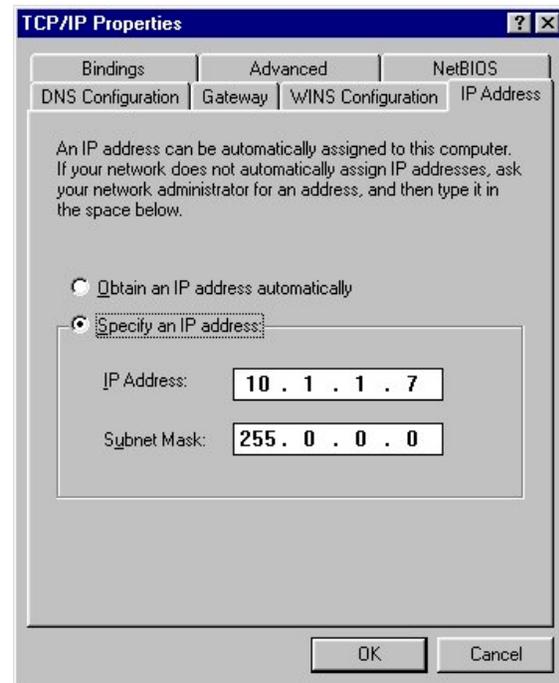
- Click Start/Settings/Control Panel
- Click Network/Protocols
- Select TCP/IP
- Click Properties, Advanced
- Add an IP address like 10.1.1.7 to match the PowerTALK 101 default IP address range 10.x.x.x.

Windows 95

- Click Start/Settings/Control Panel
- Click Network
- Select TCP/IP
- Click Properties
- Change your IP address to something like 10.1.1.7 to match the PowerTALK 101 default IP address range 10.x.x.x.



Multiple IP addresses allowed



Only one IP address is allowed

IP configuration of the TCP/IP protocol in the Windows 95 and NT operating systems

Other settings on PowerTALK 101

Next, using PT.EXE or PT98.EXE, rename each PowerTALK 101 unit to suit your site. You may also change passwords, port settings, IP number, default gateway IP number and subnet mask from this menu. Note that a subnet mask must be defined if the custom IP address is used.

Connecting to the physical network

The relevant medium must be connected, i.e. a RJ-45 telephone connector in the case of 10-Base-T.

10-BASE-T

PowerTALK 101 can be connected with a normal UTP CAT-5 flylead to a network hub.

PowerTALK 101 can be connected to another PowerTALK 101 unit with a special UTP CAT-5 server cable (crossed Tx and Rx cables).

Commissioning aids

LED indications

Normal LED indications on face plate:

Refer to the LED description on page 13.

All LEDs are scanned through all possible states in sequence *red/green*, top to bottom, immediately prior to start of operation.

- ON/FAIL

Green The communications processor card has initialised and is working properly

Red An operational error has occurred.

This *Red* is not automatically recovered. The machine must be reset.

- Serial 1 Tx/Rx

Green Transmits serial data

Red Receives serial data

- Serial 2 Tx/Rx

Green Transmits serial data

Red Receives serial data

- Ethernet Tx/Rx

Green Transmits packet

Red Receives packet destined for local IP address

Indications on inside of box, only visible when cover is removed:

- Power

Red Communications processor board powered up, +5VDC.

- Ethernet

Green Indicates a physical link has been established

Flashing Red Indicates network traffic

Red Ethernet ready / power

Tests

Tests using standard networking protocols:

- The standard PING program supplied with Windows 95/98/NT can be used to determine network operation, confirming PING time to the specified PowerTALK unit.

Tests available using PT.EXE

- Networking loopback echo test. A special packet is sent to PowerTALK 101, and a special packet containing address information is returned.

Tests available using PowerTALK 98 under Windows 95 or NT

- Networking loopback echo test. A special packet is sent to PowerTALK 101, and a special packet is returned. The total loop time is measured. This packet returns address information to PowerTALK 98.
- Loopback echo test. A loopback connector must be installed on the PowerTALK 101 serial port. The total loop time for a single character transmitted through the loopback connector is measured.

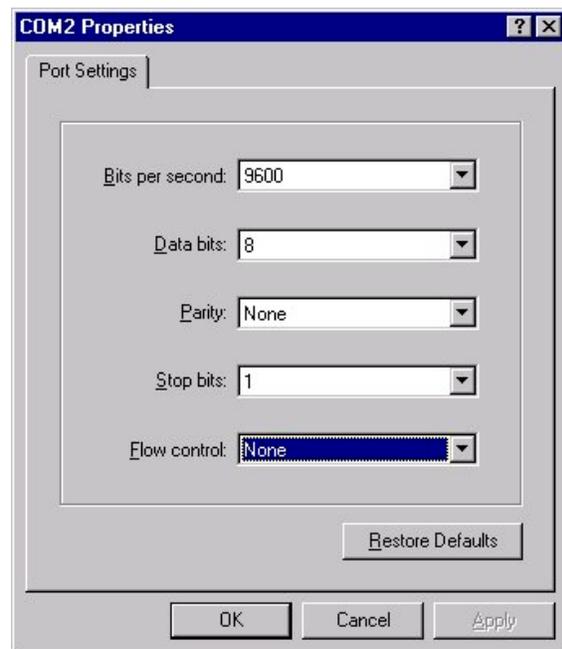
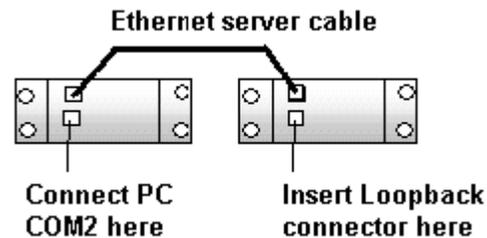
Testing procedure

It is suggested that a PowerTALK unit or system is laboratory tested prior to shipping to site.

A simple, but effective test is described below:

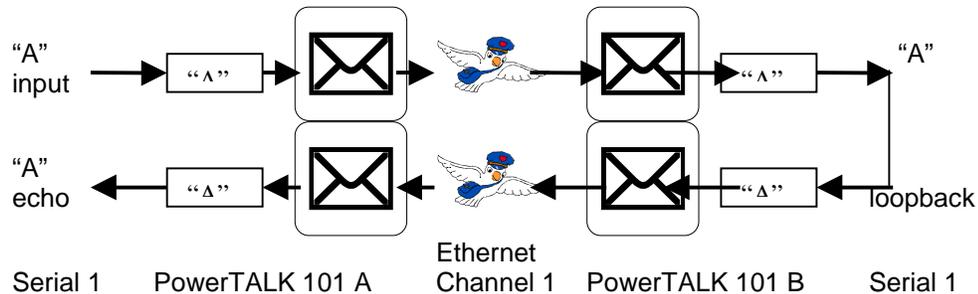
Using the default settings on the PowerTALK unit, i.e.: 9600 8N1, with the standard IP addresses, as are indicated on the back of the units.

1. Power up 2 PowerTALK units, confirming that the green "ON" LEDs are on
2. Connect a Server Flylead (Crossed over UTP lead) between the two PowerTALK units
3. Connect a loopback connector to port 1 or 2 on a PowerTALK 101 unit
4. Connect a Laplink cable between the other PowerTALK unit, and the PC COM2.
5. Run HyperTerminal on Windows 95/NT
6. Set HyperTerminal to COMn where COMn is your available COM port
7. Set HyperTerminal to the settings shown on the right
8. Ensure "local echo" is off on HyperTerminal
9. Type into the terminal emulation program, and you should see an echo returning on the screen. This comes from the loopback plug, and will stop if the loopback plug is removed.
10. The LED indications can also carefully be checked, observing the flow of data.



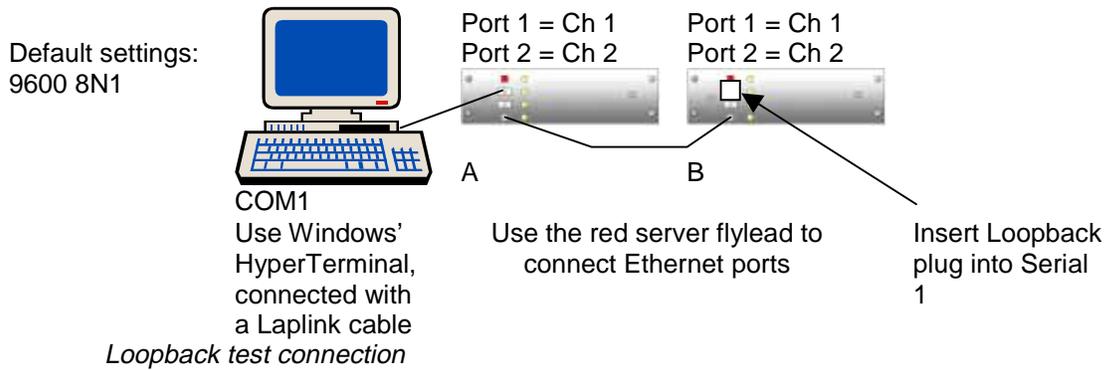
Easy functionality test - Loopback test:

A terminal program is used to send a character through a set of PowerTALK units, through the loopback connector, and then echoed back to the terminal program. The complete loop is functional if the echo is visible.



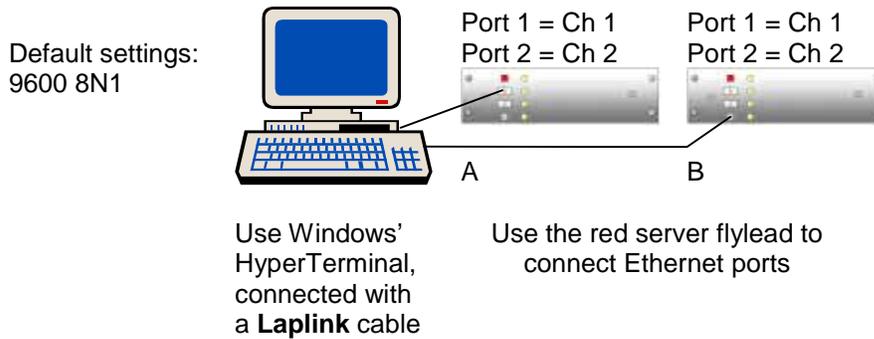
Schematic loopback test

- A character is sent from HyperTerminal on the PC COM port into the Serial 1 port on PowerTALK 101 "A"
- The character is packetised and sent from PowerTALK 101 "A" to "B" over Ethernet, on channel 1 (Serial 1 is configured onto channel 1)
- PowerTALK 101 "B" receives a packet on channel 1, destined for Serial 1 (Serial 1 is configured onto channel 1)
- PowerTALK 101 "B" strips the packet, and outputs the character to its Serial 1 port.
- PowerTALK 101 "B" Serial port 1 has a loopback connector, and the bits are bounced back into Serial 1.
- The character is once again packetised and sent from PowerTALK 101 "B" to "A" over Ethernet, on channel 1 (Serial 1 is configured onto channel 1)
- PowerTALK 101 "A" receives a packet on channel 1, thus destined for Serial 1 (Serial 1 is configured onto channel 1)
- PowerTALK 101 "A" strips the packet, and outputs the character to its Serial 1 port, connected to the PC COM port.
- This character will then be displayed as an echo on the HyperTerminal screen.
- Removing the loopback plug, or inserting it into the incorrect channel/port will stop the echo from occurring.



For the loopback test described above, no setting changes are required. The PowerTALK 101 units can be unpacked from the original boxes, powered up, and immediately be connected to perform above functionality test. The same test can also be executed using arbitrary settings as can be changed using PT.EXE.

Setting and configuring PowerTALK 101



Setting and configuration

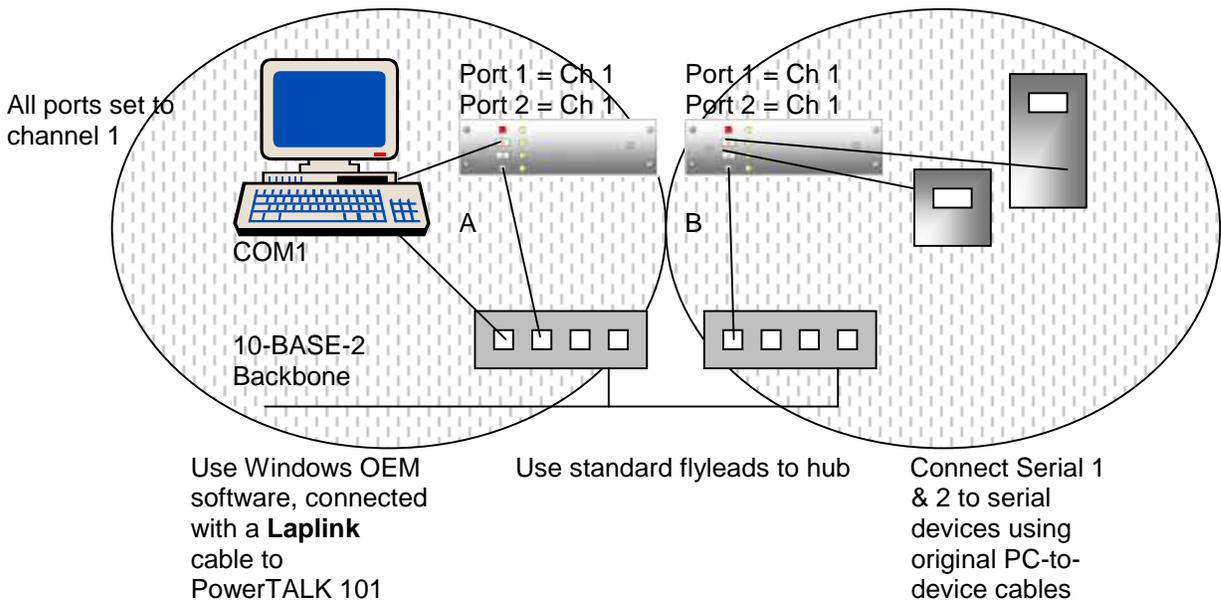
Any PowerTALK 101 unit can be remotely configured from any connected PowerTALK 101 serial port or Ethernet port. In above example, "A" is connected using a serial connection, and "B" is connected using its network port. In both cases PT.EXE can be used to configure the PowerTALK 101 unit.

For configuration detail, see the section on PT.EXE parameters.

Practical connection example – Address type serial devices

An address *type serial device* uses a protocol preventing it from answering to all messages from the master station. The device is given some ID address to which it will respond.

The connection below effectively connects device C and D to the same multi-drop network. This connection demands a device that will only respond to its ID call from a master controller.



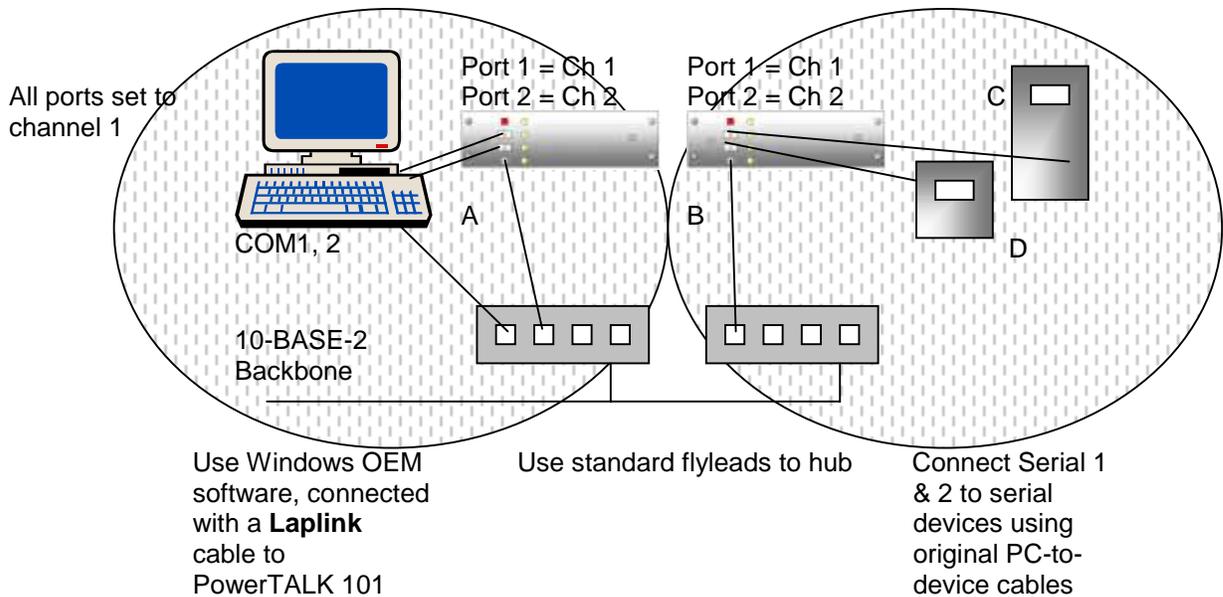
*Practical connection example
Circles indicate different locations*

Practical connection example – Non address (old) type serial devices

An address or *ID type serial device* uses a protocol preventing it from answering to all messages from the master station. The device is given some ID address to which it will respond. A non-address or non-ID type device will respond to all message on the serial line, assuming everything is destined for it.

The connection below effectively splits COM1 and COM2 on the PC, ensuring individual logical connections (channels) from COM1 and COM2 to the devices C and D.

A serial stream from COM1 (Serial 1) will only go to C, and COM2 (Serial 2) will only go to D.

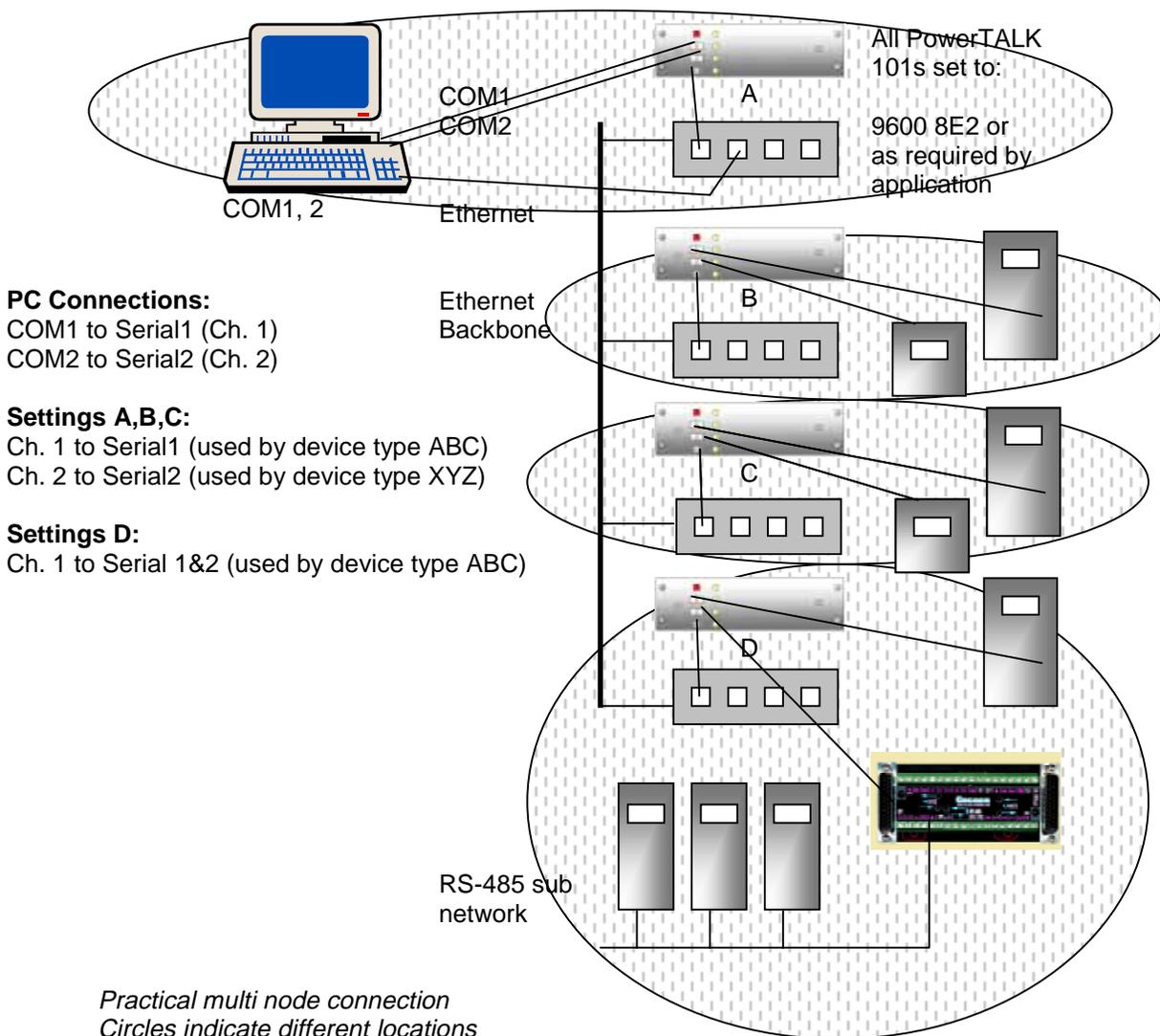


*Practical connection example
Circles indicate different locations*

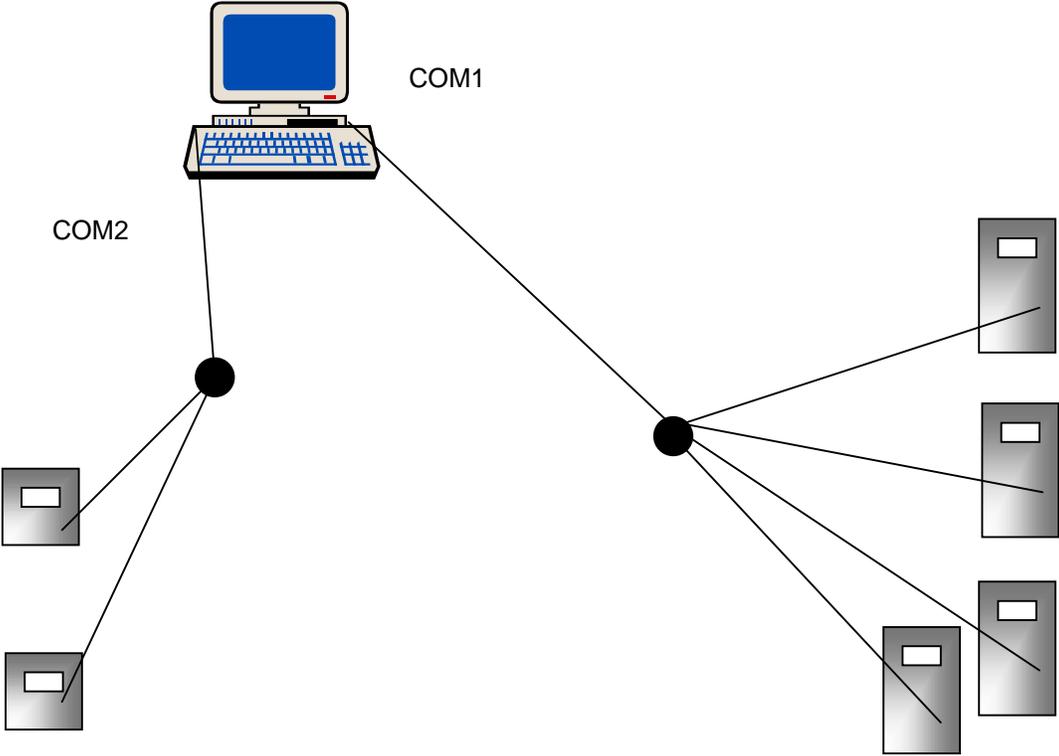
Practical multi node example

This example assumes two different types of protocols, not allowed to be on the same physical serial network. It shows each PC COM port to go to a different subnet of address or ID type serial devices, i.e. devices each with an individual address on the subnet.

The equivalent logical network is also shown below:



To the PC master station it appears to be connected to two separate transparent serial links.



Equivalent virtual network as seen by the PC

Technical detail

Settings for popular Siemens & GE Multilin equipment

The serial settings for Siemens DIGSI 7SJ600 protection relays are: 11 bit, 9600 8E1
 The serial settings for GE Multilin 239 protection relays are: 10 bit, 9600 8N1

Channels

The concept of channels was introduced to facilitate the selective connection of various PowerTALK units, connected to the same Ethernet network.

A channel has all the necessary intelligence to facilitate full duplex connections between any of its members. Important to note, that all ports will reflect all data flowing in all directions. To make such a connection useful, the user's protocol must accommodate multi-drop connections.

- Each serial port on each PowerTALK unit is connected to a specified channel.
- All incoming serial data will be made visible on the specified channel, on Ethernet.
- All PowerTALK units will listen for packets on the Ethernet, bearing the specified channel
- If a PowerTALK unit sees a packet destined for any of its serial ports, the packet gets disassembled, and the serial data contained within is output into the relevant port

All PowerTALK 101 units are factory set as follows: all Ports 1 on all PowerTALK units are connected to channel 1, and also all ports 2 onto channel 2. All connections are one-to-many, i.e. a multi drop arrangement.

	Channel 1	Channel 2	Channel 3	Channel 4
PowerTALK "A"	Serial 1	Serial 2		
PowerTALK "B"	Serial 1	Serial 2		
PowerTALK "C"	Serial 1	Serial 2		
PowerTALK "D"	Serial 1	Serial 2		

For one-to-one connections, i.e. classical RS-232 usage, a channel may only have 2 ports defined. In the table below, 4 channels are defined for four logical links between four PowerTALK 101 units.

	Channel 1	Channel 2	Channel 3	Channel 4
PowerTALK "A"	Serial 1	Serial 2		
PowerTALK "B"	Serial 1	Serial 2		
PowerTALK "C"			Serial 1	Serial 2
PowerTALK "D"			Serial 1	Serial 2

Potential PowerTALK lock-ups

Endless loop

If PowerTALK 101 SERIAL 1 is looped back to SERIAL 2, and both ports are configured on the same channel, an endless loop may occur as follows:

- ◆ Another PowerTALK 101 on the network on channel n, broadcasts a character
- ◆ The local PowerTALK 101 receives it
- ◆ Channel n receives it from Ethernet
- ◆ It gets delivered to serial port S1, which is connected to channel n
 - It gets looped back to serial port S2 via the Laplink cable
 - Serial port S2 is connected to and broadcasts it to channel n on Ethernet
 - It is received by channel n on Ethernet (on the same machine!)
 - It is re-delivered to serial port S1, still connected to channel n
 - Ad infinitum

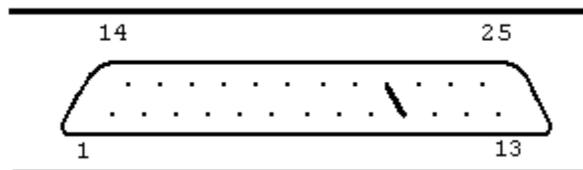
The best way to break out of this endless loop is to remove the loopback cable (Laplink cable) from S1 to S2.

Loss of communication to configure PowerTALK 101

If the serial ports are (accidentally) configured to unknown settings, one may not be able to re-establish configuration with PowerTALK 101 via the serial port, i.e. if you've set it to 6 bits, 1200 baud, even parity, and you don't know the port details, you wouldn't be able to communicate.

In this case one can still access the device via the network port of a PC. If this is not available, or the network password is forgotten, a system all reset is the only way to re-establish communications.

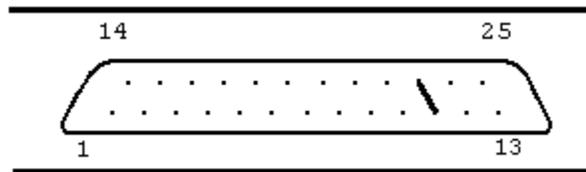
For this special circumstance, a "back door" is left, and can be accessed as follows. Open the front door of PowerTALK 101; remove the LED chord with the DB-25 connector. Insert a DB-25 male plug with pins 10 and 22 bridged. This will set the PowerTALK back to default serial settings of 9600 baud, 8N1.



Link for reset to defaults
LED connector, DB-25F (holes) seen from the outside of the box.

Testing system watchdog

PowerTALK 101 has a watchdog system implemented to guard against hardware and/or firmware failure. It is very difficult to test since one needs an actual faulty processor, but can be simulated by the short, as indicated. The short actually forces the PowerTALK 101 unit to not refresh the watchdog timer, resulting in repeated system reset.



Link for Watchdog test
LED connector, DB-25F (holes) seen from the outside of the box.

Using PowerTALK 101 with bridges and routers

Different versions of PowerTALK 101 behave differently with routers. PowerTALK 101 implements a broadcast protocol, meant for single or single virtual network segments, while PowerTALK 101B implements the same protocol with point to point links. PowerTALK 101C implements the TCP/IP protocol.

Ethernet bridges learn where the various MAC addresses on your network are and forward packets accordingly. They will normally forward all PowerTALK 101 packets perfectly, but some bridges allow filtering of packets based on certain criteria, for example broadcasts can be discarded. If broadcasts are disabled, the PowerTALK 101 network will not see units on the far side of the bridge. The same applies to routers and intelligent hubs. They will rarely pass broadcasts, so units on the far side of them will not be seen. PowerTALK 101B will be able to use any TCP/IP compliant bridge/router or intelligent hub. The PowerTALK protocol is fully TCP/IP compliant, and allows any unit on the WAN to be -

1. Linked to any other unit.
2. Have its configuration examined and modified

However, units on different sub-nets of a WAN must be referred to by IP number not name, and valid entries for IP number, default gateway IP number and sub-net mask must be entered into all units. Refer to your network administrator.

PowerTALK 101 protocol

PowerTALK 101 supports the TCP/IP suit of protocols, namely IP, ARP, ICMP and UDP. Presently it will respond to ICMP Ping and ARP, although it cannot originate Ping requests. ARP requests are sent. PowerTALK's own protocol and the transported data are carried inside UDP datagrams. The data carried is 1 byte minimum (after time out) and 128 bytes maximum. The Ethernet encapsulation is as defined in RFC 894 and mandated by RFC 1022. The packet format is shown below -

Mac Header -

- 6 bytes Destination MAC address
- 6 bytes Source MAC address
- 2 bytes Type - 0800 for IP packets, 0805 for ARP requests and 0806 for ARP replies.

IP header -

- 2 bytes IP Version - 4, header length - 20, TOS - 16 (4510h)
- 2 bytes IP packet length including header
- 2 bytes identifier (packet number, unique over a short period)
- 2 bytes fragmentation - 00
- 2 bytes TTL - 64, protocol - 17 = UDP (4011h)
- 2 bytes header checksum
- 4 bytes Source IP number
- 4 bytes Destination IP number

UDP header -

- 2 bytes Source port – variable
- 2 bytes Destination port – 7000dec
- 2 bytes length of UDP portion including header
- 2 bytes optional UDP checksum - set to 00

PowerTALK data -

- 2 bytes command_code // Command code
- 2 bytes target_comport // Target com port, 1=COM1 etc, -1=broadcast
- 2 bytes data_length // Length of data in data block
- 2 bytes source_comport // Source com port of data, 1=COM1 etc
- 2 bytes sequence // Incrementing sequence nr
- 2 bytes channel // Channel ID (for broadcasts)
- 20 bytes reserved // reserved (must be all 0)
- 128 bytes data // data buffer

Other products available in the PowerTALK family

PowerTALK 110

Serial data switch

Access & configuration from serial port(s), network port

REMOTE COMMUNICATION TO MULTIPLE RS-232 LINKS

6, 10, 14, 18 or 22 serial ports. More optionally available.

PACKETIZING OF SERIAL DATA STREAM ONTO ETHERNET

TCP/IP compatible

2.5kV isolation



PowerTALK 120

IP and/or MAC router

Access & configuration from serial port, network port

2, 3 or 4 network segments available.

TCP/IP compatible

2.5kV isolation



PowerTALK 100B

7SS50 V4.xx Event logger

Printing hard copies of important events

ON BOARD IMPACT PRINTER

Constant polling of 7SS50

Fault / trip recognition and automatic report printing

2.5kV isolation

No picture available

PowerTALK 103

Isolated dual RS-232 to RS-485 converter

For industrial communication networks

CAPABLE OF CONNECTING 64 SIMILAR UNITS ON RS-485

Two master/slave modes

Optimal timing for 9600 or 1200 baud

19200 baud can be used, depending on software

Fits onto face of Siemens protection relay series

Tested with GE Multilin series and Siemens series protection relays

Port powered

DIN / G rail mountable

2.5kV isolation



Option: Remote software gate switching

History of changes to this manual, from release 1

Release 2

Small changes are not listed.

Added “commit” under PT.EXE examples

Added section on PowerTALK 98

Clarified some of the sketches

Added section on battery replacement

Notes

