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INTRODUCTION

FOR A BETTER COMPREHENSION

We assume that you are familiarized with or you can obtain help on this topics if necessary:

- ✓ MAP27 Protocol
- ✓ Modem devices
- ✓ RS-232 Hardware
- ✓ JPC-1 is the name of the hardware board for this protocol converter firmware

DOCUMENTATION COVENTIONS

The following conventions are used in this document:

To indicate a particular key, the name of the key is given in capitals. For example, press the ENTER key.

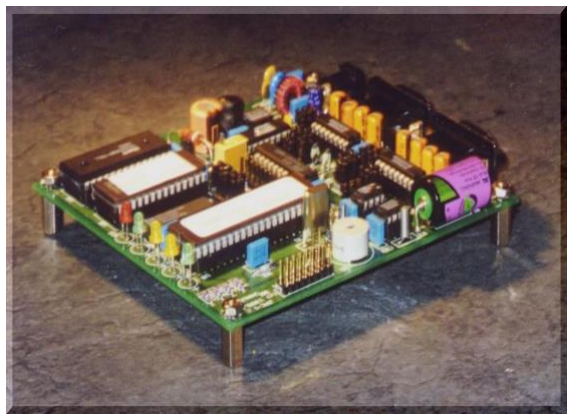
Sometimes you need to hold down one key on the computer while pressing another key. This is indicated by giving the name of the first key, then a plus "+", then the name of the second key. For example, "Ctrl+C" means "press the key labeled "CTRL" or "Ctrl"(i.e., the "control"·key) and, while continuing to hold it down, press the "C" key. Multiple-key combinations that generate a single character are shown in angle brackets, like this: <Ctrl+C>

DESCRIPTION

JPC-1 is a device capable of sending/receiving data through a V.24/Logic serial input using HAYES protocol, standard in any PC modem, and to send/receive data through another V.24/Logic serial output using MAP27 protocol.

JPC-1 was designed to work in hazardous environments. It could be installed in workstations as a standard modem, it could be integrated in more complex communication devices or systems. Besides, it is a effective alternative to migrate other communication systems as cellular telephony to trunked radios. In this case, the trunked radio total control is achieved using the radio data interface protocol MAP27. This allows full trunked radio control as establishing or ending a data communication. With this protocol the device can sent long and short messages types.

JPC-1 is compatible with a wide range of available trunked radio equipment.



There are two JPC-1 editions, wich will be especified in this guide. The two available editions are:

- ✓ JPC-1 OEM: It is intended for users who want to incorporate JPC-1 inside existing devices and therefore there is no need of a cabinet because the existing device has one and the user will incorporate de board in order to enhance the device functions.

- ✓ JPC-1 E (External): For applications where JPC-1 will be use as an external device like is the PC external modem case.

JPC-1 APPLICATIONS

- ✓ Trunked radio device-PC Interface
- ✓ Messaging
- ✓ Communication systems adapter

OPTIONAL

- ✓ GPS
- ✓ Internal or external power supply
- ✓ TTL Input/Outputs

CHAPTER I – INSTALLATION

This device was designed to convert HAYES protocol to MAP27 protocol, incorporating Hayes extensions to support MAP27 functionality.

In this chapter we cover the configuration and starting processes from the HARDWARE side. Next chapter describes JPC-1 eHAYES protocol (SOFTWARE).

SPECIFICATIONS

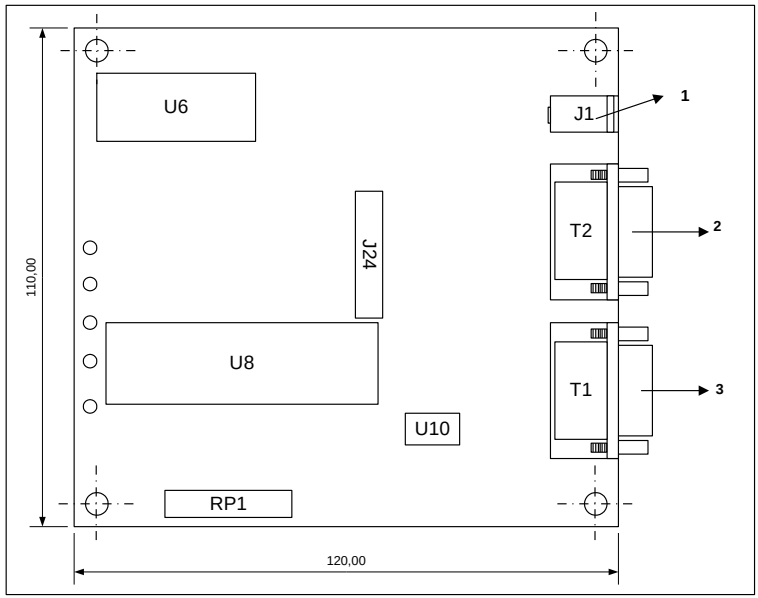
- 2 RS232C/LOGIC SETEABLES PORTS
- SWITCHING POWER SUPPLY
- EXPANSION BUS

DESCRIPTION

In this chapter we describe both JPC-1 available editions. If you bought JPC-1 E we suggest you to read JPC-1 OEM description in order to achieve a complete device knowledge.

JPC-1 OEM

The following picture is a OEM edition board diagram:



Top View

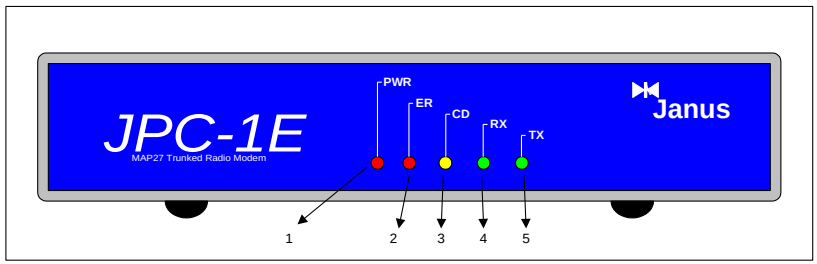
Size: 110 x 120 mm.

Weight: 107(+/-1) gr.

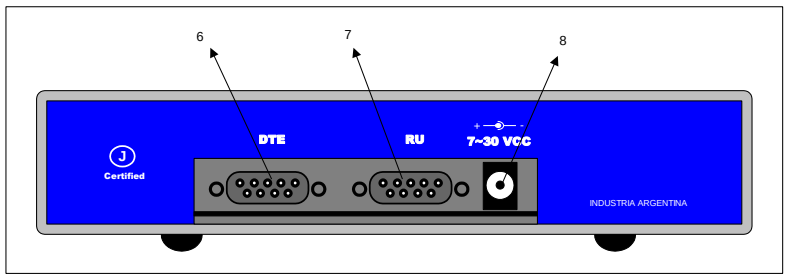
1. **External Power Supply Connector:** Power voltage is applied through a 2.1 mm jack connector. It must be direct current and because of its switching voltage regulator, the incoming voltage could vary from 7 to 35 VDC (See Power Supply connection).
2. **Trunked Radio(RU) Serial Connector:** Serial port working with MAP27 protocol which allows JPC-1 to communicate with trunked radios in order to control them(See Trunked radio connection).
3. **DTE Serial Connector:** Serial port that allows JPC-1 connection using a reduced Hayes protocol version (eHayes). (See DTE connection). DTE could be a standard PC or any control hardware.

JPC-1 E

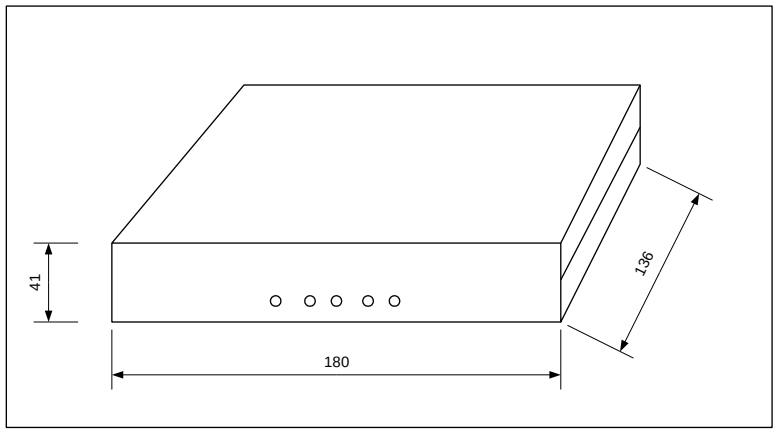
The following figures describe the JPC-1 E edition.



Front View



Rear View



External Dimensions

Size: Without legs: 180 x 136 x 41 mm/With legs: 180 x 136 x 47 mm

Weight: 300(+/-1) gr.

1. **PWR LED:** On, when an external power supply is present.

2. **ER LED:** On, when error events are present in the communication process.

3. **CD LED:** On, when external RU connection is detected and it is ready to data transfer operations.

4. **RX LED:** On, when a data reception event occurs, in other words, when data arrives at the RU connection port.

5. **TX LED:** On, when a data transmit event occurs, in other words, when data is send through the RU connection port.

6. **DTE Serial Connector:** Serial port that allows JPC-1 connection using a reduced Hayes protocol version (eHayes). (See DTE connection). DTE could be a standard PC or any control hardware.

7. **Trunked Radio(RU) Serial Connector:** Serial port working with MAP27 protocol which allows JPC-1 to communicate with trunked radios in order to control them(See Trunked radio connection).

8. **External Power Supply Connector:** Power voltage is supplied through a 2.1 mm jack connector. It must be direct current and because of its switching

voltage regulator, the incoming voltage could vary from 7 to 35 VDC (See Power Supply connection).

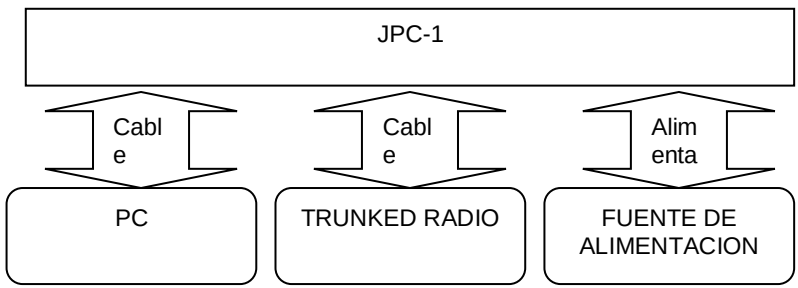
CONNECTION

JPC-1 will work with any DTE (personal computer or specific hardware) which presents an available RS232C serial port, as occurs in the standard PC modem use. Please check the availability of your serial port; that means: enabled and without software or device using it.

With your JPC-1 you have received demo software which requirements and use are treated apart.

To connect JPC-1 to your DTE you may use a standard serial cable or you can build it yourself.

The following is a generic connection diagram:



JPC-1 POWER SUPPLY CONNECTION

Power voltage is supplied through a 2.1 mm jack connector. It must be direct current and because of JPC-1's internal switching voltage regulator, the incoming voltage could vary from 7 to 35 VDC (Check the positive wire is connected to jack's center).

If the power indicator LED does not go on as expected, check to be sure the wiring is correct. If you have checked the wiring carefully and the power indicator still does not go on as expected, the unit may be defective, so you should check with your dealer.

CAUTION

Do not exceed the device power specifications. If you select to install a fuse in the positive lead, do not use a fuse greater than 200 mA.

JPC-1 DTE CONNECTION

DTE communication is achieved using a standard modem wire connected to any available DTE's serial port.

The serial cable is not included with your JPC-1, then you would buy it or build it yourself.

Making the DTE Connection Cable

We assume that if you are making your own cable you are familiar with the process and just need to know what parts are needed and how the parts are connected.

The needed parts are: DB9 Female Connector(JPC-1); DB9 Female Connector(DTE) and the appropriate length of high quality shielded cable with 3 or more wires.

The connection is:

Signal	DB9 JPC-1 (DTE)	DB9 DTE	Direction DTE JPC1
Ground (Protection)	Screen	Screen	←→
RXD Receive	2	3	←
TXD Transmit	3	2	→
SG Ground (Signal)	5	5	←→

Cable Installation

Once you have purchased or made your serial communication cable, connect it as follows:

- ✓ Make sure that power to both your JPC-1 and your DTE is turned OFF.
- ✓ Plug the female DB9 connector end of the serial cable into the "DTE" port of the JPC-1.
- ✓ Plug the other female DB9 connector end of the serrial cable into a serial port of the DTE.
- ✓ Secure the connectors using the mounting screws.

CAUTION

Be sure you do not connect to a parallel port instead of a serial port: the JPC-1 communicates serially, so it cannot communicate through a parallel port. Computer's parallel ports(i.e., printer or LPT port) usually have female DB-25 connectors. Do not connect JPC-1 to a female DB-25 connector on the computer unless you are sure it is a serial(COM) port, not a parallel (LPT) port.

CONNECTING JPC-1 TO THE RU

The last connection is JPC-1 to trunked radio(RU) in order to communicate them using MAP27 protocol.

The connection cable will have a female DB-9 connector to connect it into JPC-1 "RU" port and a male DB-9 connector to connect it into the Trunked Radio. But on the other hand the cable's internal wiring as the connector to be plugged into the RU depends on each RU and this is why you should consult your RU user's guide to look for the wiring information.

Signal	**DB9 JPC-1 (RU)**	**DB9 RU**	**Direction DTE JPC1**
Ground (Protection)	Screen	See RU's manual	←→
RXD Receive	2	See RU's manual	←
TXD Transmit	3	See RU's manual	→
SG Ground(Signall)	5	See RU's manual	←→

CHAPTER II – eHAYES Protocol

eHAYES (embedded HAYES) Protocol, provides interface between the DTE (Data terminal equipment) and the JPC-1 to control and transfer data to the RU(Radio Unit). The protocol's aim is giving a standard, simple and compatible interface with most of the existing software.

SPECIFICATIONS

- AT commands support – JPC-1 modem supports standard AT commands, ensuring operation with most of the existing available software.
- Status Messages Support – JPC-1 modem can send and receive status commands.
- Data Message Support – JPC-1 modem can send and receive short messages(SST) and long messages(MST). This allows up to 88 characters free messaging(8 bits characters).
- Error Detection and Correction – JPC-1 modem supports protocols with error correction enabling free error information communication between modems.
- Automatic Response – JPC-1 Automatically Detects incoming data and starts communication with the DTE.
- EHayes serial port Configuration to communicate with the DTE: 9600,8,N,1
- Serial port configuration to communicate with the RU: It can be configured using eHayes commands.(See RM B n command below).

COMMANDS

INTRODUCTION

Commands must begin (according to Hayes protocol) with "AT" and finish with a 13 (ENTER) character.

JPC-1 responds to commands in LITERAL mode with "OK" or "ERROR", according the command was interpreted correctly or not.

Remember that JPC-1 works with eHAYES protocol, which is a small version of HAYES protocol (for microcontrollers). For this reason there are commands that haven't been implemented, that is the case of the "numeric response command". However remember that the implemented commands are protocol compliant and therefore there behavior will be the same as in the standard PC modem.

MODEM CONFIGURATION

JPC-1 modem contains a factory configuration and two user's configuration, 0 and 1. On startup one of this user's settings is loaded and became the active configuration.

Initializing

The Z command starts Modem initialization in the following way:

AT Zn

Where n is the user's configuration to activate.

Factory configuration could be activate by **&F** command.

AT &F

Is the factory configuration, which in most of situations sets the necessary parameters for the modem's correct operation.

See active and user's configurations

In order to see active and the two user's configurations you must execute the following commands:

AT &V

Saving the active configuration

To save the active configuration use **&Wn** command, where n is the user memory(0 or 1):

AT &W0

Startup configuration

To set the startup configuration use the **&Yn** command as follows:

AT &Y0

Where n could be 0 or 1 depending on the user configuration that you wish on startup. Remember that if you wish to startup the modem with the factory settings, you must use &F command.

Echo

By default characters typed in the command line are echoed in the terminal; in order to disable the character echo you might use the En command where n=1 is echo on and n=0 represents echo off.

AT E1

Response codes

All commands sent to modem have a response code. Is possible to disable these responses using the **Qn** command**,** where n=1 represents response on and n=0 represents response off.

AT Q1

Flow Control (only JPC-1E)

JPC-1 modem supports hardware and software flow control. The **\Qn** command select which is the active mode.

AT \Qn

Where n is the flow control mode:

0	Flow control disabled
1	Software Flow Control (XON/XOFF)
2	Hardware Flow Control (RTS/CTS)

In order to achieve compatibility with HAYES protocol, **&Kn** and **\Xn** commands were implemented to set flow control.

The **&Kn** command is defined as:

0	Flow Control Disabled
3	Hardware Flow Control (RTS/CTS)
4	Software Flow Control (XON/XOFF)
5	Clear Software Control (XON/XOFF)

The **\Xn** commands is:

0	Xon/Xoff characters filtered
1	Xon/Xoff characters Enabled

Modem Information

The information command is:

AT I*n*

Where n represents the information required:

0	manufacturer data
3	firmware version data

Trunked Radio Network Specific Functions

SEND / RECEIVE STATUS MESSAGES

With this command you can transmit status commands according to MAP27 protocol. Its format is:

RM S [number MPT1327], [status number]

For example:

RM S 2 31, 1

JPC-1 modem can receive a status command sending the following message:

RM STATUS [number MPT1327],[status number]

For example:

RM STATUS 2 31, 1

SEND / RECEIVE DATA MESSAGES (SST AND MST)

With this command you could transmit short and long messages up to 88 characters (8 bits characters).

Its format is:

RM D [*number MPT1327*],[data to send]

For example:

RM D 2 31, this is the message to be sent

JPC-1 modem allows the message reception, the terminal receives a command with the following format:

RM DATA [*number MPT1327*],[received data]

For example:

RM DATA 2 31, This is the received information

MAP27 PORT BAUD RATE

With this command you can set the serial communication speed for the equipment connected to the MAP27 port.

RM B *n*

Where n represents:

n = 0 for 1200 Bauds

n = 1 for 2400 Bauds

n = 2 for 9600 Bauds

For example:

RM B2

NOTE

Changing MAP27 port speed, cause the communication system restarting for this port, loosing all the temporary memory contents.

CODING INFORMATION

With this command you can set MST and SST coding information:

RM C *n*

Where n represents:

n = 0 BCD radio path coding.

n = 1 CCITT Alphabet No 2 (Telex)

n = 2 Binary

n = 3 BCD see MPT1327 Appendix 5.

n = 4 CCITT Alphabet No 2 (Telex)(Compatibility)

n = 5 CCITT Alphabet No 5 (7 bit ASCII)

n = 6 8 bit PC character set.

For example:

RM C5

Quick Reference

1.1. Commands

En	n=0 (echo off) and n=1 (echo on).
In	Information n=0 manufacturer, n=3 firmware version.
Qn	Response codes. n=0 Yes, n=1 No.
Zn	Load Settings n (0 ó 1)
&F	Restore factory settings.
&Kn	Flow Control.
&V	Show Settings.
&Wn	Save active configuration n. (0 ó 1).
&Yn	Set startup configuration n.(0 ó 1).
\Qn	Flow Control.
\Xn	XON/XOFF Processing

1.2. Responses

OK	Last command OK.
NO CARRIER	Lost of connection with RU.
ERROR	Last command Incorrect.

BUSY	Device is processing transactions.

1.3. Not Standard Commands

RM Sn,x	Send Status Command x to n
RM Dn,x	Send x data to n
RM Bn	Set MAP27 port Speed
RM Cn	Set coding information

1.4. Not Standard Responses

RM STATUS n,x	Receive status command x from n
RM DATA n,x	Receive x data from n

Factory Default Settings

Command	Value	Description
E	**1**	Send Echo
Q	**1**	Send Response
&K	**3**	RTS/CTS Flow Control
&Y	**0**	Startup Setting 0
\Q	**2**	RTS/CTS Flow Control
\X	**1**	Allows XON/XOFF characters
B	**2**	MAP27 port to 9600 bauds
C	**6**	8 bit PC character set.