PrimeHERTY

(Radio Beacon for Voice and Morse Code, Simplex Repeater and Repeater Controller)

(Repeater for PMR446 and LPD radios)

User Manual

v1.1

(September/2005)

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1. Introduction

Voice repeaters need to have an automatic Radio Beacon to identify them in Voice and Morse code. This way, users are informed of the location of the repeater, and to whom it belongues, among other useful or technical informations.

PrimeHERTY may also work as a Simplex Repeater, eg, when it detects incoming audio, records it, and retransmits it as soon as the incoming audio stops. Using a monoband radio, one can do an economical and easy to use Simplex Repeater.

If a Full-Duplex radio is available, or two distinct radios, ***PrimeHERTY*** may also control them, behaving like a Repeater Controller. In case of having a Full-Duplex radio, ***PrimeHERTY*** receives its incoming audio, activates PTT, and returns in real-time the audio being received. Having distinct radios, the process is exactly the same: one receives, the other transmits.

PrimeHERTY may be connected to any radio system, transmitter or transceiver, or to any audio system.

Transmition modes, power connection and voice recording may be chosen by the use of DIP swiches mounted on the ***PrimeHERTY*** board.

Voice/audio recording is done whenever it is desired, for there is a microphone available for that end on the ***PrimeHERTY*** board. Audio signal levels may also be adjusted by the use of potentiometers available.

PrimeHERTY energy may be supplied from three different sources: external power, internal batteries or solar pannel.

Setup is done with the help of a Computer, running a standard terminal program (eg: HyperTerminal for Windows, goSerial for MAC or Minicom for LINUX, among others). One may program the Morse phrase to transmit, as also the delay between transmissions.

2. *PrimeHERTY*

PrimeHERTY has several sockets that enable energy, batteries, solar pannel, computer and audio/radio connection.

Figure 1 – *PrimeHERTY* external view

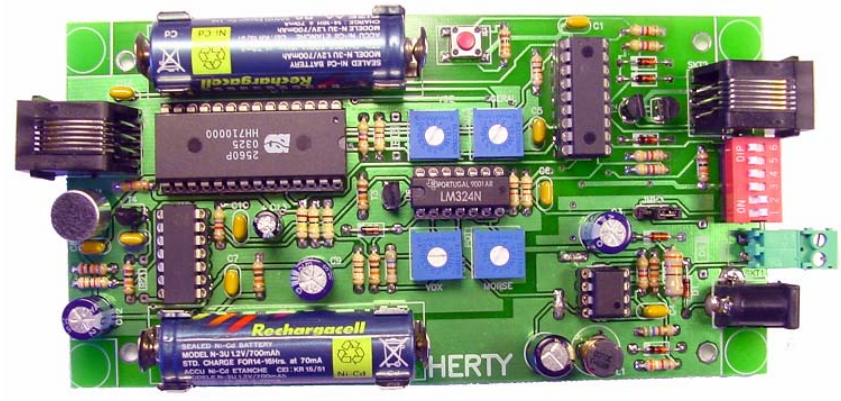

Figure 2 – *PrimeHERTY* internal view

2.1. Energy

Energy must be connected to socket SKT1 (POWER INPUT), batteries on B1 and B2, and/or solar pannel to SKT3 (SOLAR PANEL).

2.2. Audio and Radio connection

Socket SKT4 (RADIO) has all the available connections to an audio equipment, and it is ready to connect to a radio-transceiver.

2.3. Computer connection

To perform ***PrimeHERTY*** configuration, one must connect from SKT2 (RS232) to a RS232 computer port, or to a USB port if using a RS232-USB dongle. In both cases ***PrimeHERTY*** has its serial port ready for all potential levels of computer comunication ports.

2.4. Operating modes

PrimeHERTY operating modes are chosen with S1 switch.

Socket and component layout is available in Appendix II – *PrimeHERTY* component layout.

3. Connections description

After a brief introduction to ***PrimeHERTY***, detailed connections are explained below.

3.1. Energy

There several ways to power ***PrimeHERTY***: externally via power supply or solar pannel, or using its internal batteries.

One should take care of the following:

- SKT1 (POWER INPUT): DC power socket 2.1mm
  - Minimum 6VDC and maximum of 30VDC or 20VAC
  - Central pin is positive supply

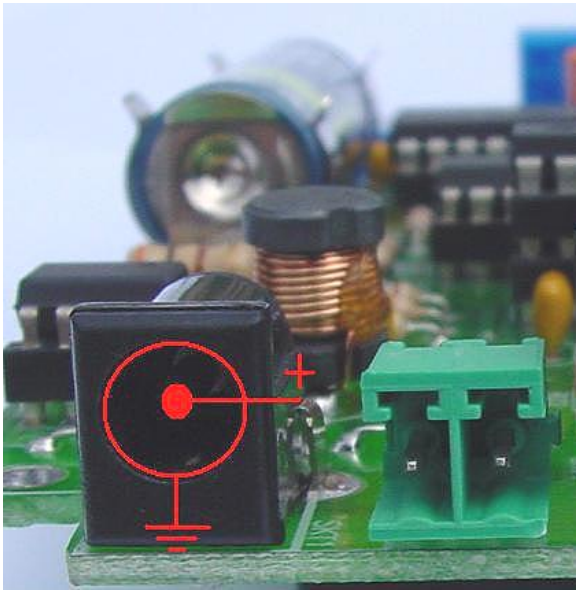

Figure 3 – SKT1 (POWER INPUT) polarity

- SKT3 (SOLAR PANEL): wire gauge 1.5mm^2,
  - Jumper 3:
    - L: low voltage pannel, maximum of +3.5VDC
    - H: high voltage pannel, maximum of +30VDC

ATTENTION: do not connect solar pannels with output higher than +5VDC with Jumper 3 on L position.

The incorrect connection of energy supply may cause unrecoverable damage to the device. Primetec – Engenharia de Sistemas, Lda., takes no responsability for accidents recurrent from connection or usage errors.

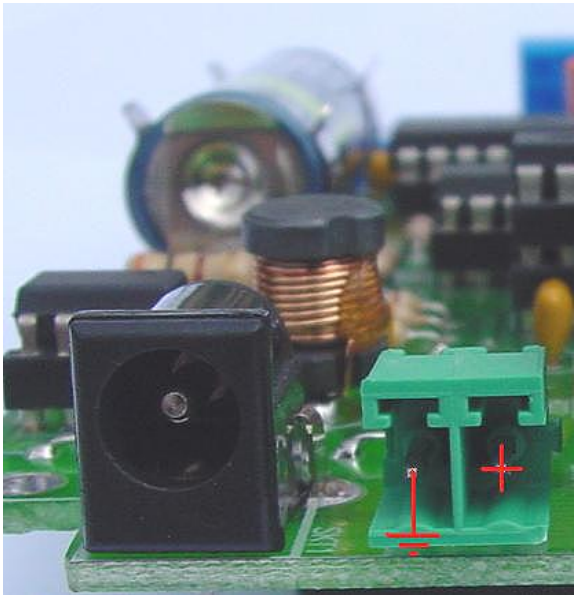

Figure 4 – SKT3 (SOLAR PANEL) polarity

- B1 and B2: rechargeable or alkaline batteries
  - 2x AA 1.2V NiCd or NiMH
  - 2x AA 1.5V Alkaline
  - Jumper 5 – charge batteries if connected

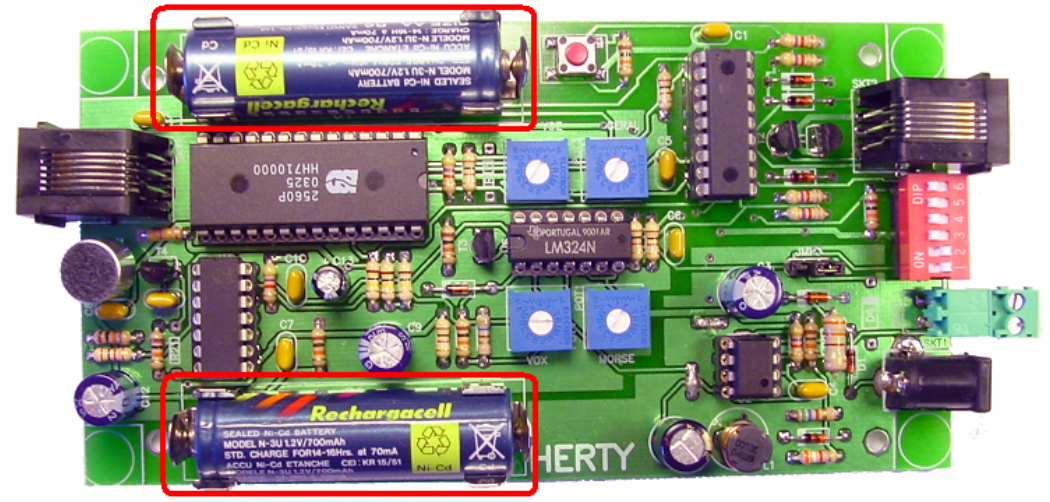

Figure 5 – B1 and B2 sockets

If one uses non-rechargeable batteries to power the system, one should not connect external power, or solar pannel, for it would present a charging current to the batteries, that could destroy them and the electronic components on its surroundings.

But, if one must or want to use alkaline batteries, JMP5 must be open. The manufacturer advises the use of rechargeable batteries, with the advantages taken from that, for they can be recharged while in use with external supply, thus JMP5 may be closed.

If nor alkaline or rechargeable batteries are used, JMP5 must be open.

The incorrect connection of energy supply may cause unrecoverable damage to the device. Primetec – Engenharia de Sistemas, Lda., takes no responsability for accidents recurrent from connection or usage errors.

3.2. Audio and Radio

Audio is available on SKT4 (RADIO) socket, as well as the connections for a radio transceiver equipment:

	Seen from *PrimeHERTY*
	
1	
2	PTT – Push to Talk, transmission activation for radio equipment
3	GND, ground
4	Audio Output
5	Audio Input
6	

Table 1 – SKT4 (RADIO) connection detail

3.2.1. *Jumper* 4, absence of PTT pin

Jumper 4 is used when the radio ***PrimeHERTY*** is connected to has no PTT pin on it. Radio's audio input is used for this purpose, with Jumper 4 in its place, thus ***PrimeHERTY***'s PTT output is not used.

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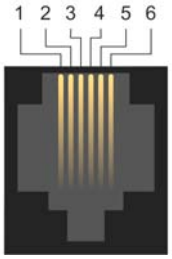
3.3. Computer

To perform ***PrimeHERTY*** configuration, one must connect from SKT2 (RS232) to a RS232 computer port, or to a USB port if using a RS232-USB dongle. In both cases ***PrimeHERTY*** has its serial port ready for all potential levels of computer comunication ports.

	Seen from *PrimeHERTY*
	
1	
2	Data Output
3	Data Input
4	RTS
5	GND, ground
6	

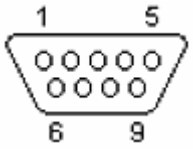
	Seen from Computer
	
2	Data Input
3	Data Output
7	RTS
5	GND, ground

Table 2 – Correspondence between *PrimeHERTY* and Computer sockets

Incorrect connections may cause unrecoverable damage to the device. Primetec – Engenharia de Sistemas, Lda., takes no responsability for accidents recurrent from connection or usage errors.

4. Operating modes[1]

PrimeHERTY operating modes are chosen with S1 switch, as well as the power connection and Voice recording.

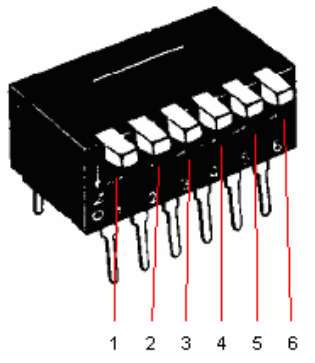


Figure 6 – S1 DIP switches

A Figure 6 shows S1 DIP switches. Detailed explanation is on the chapters below. ON state is when the key is on the "ON" position.

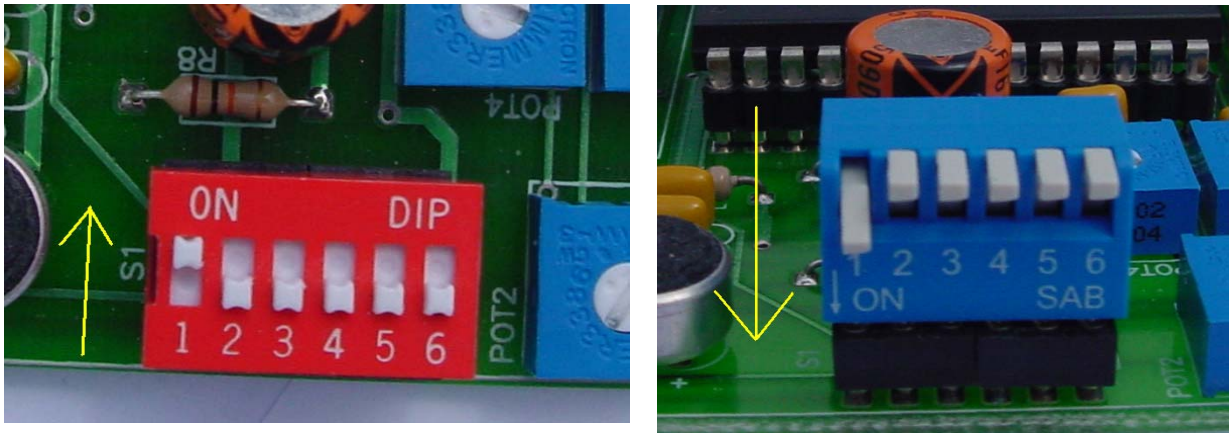


Figure 7 – ON position

[1] Check Appendix I – *PrimeHERTY* schematic

4.1. Energy connection

Keys 1 and 2

To make the energy commutation, and switch on/off the circuit, these are the keys for the purpose.

Key 1 connects the Batteries to the power conversion circuit. However, it does not disconnect the batteries from external power charging.

Key 2 connects External power to the power conversion circuit.

When both External energy and Batteries are connected to ***PrimeHERTY***, the former are being charged with a low current, in order to always have a redundant system in case of External power failure. If alkaline cells are to be used, to switch between internal and external power, Jumper 5 should be disconected.

SAFETY NOTE: when the ***PrimeHERTY*** in use does not have batteries or internal power, the power regulator is always on, regardless the state of Keys 1 and 2. To switch off ***PrimeHERTY***, one must disconnect SKT1 (POWER INPUT) socket.

4.2. Audio transmission modes

Keys 3 and 4

These keys define the Audio transmission modes. Keys 3 and 4 transmit Voice and Morse, respectivelly.

Key 3 – Voice	ON	OFF	ON
Key 4 – Morse	OFF	ON	ON
Output:	**Voice**	**Morse**	**Voice and Morse**

Table 3 – Keys 3 and 4 transmission mode description

Due to being both independent, they may work together or not, it means that one may only transmit Voice, or only Morse.

4.3. Operating modes and Voice recording

Keys 5 and 6

The choice of ***PrimeHERTY*** transmission modes, is done with the help of both these keys.

Key 5	OFF	OFF	ON	ON
Key 6	OFF	ON	OFF	ON
Operating Mode	**Voice recording**	**Radio beacon**	**Simplex Repeater**	**Repeater Controller**

Table 4 – Keys 3 and 4 operating mode description

4.3.1 Voice recording

To record the Voice, S1 keys must be like explained on table Table 4 – Keys 3 and 4 operating mode description.

Procedure:

1. Switch off keys 1, 2, 5 and 6
2. Switch ON keys 1 and 2
3. Wait 2 seconds for system bootup. If ***PrimeHERTY*** is connected to a Computer, a welcome message, and a Voice recording initiated message will show up on the screen. Check chapter 5.7. Audio recording message.
4. When recording is over, switch OFF keys 1 and 2.

After this procedure, system is ready for normal operation. It will be enough, for this purpose, to switch keys 5 and 6 according to the operating mode desired.

4.3.2 Radio beacon

To work as a Radio Beacon, keys must be switched like in Table 4.

While in this operating mode, ***PrimeHERTY*** performs a cyclic transmission, like configured in chapter 5.4. Delay between transmissions setup, of the transmission modes selected in chapter 4.2. Audio transmission modes.

The longer the transmission intervals, the longer the batteries will last.

4.3.3 Simplex Repeater

To work as a Simplex Repeater, keys must be switched like in Table 4.

While in this mode, ***PrimeHERTY*** awaits for incoming audio. It is helped by the internally available VOX[2].

When ***PrimeHERTY***'s VOX is activated, it begins audio recording of the incoming stream. While VOX is activated, ***PrimeHERTY*** will not stop recording.

Once the input audio finishes, ***PrimeHERTY*** stops recording and enters Playing mode. Thus, switches ON the PTT[3] and transmits back the recorded audio.

As soon as the playing cycle reaches the end, ***PrimeHERTY*** switches OFF the PTT and returns to the begining of the cycle. It is now ready for new recordings.

This operating mode is very useful to work as a repeater with monoband radios. It enables a standard *walky-talky* to be used as a repeater with no need for extra costs of additional devices.

Ideal to set up a PMR446[4] repeater.

[2] Audio/Voice operated switch. This switch is activated each time the input audio is above the threshold. Check 5.9. VOX level adjustments

[3] PTT – Push to Talk.

[4] PMR446 – Private Mobile Radio, portable radios, limited power and license free.

4.3.4 Repeater controller

To work as a Simplex Repeater, keys must be switched like in Table 4.

While in this mode, ***PrimeHERTY*** awaits for incoming audio. It is helped by the internally available VOX.

When ***PrimeHERTY***'s VOX is activated, it sends the incoming audio to the audio output. Thus, the incoming audio is automatically available at the output with no delays.

At the same time it sends audio to the output, the PTT circuit is activated.

Once the incoming audio stops, ***PrimeHERTY*** switches OFF the PTT and returns to the begining of the cycle.

This operation mode is very useful to work as repeater controller with radios that work in *Full-Duplex*[5], or to be used with two radios at the same time.

PrimeHERTY enables a radio in *Full-Duplex* mode to receive audio in one band, and to retransmit it back in another band. Sameway, two monoband radios on different bands, or frequencies, do the service of one *Full-Duplex* radio.

[5] Full-Duplex, transmits and receives at the same time

5. *PrimeHERTY* setup

After connecting ***PrimeHERTY*** to a computer and to a power supply, next steps describe the setup of the Morse phrase and Delay time between transmissions.

In the supplied CD, *Software* folder, there is a program called *Terminal* (freeware), capable of doing ***PrimeHERTY***'s setup, as also the status monitoring of it:

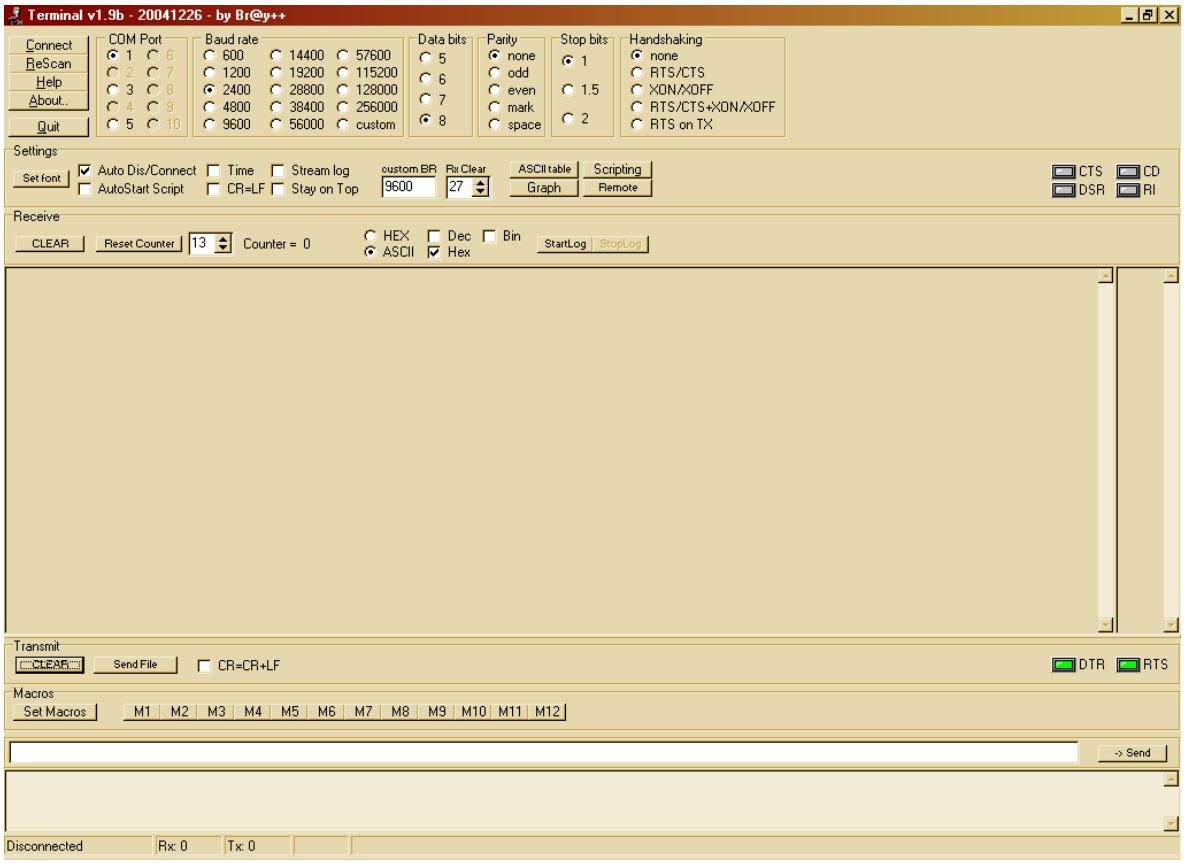


Figure 8 – *Terminal* screenshot

5.1. Terminal software setup

Communication setup is needed in order to establish a perfect link between ***PrimeHERTY*** and the computer:

- Serial port: COM1, or other available
- Speed: 2400bps
- Data bits: 8
- Parity: none
- Stop bits: 1
- Handshaking: none

Figure below shows the area where setup is made:

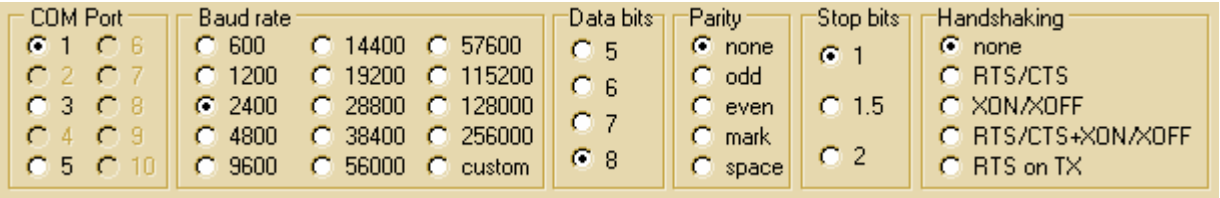


Figure 9 – Communication setup area

In order to have a perfect decoding of the received characters, the type of characters must be chosen:

- Type: ASCII

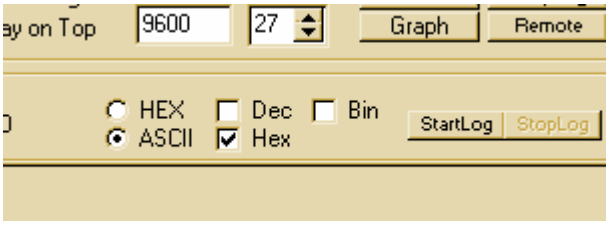


Figure 10 – Type setup area

To have a perfect compatibility with some RS-232 ports, and with Serial-USB dongles, the following buttons must be activated:

- DTR – *Data Terminal Ready*: ON
- RTS – *Requeste to Send*: ON

Figure 11 – Serial port pins setup area

To start or end the communications, the Connect/Disconnect button must be pressed:

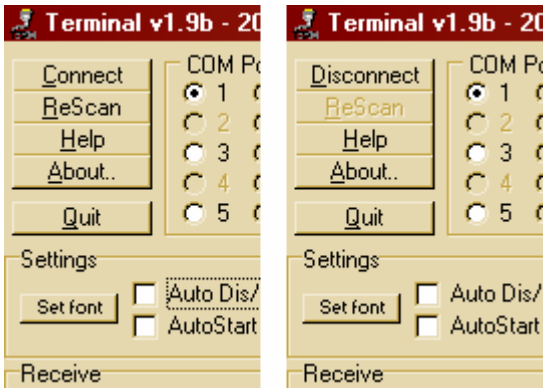


Figure 12 – Start/End of communication setup area

5.2. *Power-Up* information – Energy connection

Having *Terminal* with an open connection, when ***PrimeHERTY*** is powered up for the first time, a message can be seen on screen that informs what Morse phrase, and Delay time betweet transmissions, is saved in memory:

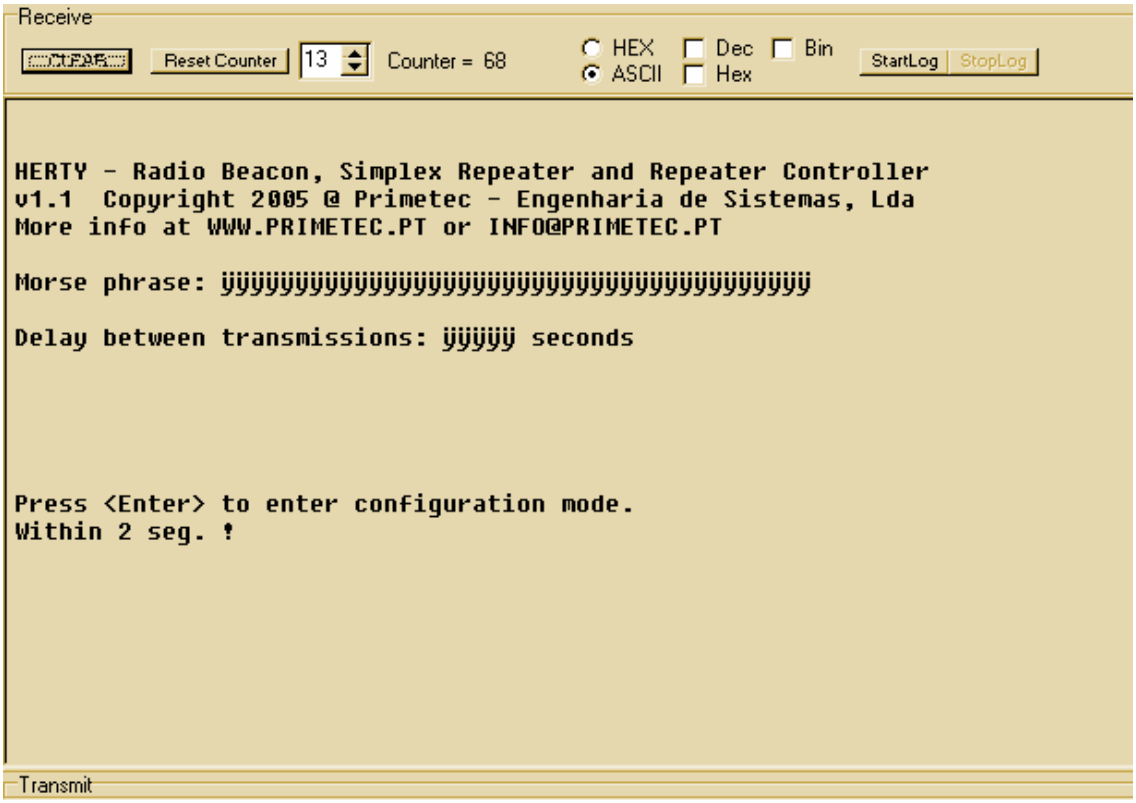


Figure 13 – Welcome message and first power up message

As it can be seen from the above figure, that there are no data saved in memory, because memory has yet not been saved with user preferences.

5.3. Morse phrase setup

Hence, and as the message sent by ***PrimeHERTY*** says, one should press <*Enter*> within 2 seconds, to enter Configuration Mode. If the 2 seconds are over, and the <*Enter*> key has not been pressed, one must do a power up cycle again. After pressing <*Enter*>, the message, asking the user to type the Morse phrase, will apear:

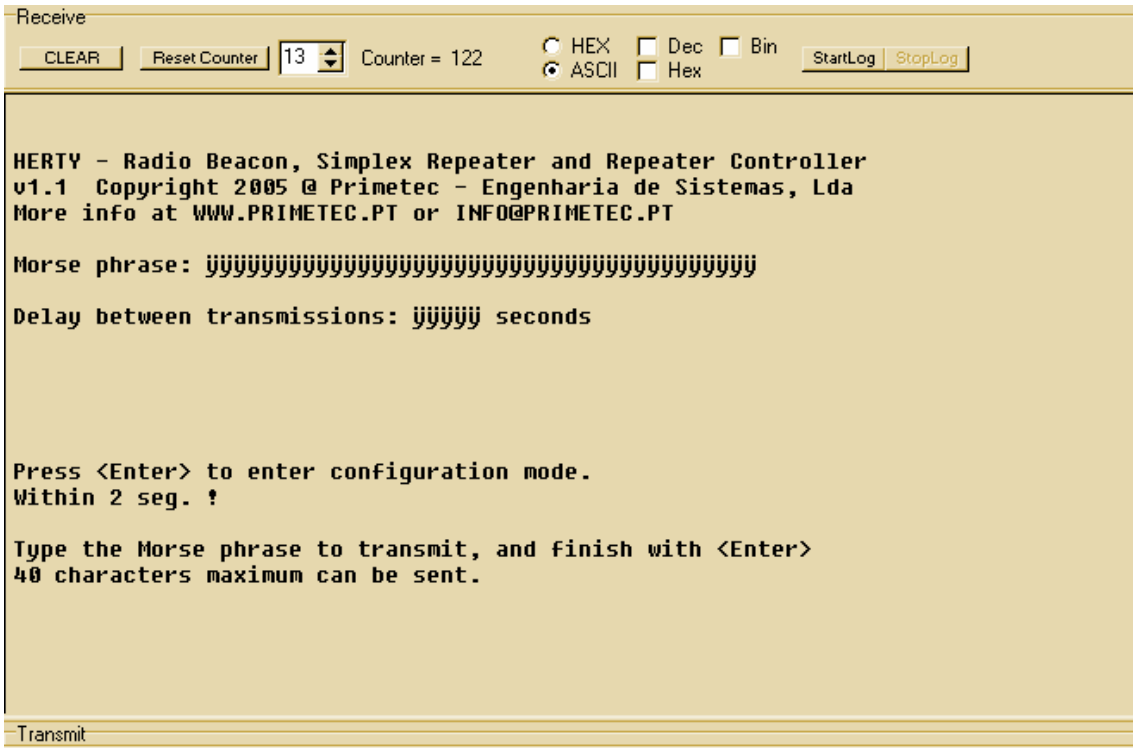


Figure 14 – Message to input the Morse phrase

A maximum of fourty (40) characters may be input, including CAPITALs, numbers, space and symbols +, /, = and (. All nonvalid characters are transmited as a SPACE.

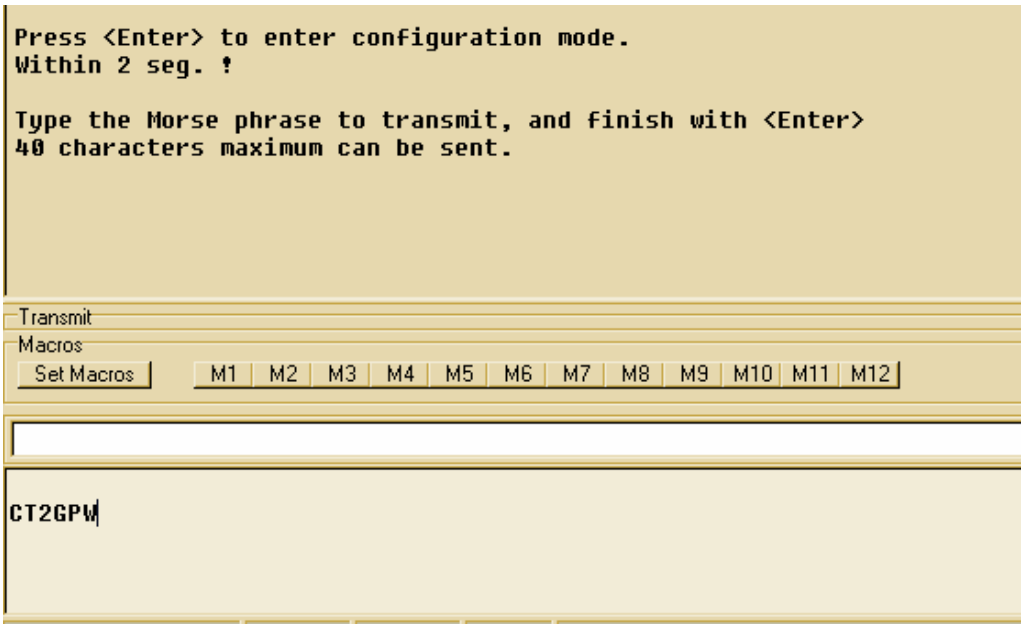


Figure 15 – Morse phrase input

5.4. Delay between transmissions setup

After confirmation of the Morse phrase input, with <*Enter*>, the message to input the delay between transmissions will apear.

The valid interval is between 0 and 65535 seconds.

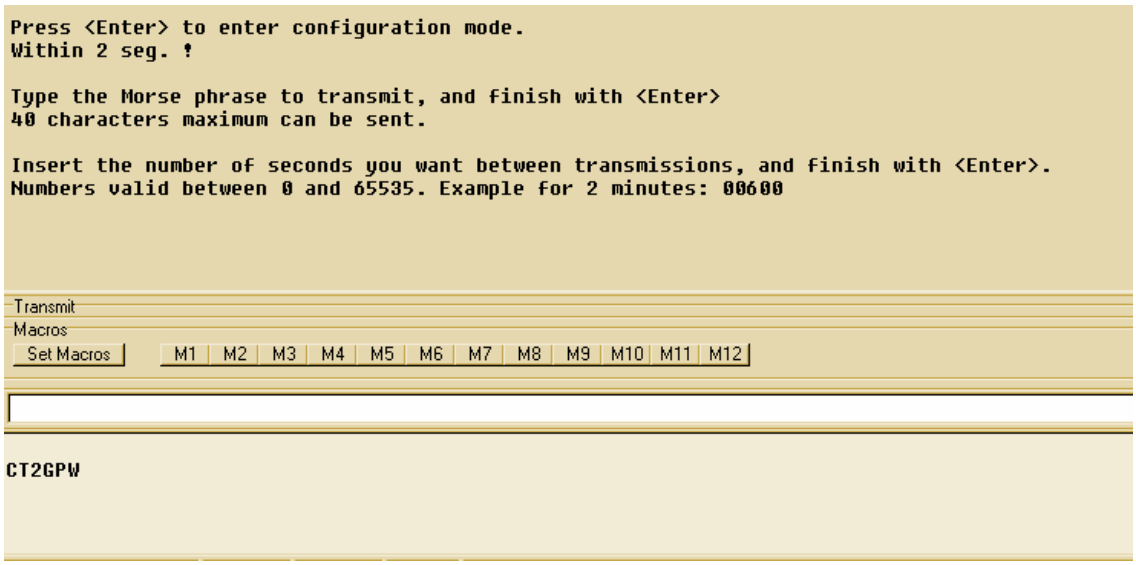


Figure 16 – Message to input the Delay

The input must always be 5 (five) numbers, independently of the number of seconds desired for the delay. E.g.:

- 10 seconds delay, type `00010`
- 600 seconds (10 minutes) delay, type `00600`
- 1 (one) hour delay, type `03600`

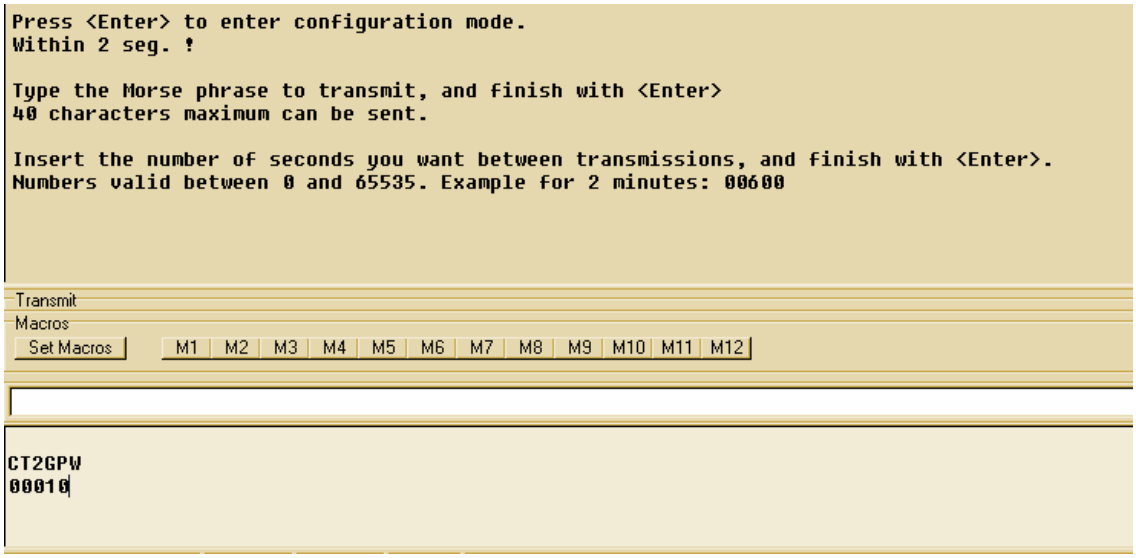


Figure 17 – 10 seconds delay input

5.5. Successful setup output

When the delay input is finished, by pressing <*Enter*>, the finishing message will apear:

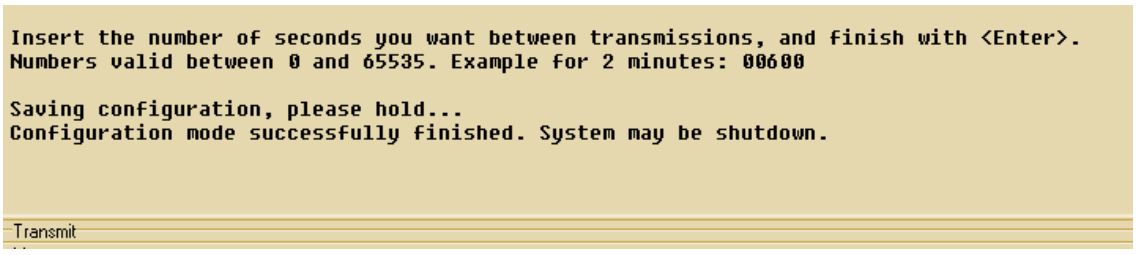


Figure 18 – Successful setup

5.6. Error message

Although all steps are easy to follow, the system is not imune to errors. There may be situations where entering configuration mode is not done with the <*Enter*> key. If that happens, the following error message will apear:

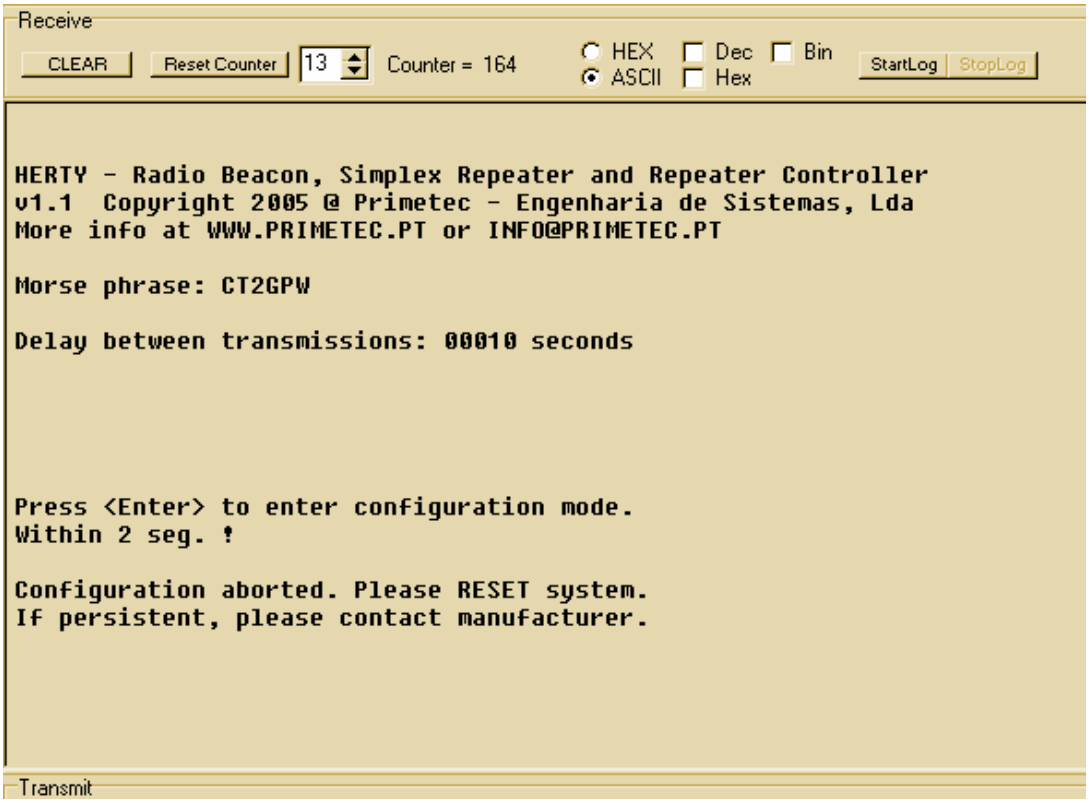


Figure 19 – Error message

PrimeHERTY will say that the user should reboot the system, but it will resume operation: according to 4.2. Audio transmission modes and 4.3. Operating modes and Voice recording. This behabiour was programmed to avoid *lock-up* of the system waiting for data, when it should be executing normaly.

If the problem persists, please contact the manufacturer after testing all the alternatives on your system: computer connections, ***PrimeHERTY*** supply, among others.

The incorrect connection of energy supply may cause unrecoverable damage to the device. Primetec – Engenharia de Sistemas, Lda., takes no responsability for accidents recurrent from connection or usage errors, and assures the perfect operation of the system at the manufacturing site, and takes no responsability for usage errors that lead to bad malfuncion of the system.

5.7. Audio recording message

If ***PrimeHERTY*** is connected to the computer when starting Audio recording, the following message the apear, one after the other:

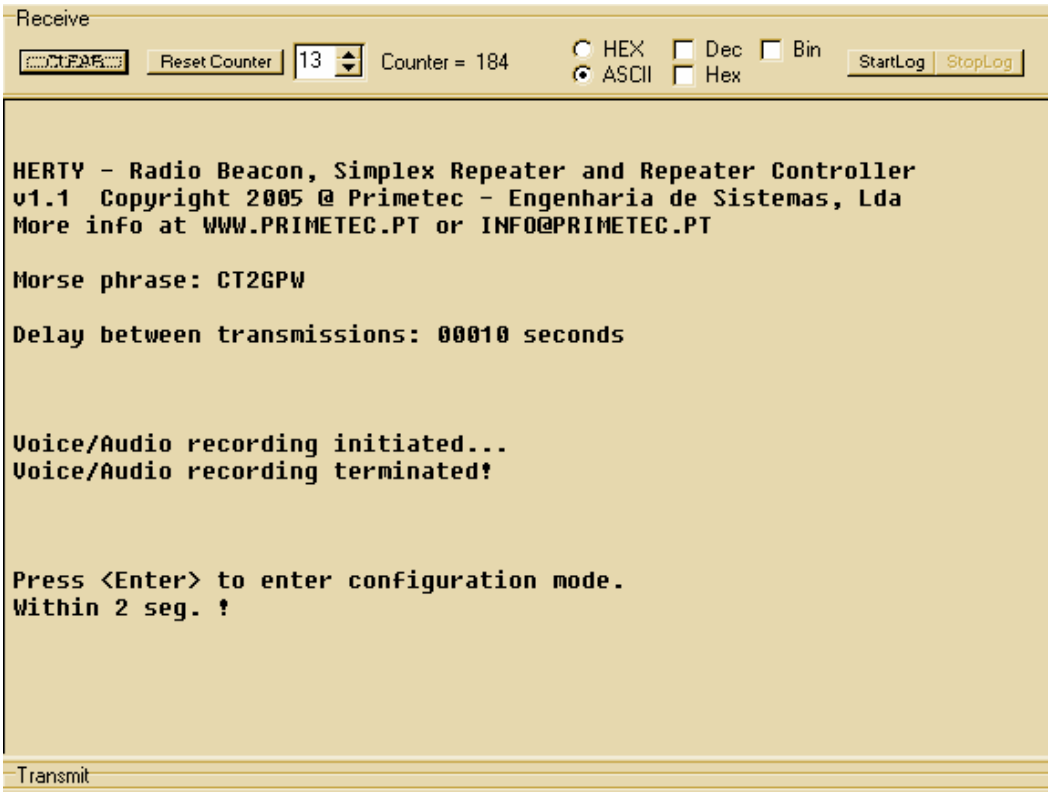


Figure 20 – Voice/Audio recording message

5.8. Audio level adjustments

PrimeHERTY's audio levels may be adjusted independently with rotating buttons:

- Voice: POT2 (VOICE)
- Morse: POT1 (MORSE)
- MAIN: POT3 (MAIN)

A small screwdriver is the perfect tool for the adjustments.

5.9. VOX level adjustments

PrimeHERTY's VOX level may be adjusted with a rotating button:

- VOX: POT4 (VOX)

A small screwdriver is the perfect tool for the adjustments.

6. Electrical and physical specifications

Below, ***PrimeHERTY***'s electrical and physical specifications are detailed:

- Working temperature: -10ºC to +70ºC
- Storage temperature: -40ºC to +85ºC

- External supply: +8VDC to +30VDC
- Power supply with batteries: +2VDC to +3.5VDC
- Power supply with solar pannel: max +5VDC or max +30VDC

- Peak power consumption: 60mA
- Peak power consumption when using batteries: 120mA

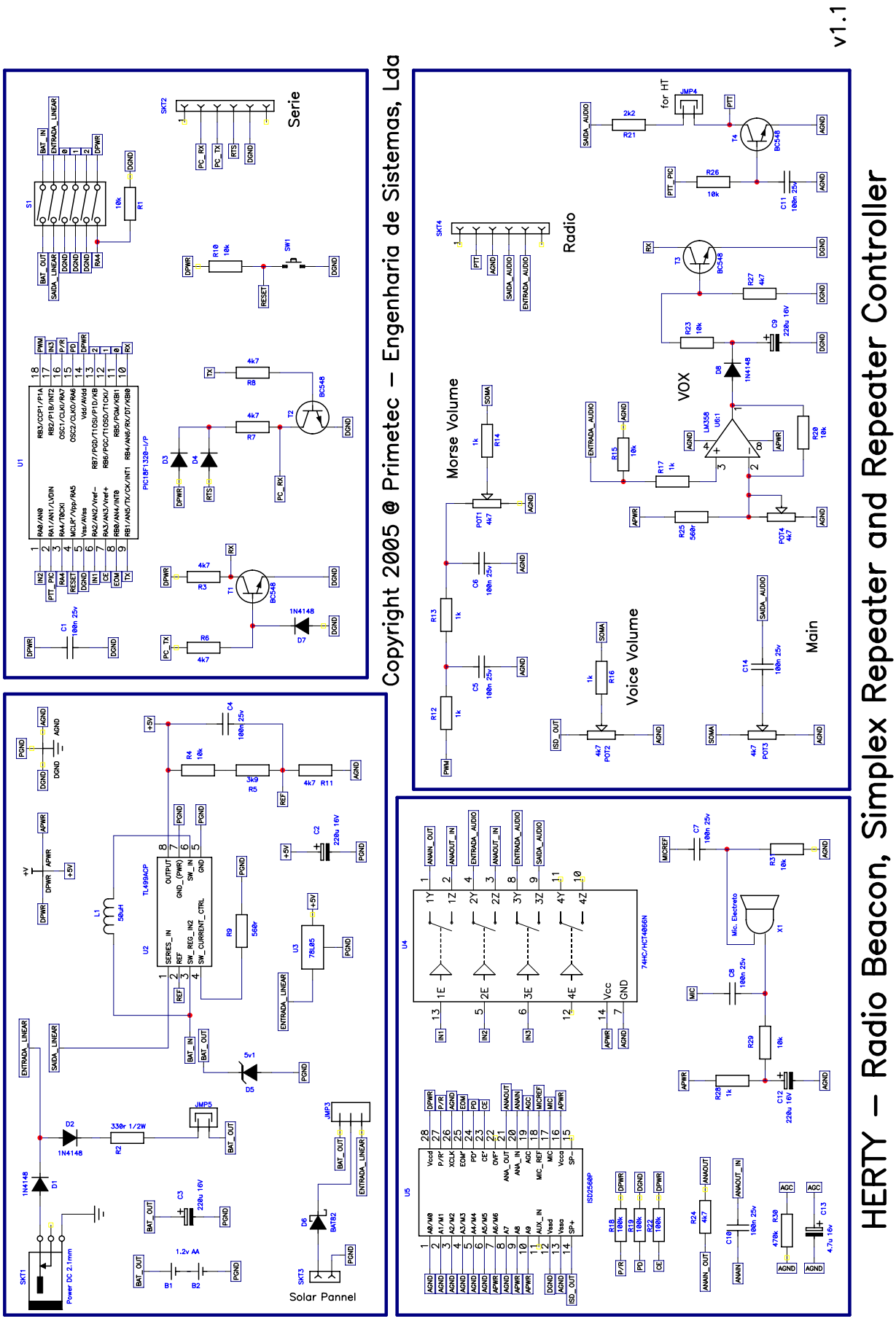
- Peak current on the PTT output transistor: 80mA

- Output peak audio signal: 1Vp-p

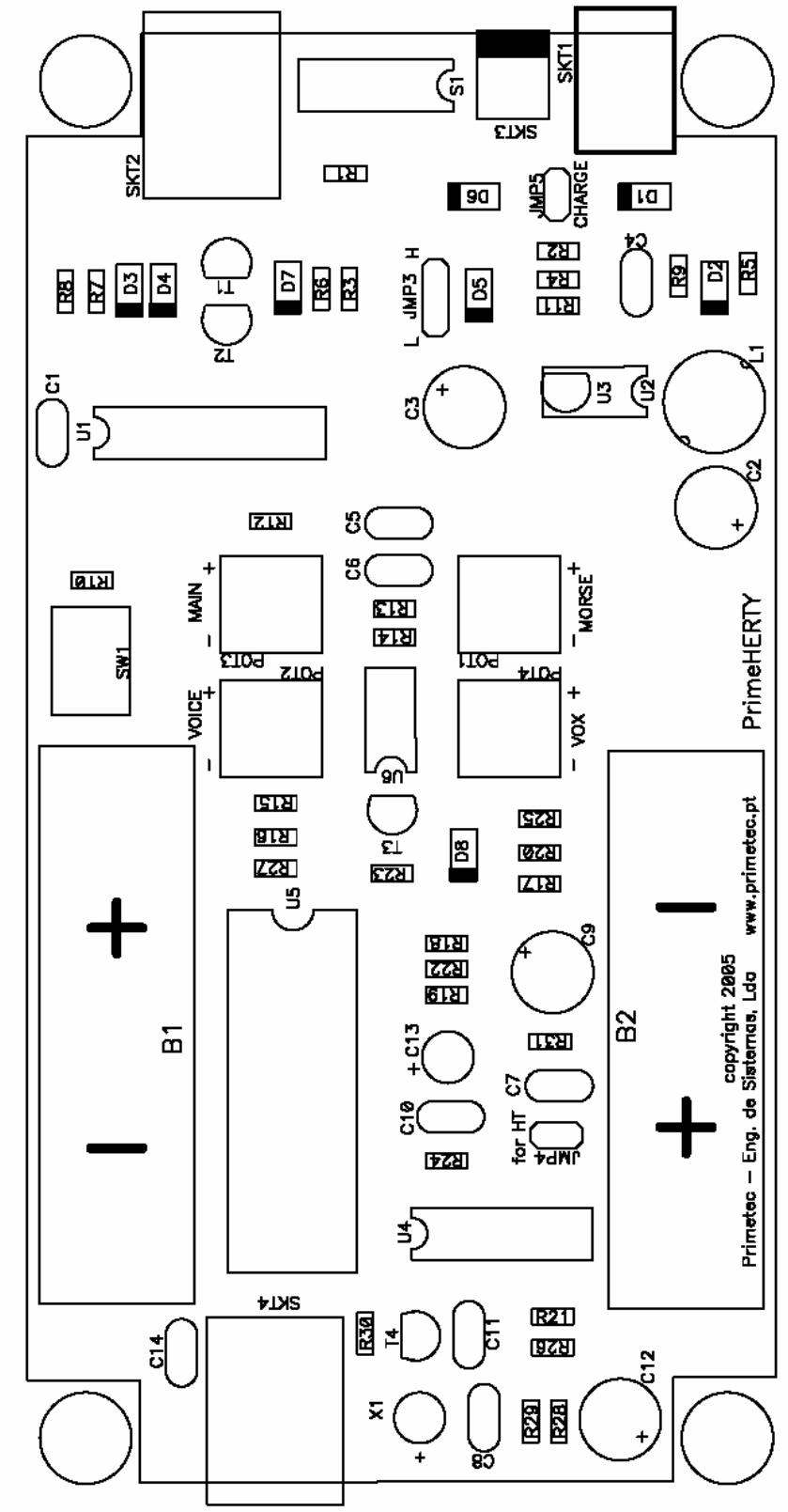
- Maximum and Minimum voltage on the Serial port: -25VDC to +25VDC

Stresses above those listed above, may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Appendix I – *PrimeHERTY* schematic



Appendix II – *PrimeHERTY* component layout



Revisions

Data	Comentário
2005-06-01	First release
2005-09-19	Minor error corrections

NOTES: