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PDR12C User Guide

Version 1.1 (DRAFT)

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1. Quickstart

1.1 For PDR12C fitted with P1 (RJ45 connector)

These boards can be connected to a PC for testing using the cable that is included in the starter kit. Alternatively it can be made up by connecting the PDR12C and PC as follows:

PDR12 (RJ45, 8-way)	PC (9-way D-Type socket)
Pin 3 (RXD)	Pin 3, (TXD)
Pin 4 (TXD)	Pin 2, (RXD)
Pin 7 (GND)	Pin 5, (GND)

No RS-232 level converter is necessary as a MAX3221 is fitted to the pager already.

Connect the pager to the PC and start the PDR12 Programmer. Next, apply power to the pager using one of the following methods:

A. If fitted, use connector P2 (DC-Jack), centre is positive
B. Otherwise use P3 (10-way header), Pin 1 (GND) and Pin 9 (VCC)

A 9V PP3 battery is ideal for first evaluation.

Upon power-up the PDR12C will now output its configuration summary:

Example:

```
PDR12 (c)Radiocom
ISS-C V5.20
SN  1000077974
RIC 00011501-3D
FRQ 153.2750
NET Vodafone Select
TEL 07699123456
ID  Test Pager1
OPT 3D CE 1 1234
```

Before changing any settings it is advised to READ the pager configuration and then to save it to disk as a backup. At any time can this configuration (*.PDR) be reloaded and written back into the PDR12 using the WRITE button.

1.2 For PDR12C without P1 (RJ45 connector)

If P1 is not fitted then you will need a RS-232 converter and ribbon cable. These are normally included in a Starter Kit (small grey box with a 9-way D-type socket on one side and a 10-way IDC male on the other).
With this setup the PC normally supplies the converter and PDR12 with power from its serial port. If you experience problems i.e. no greeting message (configuration summary) then your PC may not deliver sufficient current to drive the pager. In this case you will need to supply a separate power source to the pager (see above paragraph of how to do this).

2. PDR12 Programmer

The PDR12 programmer is a configuration software for changing PDR12 settings including RIC / capcodes, baud rates and optional parameters.

The PDR12 programmer has been tested under WIN98 and WIN2000 but should run under other 32-bit Windows operating systems.

The programmer software on CD is included in all PDR12 Starter Kits or can be purchased separately.

3. Command line interface

The PDR12C can be directly controlled from most terminal programs such as Windows Hyperterminal. Make sure both terminal and pager are set to the same baud rate and configure the terminal as follows:

8 Data bits
No Parity
1 Start bit
1 Stop bit
No Handshaking

A character sent from the terminal to the pager will wake it up and the command prompt '>' is sent back to the terminal indicating that the pager is ready to receive a command. If no characters are sent within 5 seconds the pager sends 'timeout…' and enters sleep mode. Any unrecognised inputs are responded to with '…invalid cmd!' and sleep mode is entered again.

Below is a summary of all available commands when using the command line interface.
All commands must be followed by a carriage return (ASCII 13 or hex 0x0D).

Command		Function
B?	baud rate = ?	Pager outputs active RS-232 baud rate [0..7] 0: 300 1: 600 2: 1200 3: 2400 4: 4800 5: 9600 6: 19200 7: 4800 (default)
Bx	baud rate = x	Pager sets its RS-232 baud rate to x = [0..6] (see under **B?** for values of x)
H?	handshaking = ?	Pager outputs active handshaking setting
H0	handshaking = 0	Pager sets handshaking = none
H1	handshaking = 1	Pager sets handshaking = CTS / RTS
IS	indicator of signal strength	Pager listens for transmissions and outputs 'SYNC!' + RSSI value upon detection of sync codeword. Any key press aborts.
M?	mode = ?	Pager outputs active message storage destination
ME	mode = EEPROM	Pager stores message in EEPROM
MR	mode = RAM	Pager stores message in RAM
P?	power save mode = ?	Pager outputs power save mode setting [0,1,D] 0: off (radio receiver permanently on; no message reception) 1: on (radio receiver is switched on when needed; default for receiving messages) D: down (radio receiver permanently off)
P0	power save mode = 0	Pager sets power save mode = 0
P1	power save mode = 1	Pager sets power save mode = 1
PD	power save mode = D	Pager sets power save mode = D
SI	show pager info	Pager outputs its configuration (summary)
SM	show message	Pager outputs the last received message from EEPROM (if active message storage destination is EEPROM; set to **ME**)

Note: All characters can be upper or lower case.

4. Status LED

The status LED can be enabled or disabled by the user using the PDR12 Programmer software. It is recommended to leave it enabled (default) as it will only be on for very short durations of activity and provide the user with information as to what is happening.
Whenever the PDR12C is powered up or when the onboard microcontroller is woken up, either after by an incoming pager message or by RS232 data input, the status LED will be on. Also, during message reception it will flicker briefly indicating incoming data.

5. Message output control and RTS/CTS handshaking

In applications where the user device is in sleep mode itself or mostly busy with other tasks it is necessary to implement a form of signalling and handshaking to transfer messages only from the pager to the user device when the latter is ready for it.

I order for this to work the user has to set the pager to RTS/CTS handshaking mode. That can be done either via the command line interface (command: H1) or using the PDR12 Programmer software (Menu ➔Configuration ➔ Pager Main Settings ➔ Handshaking: RTS/CTS).

Also, the pager has to store the message in EEPROM. This can be done either via the command line interface (command: ME) or using the PDR12 Programmer software (Menu ➔Configuration ➔ Pager Main Settings ➔ Tick box: Store latest message in EEPOM).

After a message has been received, the state of CTS is read. If it is active (logic 1 = +4.3V) the message is output on the TXD pin. If CTS is not active (logic 0 = 0V), i.e. the user device is not ready to receive the message from the PDR12, the pager sets RTS high (logic 1 = +4.3V) to indicate a waiting message and then enters sleep mode.
Upon CTS being set active (logic 1 = +4.3V) by the user device, the pager wakes up and outputs the latest message. RTS is then set inactive (logic 0 = 0V).

Note: RTS / CTS handshaking is not implemented on the PDR12 for other data exchange i.e. command line interface. It is intended to provide the user with a means to control the output of messages.

6. Switching Functions

The PDR12C can control up to 4 switching outputs. These outputs connect directly to the PIC microcontroller. An output is on when the voltage on the pin is 4.3 V and off when 0V is present.
Although each output can sink and source up to 25 mA, it is recommended to limit output current to not more than 5 mA as the PDR12C performance specifications cannot be guaranteed otherwise. If higher loads need to be driven consider the use of bipolar or MOSFET transistors.

The following table shows the four available channels and how to access them:

Channel	Signal	Location
1	PIC RA5	Connector P6: To the bottom left of the writing 'PDR12' on the component side of the pcb are two pads. CH1 is the pad BELOW the pad marked 'A'.
2	PIC RC2	Connector P3 (10-way header): Pin 5 (PIN 1 on the header is closest to the fixing hole, Pin 2 opposite of Pin 1 and so forth)
3	PIC RB6	Connector P3 (10-way header): Pin 10
4	PIC RB7	Pin 28 directly on PIC (will be user accessible on next issue pcb)

6.1 Sending Switching messages

To prevent switching due to accidentally misdialled pager calls, a PIN / Password has to precede the actual switching string.

The default for the PIN / Password is '1234'.

To change the PIN / Password the PDR12 Programmer software is used. The maximum PIN / Password length is 8 characters. Characters can include any that can be sent through the paging network (upper and lower case letters, digits and some special characters. Avoid spaces. For numeric pagers only digits can be used as the PIN / Password.

The format of a typical switching command message is as follows:

```
'12341001'
 ||||||||
 PPPP||||        P = PIN/Password (up to 8 chars)
     CCCC        CH1...CH4 = outputs
     HHHH
     1234
```

In order to perform switching the PIN / Password is entered followed by a:

'1' for switching CH on
'0' for switching CH off
any other digit will leave the output unchanged.

The following are valid examples:

```
12341000   // switches CH1 on, CH2..4 off
12341      // switches CH1 on, CH2..4 unchanged
12341111   // switches all on
12340000   // switches all off
12347891   // switches CH4 on, CH1..3 unchanged
```


It is also possible to send more than one switching string within a paging message allowing for more complex transitions (e.g. a RESET pulse).

Example:

```
1234100012340000      // switches CH1 first on and then off again
||||||||||||||||
AAAAAAAA||||||||      // switching string A  (CH1 on)
        BBBBBBBB      // switching string B  (CH1 off again)
```

The length of the above positive pulse can be varied by adding more or less characters between the two switching strings.

7. Antenna Options

The PDR12C comes as standard with an integral tuned loop antenna. Optionally we can fit a BNC or SMA bulk head with a short length of coaxial cable, typically RG174, to a PDR12C. This option also has a band pass filter included on the board.

8. Electrical Interface

8.1 Connector P1 (8-way RJ-45):

1	TXD (LVTTL)
2	RXD (LVTTL)
3	RXD (RS-232)
4	TXD (RS-232)
5	do not use (production test)
6	Switching output (Channel-1), low: GND , high: VCC
7	GND
8	VCC (positive supply, 4.5V … 26V DC)

8.2 Connector P2 (DC-Jack, 2.1 mm):

centre	VCC (positive supply, 4.5V … 28V DC)
outer	GND

8.3 Connector P3 (10-way header):

1	GND
2	TXD (LVTTL)
3	do not use (production test)
4	RXD (LVTTL)
5	Switching output (Channel-2), LVTTL
6	VDD (+4.3V, internal rail)
7	TXD (RS-232)
8	RXD (RS-232)
9	VCC (positive supply, 4.5V … 26V DC)
10	Switching output (Channel-3), LVTTL

8.4 Connector P4 (3-way header):

1 Output, switched VCC
2 VCC (positive supply, 4.5V … 26V DC)
3 GND

8.5 Connector P5 (2 pads):

1 RF-Input, external antenna (50Ω), optional
2 GND

8.6 Connector P6 (2 pads):

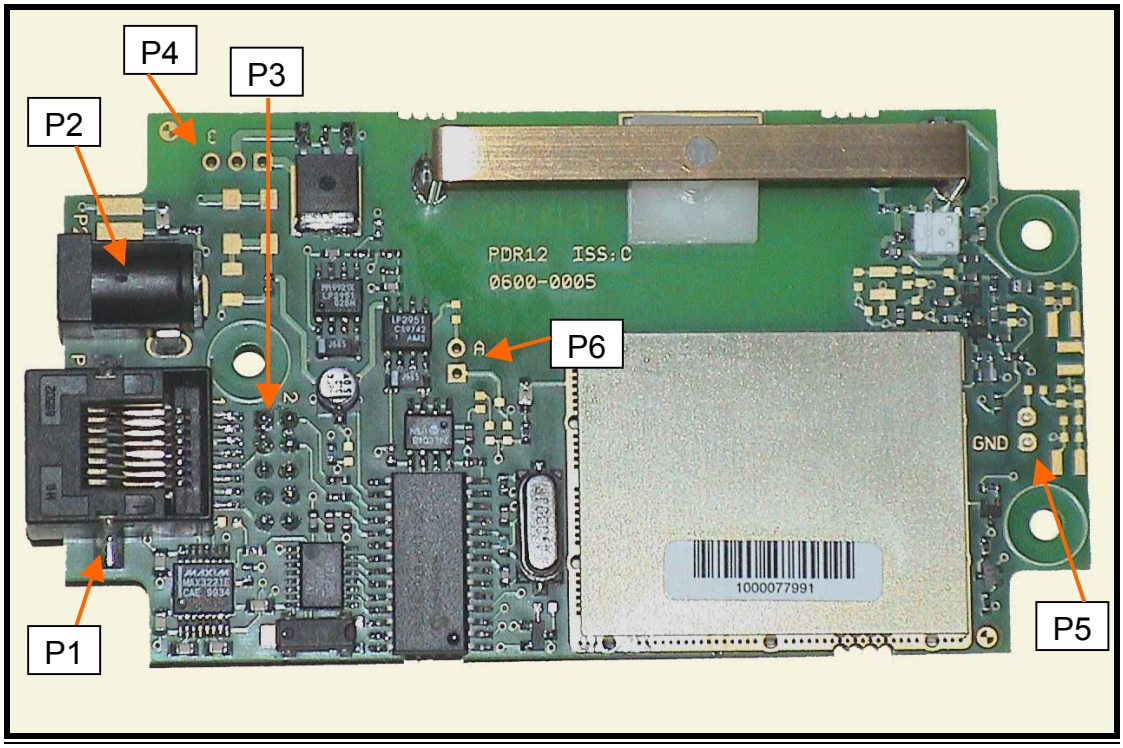
1 Switched output PIC RA5
2 (A) VCC (positive supply, 4.5V … 28V DC)

Note: LVTTL = low voltage TTL (low=0V , high=+4.3V)

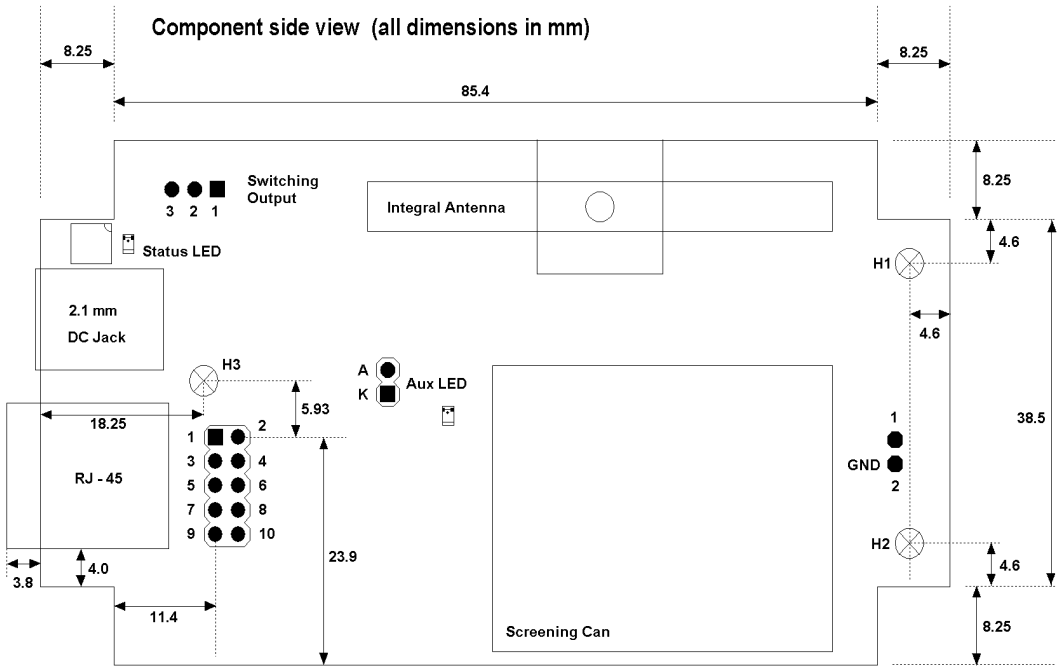
Appendix A: Technical Specifications

Supply rail:	minimum:	+4.5 V DC
	maximum:	+28.0 V DC
Supply current:	Mode P1 (receiver pulsed on/off):	**520 µA typ. average**
	Mode P0 (receiver on):	2.2 mA typ .
	Mode P0 (receiver on) + LED on:	9.6 mA typ .
	Mode PD (receiver off):	250 µA typ.
Sensitivity:	Conducted (BNC input):	-123 dBm typ.
Intermodulation, IP3:	better than 50 dB (typ. 56 dB)	
Adjacent Channel:	better than 60 dB (typ. 73 db)	

Appendix B: Photo of PDR12C showing connector locations



Appendix C: Mechanical drawing of PCB



H1..H3: fixing holes (3.2 mm dia for M3 screws)
board thickness: 1.6 mm
overall height (highest component + pcb): 16 mm (excluding 10-way header on bottom side)