

P4dragon Firmware Update

Description of the upgrade / improvements

Firmware-Version 1.17 (10/2012)

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Firmware Update Information for **P4dragon DR-7X00**

(P4dragon-Firmware 1.17, October 2012)

1. General

The firmware 1.17 replaces the firmware 1.10 (and the following beta version), and with its monitor function for PACTOR-4 and PACTOR-1/2/3 using the new “PACTOR monitor” it offers a greatly expanded range of functions. A few further improvements and the fixing of some programming errors round out the new firmware.

2. New features

2.1 PACTOR-Monitor

General

The PACTOR monitor (PM) allows the thorough observation and documentation of all the presently available un-encrypted PACTOR transmissions. The PM covers all PACTOR levels with the appropriate Speedlevels and packet variations. This means that (for example) in PACTOR-4 monitoring, Chirp-, Short Robust-, Robust-, and Normal mode- packets are searched for in parallel. In the operating mode “PACTOR-3” the PM will read in parallel also PACTOR-2 and PACTOR-1. The very wide receiving range (frequency offset +- 240 Hz), as well as the automatic sideband recognition, ease routine operation of PM with PACTOR-2 and PACTOR-3 considerably when compared with the “Listen-Mode” of the PTC-II. In addition, the PM searches for “Connect Packets”; this search comprises the “Normal Connect”, the “Robust Connect” as well as the “Free Signal” in normal and disguised mode.

Operation / Commands

The PM is always operated and used in Terminal Mode (cmd: prompt). The main command for operation is **PMONitor**.

It is however also possible to switch between “PT4-Monitor”, “PT123-Monitor” and well as “normal auto-decoder monitor” (with PACTOR-standby function) by choosing the “Monitor” menu point in the sensor menu of the DR-7800. The three operating conditions will then “cycle” through. See details in the PACTOR-Monitor operation below.

Note: in the following text, <...> (statement in pointed brackets) a “Byte”, e.g. <CR> means “Carriage return” (Decimal value 13), <0xFE> shows a Byte with the decimal value 254.

PMONitor command

The PMONitor command without an argument leads to the output of a list of the possible sub-commands:

PMONitor:

controls the PACTOR Monitor parameters.

First argument determines "sub command", second argument is the (optional) parameter which can be changed:

Command	Param	Default	
PMONitor Start:			Starts PACTOR Monitor Mode.
PMONitor Stop:			Stops PACTOR Monitor Mode.
PMONitor Mode:	3-4	[3]	Defines PACTOR level to be monitored, 3= Level 1-3, 4 = Level 4.
PMONitor Packets:	0-1	[0]	0= TRAFFIC only, 1= +RQ.
PMONitor Verbose:	0-1	[1]	0= No meta data, 1= +Status info.
PMONitor Autostart:	0-1	[0]	1= Start PMON automatically after booting.

Possible sub commands

General note: All PMONitor parameters may be permanently stored in the EEPROM of the DR-7800 using the command SAP. It is hereby possible to “personalize” the modem.

PMONitor Start

Starts the PM. The display of the DR-7800 switches over to the “PT-...-MONITOR” display. See fig 1. (Note: depending on “PMON mode” setting, see below, the display shows instead of “PACTOR-MONITOR” in practice “PT-123-MONITOR” or “PT-4-MONITOR”). The text being read is shown in the lower half of the display (always the original text, i.e. without automatic Hexadecimal conversion from “non printable” characters, see below). On the user interface the message is

```
PACTOR-1/2/3 Monitor started:  
=====
```

or

```
PACTOR-4 Monitor started:  
=====
```

displayed, depending on the “PMON mode” parameter. See below.

With the DR-7400 the entire PMON functionality - as with the DR-7800 - is available, but obviously all functions which concern the OLED display are not available. As soon as the PM is activated, the CON/ISS-LED of the DR-7400 is permanently lit orange.



Fig 1: Display with PM running

The data which appears on the display flows into the text memory of the so-called Auto-Decoder. (See general documentation concerning the DR-7X00-modem). The text which is displayed (and possibly scrolled upwards off the display) can also be given out again over the user interface by using the command “ADEC BUFFER”.

In the right hand field, next to the small waterfall, is displayed additional information when PACTOR packets are received, such as the actual PACTOR level (1-4), the speedlevel (1-10), whether it is a repeated packet (“RQ”) as well as the current packet number (“Cycles” from 1-99). E.g. **P3 SL5 RQ 12.**

Essential note:

With PM running, receipt of an external PACTOR call is only possible within limits. I.E. there is at least a one calling packet delay, and that a considerably higher signal/noise ratio is required for the link to be established than is needed in the “normal STBY condition”. The PM checks for link acceptance by seeing if the detected call packet contains the “Mycall” of

the modem, and if so, switches itself off automatically for 60 seconds and activates temporarily the “normal STBY condition”. In this condition the modem accepts the PACTOR call and answers with short acknowledgement packets. During the temporary PM deactivation the message “PMON..” is shown on the display of the DR-7800 instead of “STBY”. If a call from outside takes place within this 60 seconds, then the PM remains in the “normal STBY condition” for 60 seconds until the PM is automatically re-activated again.

The same principle is valid when a link is started with a Connect command whilst PM is running. Also in this case, the modem switches temporarily to the “normal STBY-condition” for 60 seconds after the end of the link, with the message “PMON..” instead of “STBY” in the DR-7800 display. The PM is then automatically re-activated after the 60 seconds have elapsed. A complete switching off of the PM is possible with the “PMON Stop” command. (See below), or with the Sensor-menu point “Monitor”.

PMONitor STop

Stops the PM. The modem continues to operate in normal “Standby” mode after this command. PACTOR links can be accepted and built up. On the user interface this message can be seen

```
PACTOR Monitor stopped!  
=====
```

PMONitor Mode

Range of values: 3-4

Default setting: 3

Sets the PACTOR level to be detected. PACTOR-4 is read with the value 4. As the required computing power required for this is very high, the other PACTOR levels cannot be read in parallel. PACTOR-1,2,3 are read in parallel with the value 3 but PACTOR-4 will not be detected then.

PMONitor Packets

Range of values: 0-1

Default setting: 0

Defines which packet variation should be given out.

- 0: Only TRAFFIC packets are given out. These are packets with correct CRC, i.e. like the previous packet but with a different CRC.
- 1: TRAFFIC packets and REQUEST packets (repetitions) are given out.

PMONitor Verbose

Range of values: 0-1

Default setting: 1

The Verbose sub command defines if the status information concerning the received packets (in addition to the actual “Payload”) should be given out.

- 0: Only the actual “Payload” or useable information is output, otherwise no additional information or framing information such as “PAYLOAD2” and “PAYLOAD END”. Also the unique output start character <0xFA> is not given out when using this setting!
- 1: Formatted output, beginning with status information followed by the actual “Payload”.

PMONitor Autostart

Range of values: 0-1

Default setting: 1

If this parameter is set to one, the PM starts automatically after booting / newstart of the DR-7X00.

Display / Output of detected packets

When detected PACTOR packets are displayed in the “PMON Verbose 1” mode (see above) the additional information is displayed as follows:

```
<0xFA>
###PLISTEN: Level: 3:
###STATUS: SL: 2, CYC: 1, RQ: 0, REV: 1, LSB: 0, dF: -2.5, FRNR: 30
###PAYLOAD1: LEN: 77, TYPE: 1
###PAYLOAD2:
```

```
This is a test. The actual useable information is displayed here...
###PAYLOAD_END
<0xFE>
```

Every output begun with the byte <0xFA> as the unique output start character (“Start of Frame”). This character cannot appear in the following data set, also not under the “Payload” as “unprintable” characters are automatically given in hexadecimal form. See below.

The following line “<CR><LF>###PLISTEN: Level: 3:<CR><LF>”, shows the current PACTOR-Level (1-4).

The line following – the **Status output** consists of the line:

```
###STATUS: SL: 2, CYC: 1, RQ: 0, REV: 1, LSB: 0, dF: -2.5, FRNR: 30
```

SL:	1-10	Speedlevel of the packet.
CYC:	0	means that it is a “short” packet.
	1	means that it is a “long” packet.
RQ:	0	means that the packet is not a REQUEST packet, but a “normal TRAF-FIC packet” (with a new 2-bit packet counter or new CRC in comparison with the previous packet).
	1	means that the packet is a “REQUEST packet”. This is detected in the PM by comparison of the actual CRC with the CRC of the previously received packet.
REV:	0	Paket with the original tone-adjustment.
	1	Paket with “reversed” tone-adjustment.
LSB:	0	The packet is received in the sideband mode that the radio is set to.
	1	The packet is received in the opposite sideband to that which the radio is set to. E.g. in LSB if the receiver is set to USB.
dF:	-250...+250.0	Measured frequency error in Hertz. One significant figure after the point.
FRNR:	1...X	Running frame number beginning with 1, to ease documentation.

After output of the status line follows the **output of the actual payload data “Payload”**

```
###PAYLOAD1: LEN: 77, TYPE: 1  
###PAYLOAD2:
```

```
This is a test. The actual useable information is displayed here...
```

```
###PAYLOAD_END
```

The line “###PAYLOAD1: LEN: 77, TYPE: 1<CR><LF>” precedes the output and contains the length of the following output as well as the type. The length always concerns the actual “Payload” bytes and so does not change for hexadecimal output. For the data type indicator “TYPE” the following values are possible:

- 0: “ASCII” (8 Bit, “transparent”)
- 1: Huffman, text data
- 2: Huffman, “swapped” (reversed capitals and small letters), text data
- 3: Reserved
- 4: PMC, German, text data
- 5: PMC, German, “swapped”, text data
- 6: PMC, English, text data
- 7: PMC, English, “swapped”, text data
- 8: “ASCII” (8 Bit, “transparent”), automatic hexadecimal output as the data contains “unprintable” characters. These are characters between decimal values <32 and >127 except for <CR> and <LF>.

The last character of a packet data set is always the unique end character <0xFE> (“Frame End”) except with “PMON verbose 0”.

Output of received connect-packets

The output of detected connect-packets are always begun with the sequence
“<0xFA><CR><LF>###CONNECT:”

Example:

```
<0xFA>  
###CONNECT: [Robust Call: DL6MAA]  
<0xFE>
```

There then follows the output of the type of the packet as well as the destination callsign (max 8 characters – alphanumeric), both enclosed in right angled brackets. The output is always finished by <CR><LF><0xFE>

The following packet types are possible:

```
[Normal Call:      ]  
[Longpath Call:   ]  
[Robust Call:     ]  
[Free Signal Normal:    ]  
[Free Signal Encrypted:  ]
```

Technical Details / Data

Allowed Frequency offset

PACTOR-1

Generally: ca. ± 100 Hz

PACTOR-2

Generally: ca. ± 240 Hz

PACTOR-3

Generally: ca. ± 200 Hz

PACTOR-4

Chirp-Mode: ± 133 Hz

Normal-Mode (Speedlevel 5-10): ± 112 Hz

Robust-Mode (Speedlevel 1-4): ± 56 Hz

Note: If packets are detected in PACTOR-4 Chirp or Normal Mode with a frequency offset of more than 50 Hz, then it is recommended that manual adjustment of the receiver frequency is made in order to also detect Robust Mode packets.

Delay of the data output

The PM uses sometimes very difficult iterative searching algorithms in order to detect packets under the worst possible SNR. This means that very many “False Synchronizations” are produced and must be evaluated. The resulting computational effort can give a maximum of 6 seconds delay between the physical end of a packet at the AF input and the display of the packet on the user interface. The average value is generally only 1 to 2 seconds however.

Main Limitations

CS3-Packets (Changeover) are not detected in the present firmware. These packets however contain only idle bytes in virtually all practical cases.

3. Improvements and clearing up of errors

- Bluetooth-“Passkey” now adjustable (mainly only interesting for MAC users).

New Menü “bt:” With the command “BT” im cmd:-Mode. Here the passkey can be set with the command “Passkey”. Permanent storage of the key follows (as is usual) with the command SAP in the main menu (cmd:).

- Tone-Command in Aud:-Menü now accepts 2 Arguments, so that the DR-7X00 Can be used as a 2 tone generator (e.g. IMD measurements on the transmitter).

- System-Log-Function corrected. Log is no longer randomly cut short.

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