SCS

PTC *plus*

The PACTOR™-Controller

Manual for Version 1.1

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Foreword

The information contained in this handbook has been carefully put together. It is, however, still possible that errors have crept in. If any errors are found, we ask your forgiveness, and request you send us a short note pointing them out.

Your SCS-Team

Attention, Very Important:

You should connect the power supply plug to the PTC, **only when the power supply is switched off.** First connect the plug to the PTC and, then connect to the power supply.

The DC plug of the PTC should **never** be plugged into its socket with the power connected. This applies especially when the PTC and the radio equipment are connected by means of the AF and the PTT cables, and use the same power supply.

The case of the PTC is at earth potential, and in event of a short circuit, very serious internal damage to the PTC can occur if this advice is not followed.

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Manual rev. B

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1 Introduction

1.1 About this manual

This manual contains information about the installation and operation of the SCS PACTOR Controller. The shortform for PACTOR Controller is PTC and is used in this manual alternatively.

The manual may be used as a reference manual for the PTC commands, and as a hardware reference.

The second part shows how to quickly start working with the PTC.

Part 5 (The Software) will make you familiar with the command-structure and operating with the PTC. Part 3 will help you to make your first QSO and tell you something about the behavior on the air.

Part 6 describes the electrical circuits.

1.1.1 Typography

To clarify various meanings connected with this handbook, various types of print have been used.

`Typewritten`   is for all outputs or messages FROM the PTC.

Sanserif   shows Instructions or Inputs (Commands) TO the PTC.

Characters inside pointed brackets <> in the following text mean that the corresponding key or key combination should be pressed. <ESC> means that the ESCAPE key should be pressed.<RETURN> characterizes the RETURN or ENTER key, and <CTRL-D> that the CTRL key should be pressed together with the 'D' key. All commands are closed with <RETURN>. Commands may be input either in upper or lower case letters or a mixture of the two.

1.2 Why PACTOR?

PACTOR (*from Latin: the mediator*) is a new radio teletype mode developed in Germany by DF4KV and DL6MAA to improve on inefficient modes such as AMTOR and PACKET-RADIO in weak short wave conditions.

The AX.25 PACKET protocol has its advantages on VHF/UHF FM channels, but gives a lot of problems on short wave:

- The data rate of 300 baud combined with a large packet length used by many radio amateurs is very susceptible on fading or multipath conditions and QRM.

- The large protocol overhead dramatically reduces the amount of information contained in a packet.

AMTOR had been developed specially for transferring text on an HF channel. Even weak signals under distorted conditions, where a PACKET connect would never be possible, could be copied. But AMTOR also has its disadvantages:

- Using 5 bit code makes it impossible to transfer the whole ASCII character set or binary data.

- Detecting and correcting errors is insufficient for error free transmission of binary data.

- The effective data rate is only 35 baud.

PACTOR offers a much better error correction system, and a considerably higher data transfer rate, than AMTOR. The synchronous transmission format, and the short packet lengths of AMTOR have been retained. These result in a protocol much more resistant to interference than Packet-Radio under poor propagation conditions.

The PACTOR protocol, together with the SCS-PACTOR Controller, allows a much higher throughput than AMTOR, with the efficient error correction and data transparency of Packet-Radio.

One should not, however, be under the impression that PACTOR is just a combination of Packet and AMTOR. Although essential parts of both systems have been included, such as data integrity, by using a CRC from Packet, and the synchronous transmission format and short block lengths (compared to Packet) of AMTOR, a fully new concept has also been included from the very beginning. For the first time in amateur radio, online data compression is used to markedly increase the effective transmission speed. Also the use of memory ARQ in PACTOR is a milestone, although it has long been known in the commercial sector. Previously it has been very difficult, or impossible, to apply this concept in amateur radio. The use of memory ARQ is the main reason that PACTOR does not lose the link under bad conditions. With memory ARQ, defectively received packets or blocks are not just simply thrown away. They are stored and added to other defective packets, until enough data is collected to reconstruct the original packet, and thus keep the link in operation. The original SCS-PTC uses a real analogue memory ARQ, whereby the received AF tone is not simply turned into 0 or 1 data, but intermediate values are also stored. A much finer evaluation is thus possible than with so-called 'digital memory ARQ'.

1.3 Requirements

To operate PACTOR, a transceiver capable of switching between transmit and receive within 20 ms is required. Therefore any transceiver capable of AMTOR can also be used for PACTOR.

To operate the SCS-PTC you need a computer or a simple terminal that provides an interface compatible with the RS232 (V24) standard. If you use a computer you need a terminal program to operate the interface with 8 bit, 1 stopbit, no parity and a baud rate between 300 and 38400 baud, dependent on setting at the PTC.

An old surplus terminal with a serial interface is also suitable to use with the PTC, providing it is able to be adjusted to the parameters required by the RS232 interface.

1.4 The SCS PACTOR Controller

The original SCS-PTC comes directly from the creators of PACTOR. This ensures absolute compatibility and optimized support. The concentrated knowledge and experience of the PACTOR team is at your disposal. We highly recommend the use of the SCS-PTC for PACTOR, or equipment from manufacturers supported and licenced by SCS only. That is the easiest way to ensure that you are running the optimized protocol with the full performance of PACTOR.

The SCS-PTC also supports AMTOR and RTTY. **It automatically responds in the mode that is requested.** The mailbox is accessible from PACTOR and AMTOR, these features making the SCS-PTC the optimal equipment for HF-Radio data transmission and teletype.

The command structure of the PTC is similar to that of a TNC with TAPR firmware and therefore well known to many operators that come from Packet-Radio, this making it very simple to switch to PACTOR.

Figure 1: The SCS PTCplus.

2 Installation

Installing the PTC is easy. Almost all adjustments are via software. The baud rate need of course to be adjusted for the serial computer interface, and the AF output level to the transceiver from the PTC must be adjusted to prevent overdriving the transmitter. The cables to the computer and the transceiver must naturally also be made up, if not already to hand. Apart from that its basically just "*Connect-up and go*"!
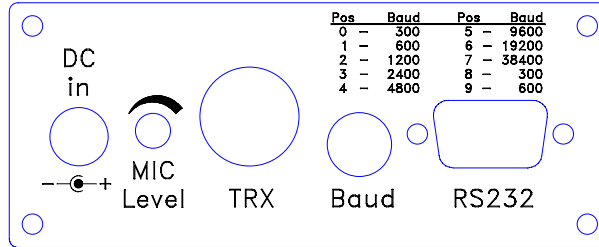
Figure 2: The PTC rear panel.

2.1 The Serial interface (RS232/V24)

The SCS-PACTOR controller communicates with the computer or terminal via a serial interface using the RS232/V24 standard.

The format used by the PTC for this communication is 8 data bits, 1 stop bit and no parity. The baud rate can be adjusted via the rotary code switch at the rear of the PTC.

Position	Baud rate
0	300
1	600
2	1200
3	2400
4	4800
5	9600
6	19200
7	38400
8	300
9	600

Table 1: Baud rate selection.

The connection for the serial interface is the 9 pin SUB-D socket at the rear of the PTC. The following diagrams show the minimum connections to the serial interface. The configuration shown is often known as the t*hree wire connection.*
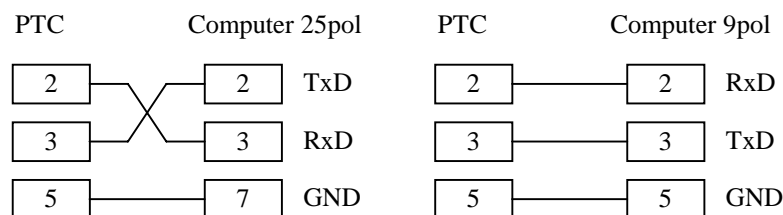
Figure 3: RS232/V24 cable connections (three wire).

Some computers or terminal programs require the following extra connections to be made on the **COMPUTER** side, so that the handshake line is correctly serviced.

	Computer 25pol				Computer 9pol	
RTS	4			DCD	1	
CTS	5			DTR	4	
DSR	6			DSR	6	
DCD	8			RTS	7	
DTR	20			CTS	8	
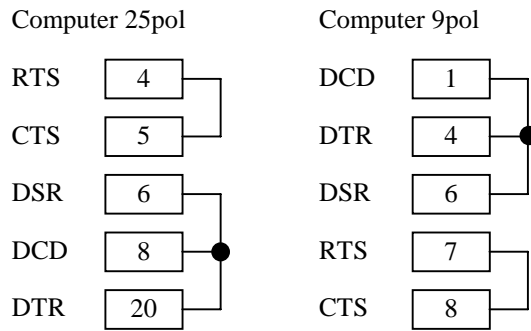
Figure 4: Handshake connections.

2.2 Connection to the transceiver

The PTC is connected to the radio equipment via an 8 pin DIN socket. Both AFSK and FSK signals are available. With AFSK, a clean filtered signal, generated by the PTC, is applied to the microphone (or other audio) input of the transceiver. AFSK can be universally applied to any modern SSB transceiver without problem. In Low tone operation, the PTC provides 1200 Hz and 1400 Hz. In High tone operation the frequencies are 2100 Hz and 2300 Hz. In both cases **200 Hz shift** is used.

FSK is to be preferred to AFSK operation. With FSK, the spectral purity of the transmitted signal is better than with AFSK. Naturally, the transmitter must offer this form of operation, and be fitted with the appropriate FSK connector. In this case, Pin 7 of the 8 pole DIN socket should be connected to the transmitter FSK input connector.

The transmitter should also of course offer the 200 Hz shift as used by PACTOR. The majority of modern transceivers offer a programmable shift for use with FSK.

IMPORTANT: Operation with High tones should only be used when the receiver offers a **narrow IF filter**, as the High pass filter on the input of the PTC cannot be changed by software, and is optimized for low tone operation.

The 8 pin DIN socket is connected as follows (Looking at the back of the PTC):
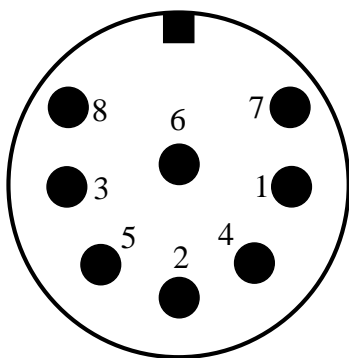
Figure 5: Radio equipment connections.

Pin 1: AFSK Output from PTC to transmitter.

Pin 2: GROUND.

Pin 3: PTT Output. (to transmitter PTT line)

Pin 4: AUDIO from receiver to PTC. (From L/S or appropriate AUX socket)

Pin 5: Optional Power Supply input.

Pin 6: ABST 2. (output for an external tuning indicator)

Pin 7: FSK Output from PTC to transmitter.

Pin 8: ABST 1. (output for an external tuning indicator)

NOTE: Unfortunately, there are 8 pin plugs with different pin numbering. One should not blindly rely on the printed numbers on the plug. The connections as shown here in the handbook should be used as a reference.

The 8 pin DIN socket is mechanically so laid out, that a 5 pin DIN plug may be plugged into it. An existing cable for the Z80-PTC may be used without further alteration, the pinout being that of the Z80-PTC set for AFSK.

It is obviously possible to use a 5 pin DIN plug if an 8 pin is not available, or the extra functions are not required.

If a 5 pin DIN plug is used, then the connections are as shown:
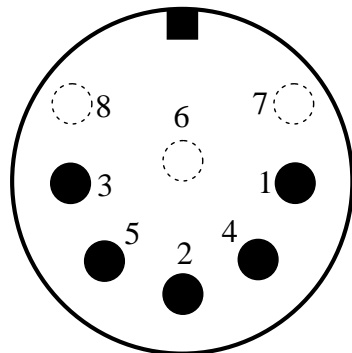
Pin 1: AFSK Output from PTC to transmitter.

Pin 2: Ground.

Pin 3: PTT Output. (to transmitter PTT line)

Pin 4: AUDIO from receiver to PTC. (From L/S or appropriate AUX socket)

Pin 5: Optional power supply input.

Figure 6: Radio equipment connections (5 pin DIN).

2.3 RAM expansion

The PTC RAM may be expanded in four stages. Table 2 shows the possible variations. The exact type number of the RAM chips depends of course, on the RAM manufacturer. For the 32 kByte chip types (32k x 8), you may find the following numbers: 62256 (Hitachi, UMC), 55257 (Toshiba), 43256 (NEC). For the 128 kByte (128k x 8): 628128 (Hitachi), 581000 (Sony), etc.

In general, the following rules apply. Only low power versions should be used. Never use pseudo-static RAM types. The access time must be faster than 120 ns.

U4	U5	Size
void	62256	32 kByte
62256	62256	64 kByte
void	628128	128 kByte
628128	628128	256 kByte

Table 2: RAM sizes.

The following step-by-step guide should be followed exactly. The normal precautionary measures concerning CMOS components must also be carried out.

- If needed, use the Backup command to save the mailbox contents.

- Always use the Verify command to check stored data.

- Remove all connections to the PTC.

- Remove the 4 screws on the front panel.

- Remove the upper case cover.

- Localize the RAM sockets U4 and U5 with the aid of the PCB component plan.

- Remove the RAM that is no longer required. Then carefully insert the new RAM into the socket(s).

- The 32k x 8 types are mounted aligned with the center of the board, that is - the four pins of the socket that face towards the edge of the board remain unused.

- Be careful that no pins are bent, and are fully pushed home.

- Replace the upper case cover.

- Replace the front panel and re-tighten the four screws.

- Re-connect the PTC with the computer and power supply.

- The PTC automatically checks the altered RAM configuration, and performs a RESTART.

- Restore the mailbox by using the RELOad command.

- Any personal PTC settings may now be programmed.
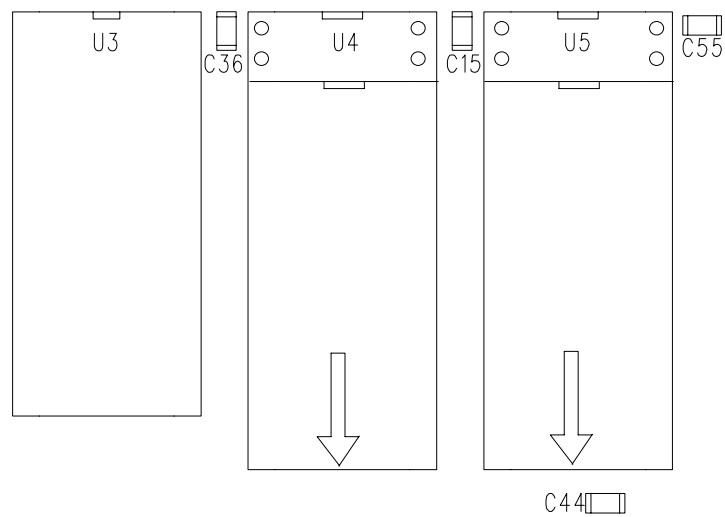
Figure 7: Placement of the RAM chips.

3 The First QSO

Before the first QSO takes place, the PTC has to be connected to the computer. This should take place with PTC and computer still switched off. The next step is switching on the computer, and loading an adequate terminal program. Take care that the parameters of the serial interfaces of the PTC and the terminal are set correctly, e.g. 9600 baud, no parity, 1 stopbit and halfduplex. If this is ok, then switch on the 12 V power supply of the PTC.

The following announcement should appear on the screen of your terminal:

```
PTC plus  68k System
 Version P.1.1  Level 1
  (C) SCS-GmbH 1993/94

262144 bytes RAM detected

ROMCALL: *SCSPTC*

*** STBY >>

cmd:
```

To check if the PTC accepts the computer input, it is only necessary to press the <RETURN> key. After each return the PTC should answer with cmd:. If all is in order, then your own callsign should be programmed with the MY command. If this is, for example, DL0XYZ, then the following is typed MY DL0XYZ <RETURN> (pressing the return key). It is now possible to check or change the various settings of the PTC. Using MY it is possible to see your own programmed callsign. TI shows the actual time, and DA the date. With HELP is given a short list of commands. Each command to the PTC is terminated by pressing the RETURN or ENTER key.

For these first tests, we suggest to use a simple terminal program. Comfortable and more complex programs (e.g. MT or PlusTerm) initialize the PTC at the program start, which naturally cannot work if the PTC is not turned on. These complex programs will probably then not operate properly, as various essential PTC settings have not been correctly initialized, for example the status request and the split screen.

For a QSO the PTC has to be connected to your transceiver. The line microphone, speaker, PTT and ground are required. If they are wired correctly the tuning display should show a broad flickering of all leds if the AF input signal is only noise. Choose the upper sideband of your transceiver and an IF bandwith of about 500 Hz, but not narrower. PACTOR signals are easily found on almost every band. Type L 1 to monitor a QSO.

Only monitoring is a bit tedious, therefore you should try to make your first QSO on your own. Mailboxes are easiest for the first test. You can find HB9AK on 40m. The list shows a frequency of 7.041 MHz. This is the mark frequency of the FSK signal.

The PTC generates the tones mark and space as 1200 Hz and 1400 Hz AF signals. The higher tone is the mark frequency. If the transceiver is set to upper sideband the display should indicate a frequency 1400 Hz below the desired one. Adjust the transceiver tuning to a displayed frequency of 7039.6 kHz. Now you can begin by typing C HB9AK on the keyboard. After the <RETURN> the PTC begins transmitting. The frequency should be varied around 100 Hz until the connect led lights. The connect message appears on the screen. The operating frequency should be optimized so that only the upper and the lower led of the tuning display are flashing. At this time the welcome text from the mailbox should be on your screen. The box

asks for your name and MYBBS. With HELP followed by RETURN you may request a command list. With Q like QUIT you can terminate the connection.[1]

On direct QSO's the change over is initiated with CTRL-Y (the CHOcharacter) and not with RETURN as in QSO's with mailboxes.

3.1 PACTOR operation

This is a brief introduction to PACTOR operating procedures by Armin Bingemer (DK5FH). We assume that the reader is already familiar with the PACTOR protocol and that he knows how to operate the PTC. Please refer to the October 91 issue of QEX for details on PACTOR.

PACTOR is one of the most fascinating modes available for amateurs. It is possible to run contacts with very little power or poor antennas. Similar to CW, signals that are down in the noise (QRM, QRN) can be decoded. The PTC does all the work and the operator does not have to strain his ear as with CW. PACTOR is much superior to AMTOR, since the transmission speed adapts to the quality of the link.

In addition, the memory ARQ brings advantages over the normal ARQ as used for AMTOR. Compared to AMTOR the throughput is increased four-fold in addition to a much improved error correction.

Direct QSO's should be the dominating type of contact. Contacts with mailboxes cannot replace a live QSO, but may be helpful in checking propagation conditions to a certain region. They are also useful for sending messages to hams that are not on the air at that time or can not be reached directly due to poor propagation. They present a neat way of setting up skeds for later direct QSO's.

As with other modes there are two ways to establish contact: calling CQ or replying to a CQ. Check whether the frequency is clear before calling CQ.

Which frequencies? Try one of the classic AMTOR calling-frequencies such as **14.075 MHz** for AMTOR calls. PACTOR activity is centered around **14.079 MHz** and **21.079 MHz** ±QRM.

Your call in UNPROTO-mode (FEC) could look like this:

CQ CQ CQ de N5MQD.

You may want to repeat this 3 to 8 times. End with PSE K and switch to standby. Then turn on the listen-mode to copy possible UNPROTO replies. While in listen-mode the PTC will also respond to PACTOR-ARQ calls to your station. Most contacts will be run in the ARQ mode to take advantage of the error correction and Memory-ARQ.

Sending RYRYRY... in FEC or ARQ makes no sense, since the RY's do not synchronize the stations as they do for RTTY.

The station replying to a CQ starts a PACTOR ARQ call to the callsign listed in the CQ call. Then both stations synchronize. CONTROL-Y is the customary change-over sequence for PACTOR.

If the contact was begun on an established calling frequency, both stations should change to another clear frequency as soon as possible. During the frequency change the transmitters should be turned off to avoid interference to other stations.

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[1]NOTE: It is obviously not possible to give instructions for every mailbox. Various mailboxes have different command structures. There is only one thing that can help here: read what is on the monitor screen! Use your imagination and don't get flustered. Otherwise just play, play, play!!

The QSO is run in the same way as an RTTY contact. However, it is possible to interrupt the other stations transmission by entering CONTROL-Y. During normal QSO's this possibility is seldom used.

To end the contact, one station enters <ESCAPE> D and the PTC's will terminate the link. The station that started calling CQ may start a new UNPROTO call on this or the calling frequency.

If a station-to-station contact is not desired i.e. a roundtable is established or a bulletin is transmitted, the mode of operation is UNPROTO (FEC).

3.2 The first AMTOR QSO

This section offers a short introduction to the AMTOR side of the SCS-PTC. There will be no attempt here to explain the AMTOR system or AMTOR operation. The essential AMTOR functions and operation is explained in references [1] and [2].

The AMTOR input prompt must first be activated with the 'A' command. The PTC then answers with:

```
AMTOR/PTC plus P.1.1 (C) SCS-GmbH 93-94
========================================

**-A-** (DFCJ):>
```

(if the SELCALL given is DFCJ)

(For the complete description of the AMTOR prompt see 5.6.3 Amtor).

Now that the AMTOR prompt is active, and the first command can be given. Apart from the form of the command prompt, nothing much has changed. If the settings have not been changed, then the PTC is still able to copy FEC transmissions, which are usually CQ calls, or broadcasts to all stations, as well as answer an ARQ call. Assuming you see an interesting CQ call, and want to answer. The four letter SELCALL is noted from the CQ call. Let us assume it is DMAA. Then type in C DMAA <RETURN>. The PTC now tries to make the connection: >>> AMTOR-CALLING: (DMAA). If this is successful, then the PTC shortly signals with: >>> CONNECTED AT - 14:07:06 / WED, 23-FEB-94. You can now type messages to the connected station. To hand the keys over to the other station merely type +?, as is usual with AMTOR, or use the <CTRL-Y> keys[2]. If you have the keys, then you may end the QSO with <CTRL-D>. The PTC closes down the link, and signals the computer with: *** DISCONNECTED AT - 14:10:34 / WED 23-FEB-94, and then the AMTOR prompt.

To read what is being sent over an existing AMTOR ARQ link between two stations, type MON <RETURN>. The PTC then goes into AMTOR Monitor mode, and can read what is being sent on the frequency. Please note: The PTC will **only** monitor AMTOR ARQ, and not FEC transmissions in monitor mode. If you wish to connect with one of the stations monitored when their QSO is ended, then proceed as detailed above.

To return to normal STANDBY from the monitor mode, merely type DD <RETURN>

To make a CQ call, type FEC <RETURN>. The PTC will switch to FEC mode transmit, then you can type your CQ call. Do not forget to give your SELCALL so that any receiving stations can call you back in ARQ. There is a convention in which the SELCALL is built up

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[2]NOTE: <CTRL-Y> is only valid if the CHO character has not been changed. From the CHO character, the PTC generates automatically the +? AMTOR changeover sequence.

from the existing amateur call, it is not, however, always possible to make up a unique SELCALL in this way. An AMTOR SELCALL may only contain FOUR LETTERS. More than four letters, a mixture of numbers and letters, or numbers only is not allowed. To form the standard selcall of your callsign, just put its first character and the last three together. If the callsign only consists of three letters, the first one is doubled.

End your CQ call with <CTRL-D>. The PTC then switches to AMTOR STANDBY and is ready for contacts.

To return to PACTOR type PT <RETURN>, and the PTC answers then with the usual cmd:.

3.3 The PACTOR frequency list

80m	
3545	w8kcq
3581	DK0BLN
3582	DL6FZ
3583.7	dl2fak, DL7AMW
3586	DL6FZ
3622.5	WA2MFY
3642	WA2MFY
3645	WA2MFY

40m	
7033	HB9BJJ
7036	DL6FZ
7038	DL6FZ
7040	DL6FZ
7041	HB9AK
7042	HB9BJJ, K1HB, dl1wx
7071	W8KCQ, ve3awe, WA2MFY, ve3eg
7072	ve2fk
7073.5	W8KCQ, WA2MFY, ve3awc, ve2fk,ve3eg
7075.5	WA2MFY
7076	ve2fk
7076.5	WA2MFY, ve3eg
7077	WA2MFY, ve3awc, ve2fk, ve3eg
7081.5	WA2MFY

30m	
10128	WA2MFY, W8KCQ
10141	HB9BJJ
10142	HB9AK
10143	HB9BJJ
10147	HB9BJJ, K1HB
10129.5	WA2MFY

20m	
14066.6	TA3B
14068	WA2MFY
14068.5	WA2MFY
14069	WA2MFY
14069.5	WA2MFY
14070.2	WA2MFY, VE3AWC
14070.5	WA2MFY
14071	JA5TX, HB9AK
14072	JA5TX
14073.5	WA2MFY
14074	WA2MFY, JA5TX
14076	HB9BJJ, JA5TX
14078	DK0BLN, JA5TX, DL6FZ, ve3awc
14079	DL7AMW, WA2MFY, ve3awc, DL2FAK, K1HB, W8KCQ
14080	DL7AMW, WA2MFY, W8KCQ, DL6FZ, ve3awc, ve3eg
14081	DK0BLN
14082	VE7CIZ
14085	HB9BJJ, K1HB
14098	HB9AK

17m	
18101.5	ve2fk
18102.5	ve2fk
18107.5	WA2MFY, W8KCQ, K1HB

15m	
21069	ve2fk
21070.5	WA2MFY
21071	HB9AK
21073.5	WA2MFY
21074	ve2fk, hc5k
21075	WA2MFY, VE3AWC
21076	WA2MFY
21077	VE3AWC
21079	WA2MFY, VE3AWC, K1HB, W8KCQ, ve2fk
21081	DK0BLN, DL7AMW
21082	DL6FZ

12m	
24915	WA2MFY, K1HB

10m	
28071	WA2MFY
28074	WA2MFY
28075	DK0BLN, DL7AMW
28079	w8kcq, ve2fk
28082	DL6FZ

Table 3: Some PACTOR frequencies.

The stations in capitals are normally available on a 24 hour basis.
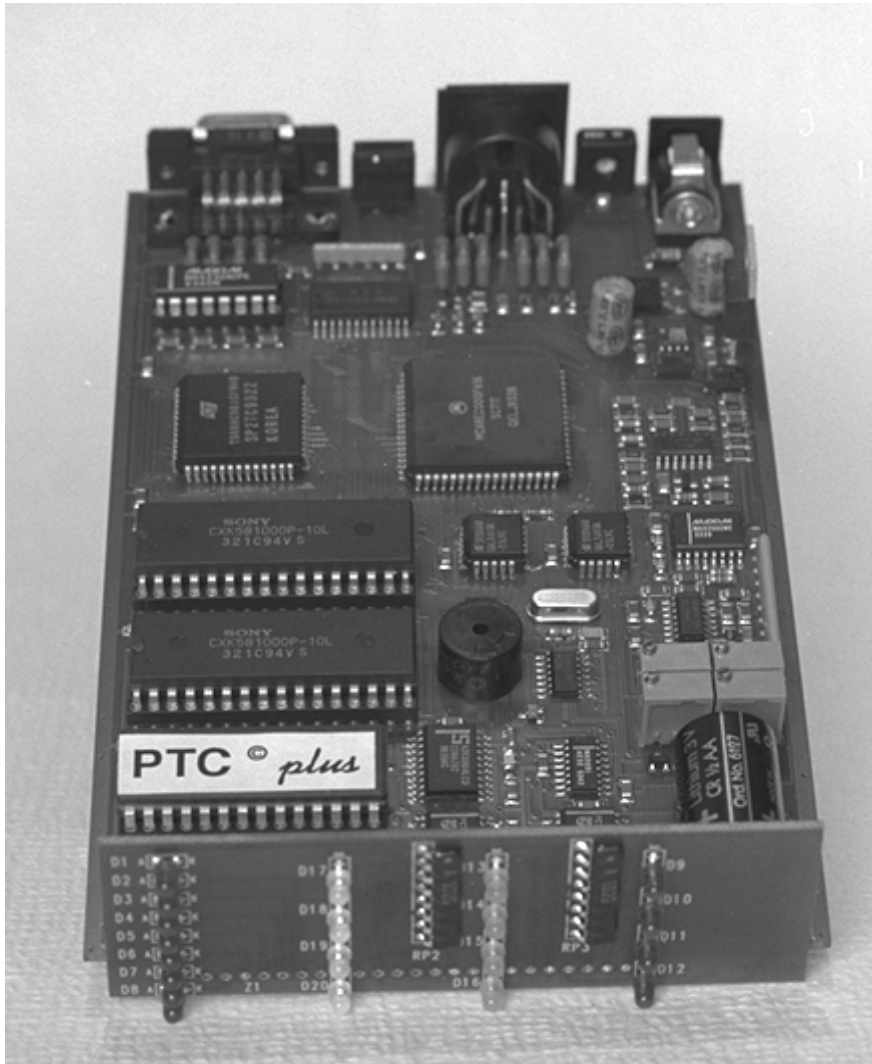
Figure 8: The PTCplus board with front panel.

4 The LED's
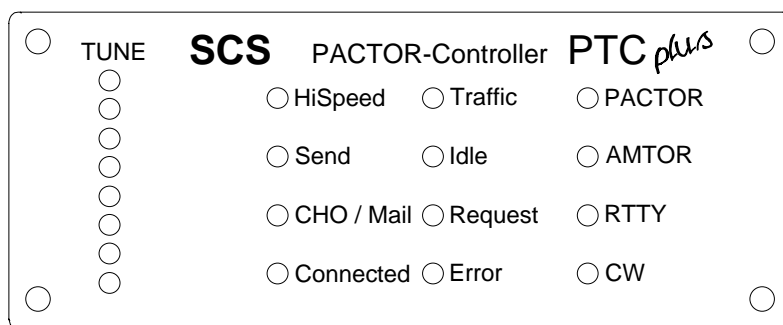
Figure 9: The PTC front.

The SCS PACTOR controller is equipped with 12 LED's to display all operating parameters, together with an 8 LED tuning indicator.

HiSpeed:	Data is transmitted at 200 Baud. In AMTOR, the PHASING condition is displayed.
Send:	The PTC is the actual packet sender.
CHO/Mail:	• When Connected: At the moment, a CHANGE-OVER (change of transmit direction) is being carried out. The CHO LED goes out when a change-over is acknowledged by the other station. • Stand by: There is unread mail for the sysop in the mailbox.
Connected:	The PTC is connected to another station.
Traffic:	The system is transmitting data, the HF channel is at present clear. In Standby condition (not in Listen Mode) shows if the channel is occupied (Channel Busy.)
Idle:	The present data packet contains at least one idle character.
Request:	The packet or control has a REQUEST status. The opposite station requests a repeat of the last sent control or data packet.
Error:	The received data packet or control contains bit errors and cannot be correctly identified.
Traffic + Error:	If Traffic and Error both light, it means that a data packet has been reconstructed by memory ARQ.
Request + Error:	If Request and Error both light, it means that a control packet has been reconstructed by memory ARQ.
PACTOR:	The PTC transmits or receives PACTOR signals. If the LED is continuously lit, then Huffman data compression is in use. If it blinks at 5 Hz then data in ASCII format is being transferred.
AMTOR:	The AMTOR function is active. If it blinks at 5 Hz then AMTOR FEC is being sent or received.
RTTY:	The PTC is in RTTY mode.
CW:	The PTC is working as a CW terminal.
TUNE:	The Tuning indicator. Ideally only the top and bottom LED's light.

Table 4: Meaning of the LED's.

Figure 10: The PTCplus front panel.

5 The Software

5.1 General

Operation of the PACTOR-Controller is carried out with commands transmitted over the serial (RS232) interface. The transmission format is **8 Data Bits, 1 Stop Bit, No Parity and Half Duplex**. The baud rate can be set via a rotary code switch on the back panel of the PTC. (See **Table 1** on page 5). The PTC answers with cmd: and waits for a command. All commands and command sequences are ended with a CR (ASCII 13). LF (ASCII 10) in the command input is ignored. Corrections can be made with BACKSPACE (ASCII 8). When in Standby, the cmd: prompt is available immediately after the last command, whereas in the so-called Converse-mode, all characters received over the RS232 interface are put into a Transmit-Buffer (except after an ESCAPE Character, see below) and are sent over the HF link at the next opportunity. The text buffer is set to 4 kByte (4096 characters)

During setting up the link and in the connected condition, the PTC is in Converse mode. Switching to RTTY or the CW terminal also activates the Converse mode.

In Converse mode, commands to the PTC must be preceded with an ESC character (Initially set to ESC, ASCII 27). After every ESC character, ONLY ONE command is possible. After an incorrect command is sent, however, the PTC allows immediate new input. (The ESC character, as well as the following command characters, DO NOT of course go into the Transmit buffer.)

5.2 Simultaneous STBY mode

In the STBY condition, the PTC automatically knows if it is called in AMTOR or PACTOR. For a PACTOR call, it answers in PACTOR, for an AMTOR call in AMTOR. It is possible to use the ARX command to suppress the AMTOR reaction (In ARQ as well as FEC).

The SCS-PTC offers the possibility to receive AMTOR FEC and NAVTEX transmissions from the STBY condition. For this, the BC parameter must be set to 1. The reading of AMTOR FEC and NAVTEX can be inhibited with the ARX command, independently from BC.

5.3 The PTC mailbox

The PTC contains its own built-in mailbox. The mailbox files are stored in static RAM and remain there even when the power supply is turned off. The maximum allowable file length is only limited by the available RAM. The maximum memory capacity of the mailbox is 248064 Bytes (with 256 kByte RAM). The number of files in the mailbox is only limited by the amount of free memory. Filenames may be a maximum of 10 characters long, and should contain no special characters. The PTC truncates all over long filenames after 10 characters. No difference is made between upper or lower case letters.

Illegal simultaneous use of the mailbox from the SYSOP and the other station is shown with the error message `*** SYSTEM BUSY`

It is also illegal to simultaneously write or read a file, or to erase a file whilst another file operation is in progress.

By Read and Send commands (on the terminal side) without a file number, either the first file will be read, or, if more than one file is present, then the directory will be shown. When no argument is given, then the present directory name (path) will be used by the file system.

Break in during a remote text output (also while reading a file) will erase the text output or ends the file read.

After a Disconnect, RESEt or (RESTart), the current directory is set to the MYCALL given value (name). With a connect from another station (Slave connect), the current directory is set to the call of the other station.

Valid Write-, List-, Read-, or DELete commands set the path to the given directory. (The directory name must naturally be explicit in the argument).

5.3.1 Multiple file operations

All commands that contain a file number in the argument (DEL, READ, SEND, as well as SF, LIST, DIR) allow batch access. File numbering being in the format 'x-y'.

For Example:
DEL test 1- (the entire directory named 'test' is erased)
R 2-3   (read file numbers 2 and 3 in the present directory)
dir 4-   (lists the files in the present directory from nr 4 to end)

5.3.2 Special features in reading files

When a remote station is reading out a file in PACTOR that has been written in AMTOR mode, the file system checks to see if it only contains capital letters. If so, then the mailbox converts the file contents into lower case, which can lead to almost doubling of the transmission speed, due to more effective Huffman coding.

File names that contain a file number argument (1-, 2, 2-3, etc.) are not allowed, and are answered with the appropriate error message.

5.4 Command structure

Arguments are separated from the command by at least 1 space. A command's current argument setting is displayed if the command is entered without an argument. Nearly all commands can be used in abbreviated form to save keystrokes. The shortest keyword of a command consists of the fewest number of characters that uniquely identify it, e.g. you may type C instead of Connect. Note: all command inputs are internally converted to upper case, so both character shifts may be used. All commands are listed below, significant mnemonics are printed in capital letters.

5.5 Remote commands

Some PTC commands are also available via the radio link. There are two control possibilities.

1. Settings: REMOTE 1 and BOX 0. With this setting, all remote control commands via the radio link must begin with a // sequence, and end with a CHANGEOVER. (e.g. //DATE<CHO> or //DIR<CHO>).

2. Settings: BOX 1. With this setting, all remote control commands may be directly input via the radio link, and terminated with a RETURN. (e.g. LOG<RETURN> or SHOW<RETURN>)

Here is a list of all remote control commands:

Command	Short description	Reference
BEll	Call the Sysop.	5.6.8
CLr	Erase the transmit buffer.	5.6.13
DAte	Calls up the PTC date.	5.6.25
DELete	Erase a file or files.	5.6.27
DIR	Read the main directory.	5.6.28
Help	Help !!	5.6.32
LIst	Gives a list of files within a subdirectory.	5.6.35
LOg	Calls up the PTC log book.	5.6.38
LOGIn	Log in for AMTOR.	5.6.39
Phase	Calls up phase information.	5.6.50
Qrt	Close the link.	5.6.52
Read	Reads a particular file.	5.6.54
RESEt	Resets the PTC (without loss of MBX data.)	5.6.57
Send	Sends a particular file.	5.6.59
SHow	Calls up QSO statistical data and PTC settings.	5.6.61
TIme	Calls up the PTC clock time.	5.6.66
Version	Calls up the PTC Software version.	5.6.74
Write	Writes a file into the PTC Mailbox.	5.6.75

Table 5: Remote commands

In addition, all remote control commands are characterised with the word **remote**. (also see 5.6.56 REMote).

5.6 Commands

5.6.1 ACheck (AMTOR Check)

Default: 30

Parameter: X   0... 100, SNR for AMTOR Packets.

This command allows a much sharper error checking than is possible with previous AMTOR systems. By using the analogue information from the A/D converter, it is possible to estimate the Signal/Noise ratio of the AMTOR blocks or the AMTOR CS signals. (noise in this sense meaning all unwanted signals). As soon as a pre-set SNR is exceeded, the PTC judges this packet as containing errors, and it is rejected. This system has the advantage that the amount of undetected errors with signals that contain heavy interference or noise is drastically reduced. (AMTOR contains only a simple parity check as error indication, and multiple bit errors are often not caught.) The values of the ACheck command lay between 0 and 100. The value 0 means the additional check is switched off. The value 100 gives the maximum restricted reception. (high sig/noise ratio). The standard value of 30 allows a link, even with very weak signals, with, however, markedly reduced printing errors. Higher values (40-60) are recommended for APLINK, where data is sent over multiple AMTOR links, until the target box is reached, and thus a minimum error rate is to be aimed at. Higher values can however pose a problem when the resync rate climbes considerably. This leads to higher values of transmitted errors, as every AMTOR resync also contains a built-in random component (violation of the ARQ principle).

5.6.2 ADdlf

Default setting: 1

Parameter: 0   Auto LF inhibited.
             1   Auto LF in Baudot RTTY and AMTOR.
             2   Auto LF in Baudot RTTY, AMTOR and PACTOR.

Inserts an automatic LF on the transmit side. Some Baudot, RTTY, and AMTOR stations require this to prevent the receiver overwriting lines, which occurs when only a <CR> is transmitted by the PTC. (In PACTOR <CR> normally also contains the NEWLINE function.)

5.6.3 Amtor

This command activates the AMTOR command prompt. Some commands are automatically adjusted for the new mode. For example, Connect starts an AMTOR ARQ call. The AMTOR SELCALL can be adjusted with the MYcall command. The TR commnad becomes valid, etc. To better distinguish between AMTOR and PACTOR modes, the following system message is given:

```
AMTOR/PTC plus P.1.1 (C) SCS-GmbH 93-94
=======================================

**-A-** (DFCJ):>

 (if the SELCALL given is DFCJ)
```

Basically the system gives the following command prompt: `**-MODE-**  (SELCALL) :>`. MODE is the actual operational mode: `A` for AMTOR, `M` for AMTOR monitor mode, `R` for RTTY and `C` for the CW terminal. `SELCALL` is the present SELCALL of the PTC.

It is naturally still possible to receive PACTOR connects, to read PACTOR QSO's, AMTOR FEC and NAVTEX transmissions.

With the SCS-PTC, it is possible to use upper and lower case letters in AMTOR. The PTC uses the PLX-APLINK convention to transfer data. It is thus completely APLINK compatible, and can read messages from, and send messages to the APLINK system using both capitals and lower case.

During the reception of an AMTOR transmission (FEC or ARQ), it is possible that a figure shift, or letter shift character, is lost due to QRM etc. In these cases, using <CTRL-B> switches to letters, and normally resolves the otherwise unreadable text.

In an AMTOR QSO, instead of using the usual +? change over sequence, it is possible to use the normal PACTOR CHO character. The PTC changes the PACTOR CHO character automatically into the AMTOR +? sequence.

A break in is made using the normal BREAK IN character (BKchr).

5.6.4 ARX
Default setting: 1

Parameter: 0   AMTOR phasing inhibited.
            1   AMTOR phasing enabled.

With ARX 0, it is not possible to obtain an AMTOR connect in the standby mode. Also the reception of AMTOR FEC and NAVTEX is inhibited.

With ARX 1, the PTC reacts to an AMTOR connect attempt. Reception of AMTOR FEC and NAVTEX is enabled, provided that BC is set to 1.

5.6.5 BAKup
This serves to back up the entire PTC mailbox. After the BAK command input, the PTC requests a disk file to be opened, and waits for the input of a CR, which starts the actual back up procedure. After the back up is finished, the PTC gives a BELL character, to signify that the disk file may be closed.

For Specialists: The Back-up File-format:

```
<CR>                              ; <CR> = carriage return;
###PTCBAK<BN><CR>                 ; <BN> = number of 32k-RAM blocks
                                  ; present (decimal)


S<CR>                             ; S starts every 256 Byte Sector
0000<CR>                          ; Hex dump of the sector contents follows
S<CR>                             ; If the first word = 0, sector is empty
0000<CR>                          ; and a <CR> follows
S
1F1BABC85D56DABC8912D..<CR>       ; Occupied sector: 8 lines of 64 nibbles
                                  ; follow. After every line, a <CR>


.... ....


S<CR>
```

```
FFFF<CR>                              ; Last sector begins with FFFF and is empty
AB3C<CR>                              ; 16 bit checksum on all nibbles
```

<CR> or <LF> can generally be completely ignored, so that there should be no problem due to incompatible terminal programs. The read algorithm by RELOad *synchronizes* only with the help of the S start character.

5.6.6 BAUdot

Default setting: 45

Parameter: X   20 to 300 Baud.

Switches to RTTY with the given baud rate. E.g. BAU 100 switches to RTTY with 100 Baud. The baud rate is continuously variable between 20 and 300 Baud

The baud rate can be exactly set, without quantising problems, as an interpolation algorithm is in operation. The computer also automatically calculates the best low pass filter for the base-band filtering according to the baud rate. This gives excellent receiving characteristics, that hardly vary from the theoretical ideal value.

After BAU, the PTC answers with:

```
>>> BAUDOT-RTTY RECEPTION ACTIVE - SPEED: 45 BD <<<
```

and is ready to receive RTTY transmissions. Changing to transmit is done with the CHO character (CHOchr). Changing to receive again is done with the QRT character (QRTChr).

Directly after activating RTTY with BAU, the PTC is in Converse mode, i.e. all characters from the terminal go into the transmit buffer. This has the advantage that text can be typed ahead. During the other station's transmission, it is possible to type in the station description or other message, for example. On switching to transmit, this text will then be sent.

To send a command to the PTC, an ESC character (ESCchr) must first be input. In RTTY mode, the AMTOR-prompt is in the form of: `**-R-** (DFCJ) :>`

NOTE: After approximately 4 minutes of idle transmissions, an automatic QRT is carried out!

5.6.7 BC

Default setting: 1

Parameter: 0   FEC reception inhibited.
             1   FEC reception enabled.

AMTOR FEC reception inhibit or enable. If BC is set to 1, then the PTC can receive AMTOR FEC transmissions in the STBY mode.

5.6.8 BEll   remote

Default setting: 1

Parameter: 0   SYSOP calling inhibited.
             1   SYSOP calling enabled.

Use of this command causes an intermittent beep (approx. 10 secs) at the remote station. It serves as a SYSOP call. The SYSOP can interrupt the beep by pressing any key on his key-

board (e.g. <CR> or <ESC>). The SYSOP can either enable the BEll command (1), or inhibit it (0) on his system.

5.6.9 BKchr

Default setting: 25 (CTRL-Y)

Parameter: X   1... 127, decimal ASCII code of the break in character.

Defines the BREAK IN character which is a special command for a forced direction change from RX to TX (break-in). Since break in can only occur when connected, the PTC accepts the BREAK IN character only when in text mode, and not after the cmd: prompt.

The BREAK IN character may be changed to any other convenient character. For example: to define CTRL-B as the BREAK IN character enter: BK 2.

The following characters are not permitted: BACKSPACE (ASCII 8), CR (ASCII 13), SPACE (ASCII 32), IDLE (ASCII 30), XON (ASCII 17), XOFF(ASCII 19), and other reserved special charcters.

5.6.10 Box

Default setting: 1

Parameter: 0   Mailbox control with // sequence.
            1   Mailbox in direct mode.
            2   As in 0 but only personal messages for the SYSOP.
            3   As in 1 but only personal messages for the SYSOP.

The command Box 1 brings the PTC mailbox into the direct access mode. Remote commands can be given WITHOUT the // sequence, and the remote command is ended with a <CR>. The PTC indicates that it is in the direct mode by giving out next? as a prompt to the remote station, showing it is ready for the next command.

The next? command prompt is changed to an identification output at every fourth occurence. The identification prompt looks like: hiscall de mycall> and is to comply with the regulations of virtually all amateur licences concerning identification of stations. This increases the *Overhead* of the box only very slightly, as the callsigns are given in small letters, and thus lend themselves to efficient Huffman coding.

If a user tries to use the mailbox whilst in direct access mode by using the // sequence, then an error message is given.

Direct box access has priority over the REMote parameter of the PTC. (The direct access functions normally, even when REMote = 0). Indirect mailbox access means that commands can only be given using the // sequence, (e.g. //help, and ending with a change over). The indirect box access can be inhibited with the REMote command.

Direct box access is automatically inhibited when the PTC works as Master. (i.e. the PTC had initiated the connect). If however, the Box command is used to change the box access parameters during the contact, then these new parameters are valid at once, even while the current contact is in progress, independent of whether the PTC is the Master or Slave.

The Box 2 and Box 3 commands only allow messages for the remote stations MYCALL callsign to be accepted (generally the SYSOP). This is for cases where 3rd party traffic is not allowed.

5.6.11 CHOBell

Default setting: 1

Parameter: 0 Change over bell off.
1 Change over bell on.

As a default a change over (change of data transmission direction) is indicated by a beep of the internal beeper. In addition, the PTC sends a BEL character (ASCII 7) to the terminal and lets it beep. CHOB 0 inhibits both the sending of the BEL character to the terminal and the beep of the internal buzzer.

5.6.12 CHOchr

Default setting: 25 (CTRL-Y)

Parameter: X 1... 127, decimal ASCII code of change over character.

CHO defines the CHO character which is a special command for the change from TX to RX. Since CHO can only occur when connected, the PTC accepts this only when in text mode, and not after the cmd: prompt. The CHO character is not part of the transmitted data and is not transmitted.

A change over initiated by the TX operator is not executed until all text in the transmit buffer is transmitted.

In AMTOR, the CHO character has a further function. In an AMTOR QSO, (AMTOR ARQ / Mode A), the CHO character can be used instead of the +? sequence. Whilst in AMTOR standby, the CHO character can be used to initiate an FEC (Mode B) transmission. Whilst in AMTOR monitor mode (Mode L) it causes a new synchronisation with the monitored station(s).

In RTTY (BAU command) the CHO character switches to transmit.

The CHO character can be changed by using the CHO command at any time. If, for example, <CTRL-Z> is required, then the command CHO 26 <CR> can be given, and the new CHO character would be set (ASCII 26 = CTRL-Z).

Illegal values are 13 (CR), 32 (SPACE), 30 (IDLE), 17 (XON), 19 (XOFF), and other previously defined special characters.

5.6.13 CLr   remote

Deletes the transmit buffer. Everything that is contained in the transmit buffer, which has not yet been transmitted, is deleted.

5.6.14 CMsg

Default setting: 0

Parameter: 0 Connect text off.
1 Connect text on.

This command turns the connect text on or off. There is only one common C text for AMTOR and PACTOR. Therefore CMsg 1 enables the C text in PACTOR as well as in AMTOR.

5.6.15 Connect

Default setting: previous address

Parameter: ADDR   i.e. callsign, 2 to 8 characters.
              !ADDR   Starts a long path call.

When entered from STBY, the Connect command starts an ARQ PACTOR contact.

If the address is omitted, the last one is taken from the system memory. The command may be repeated with different addresses, until synchronization is complete, after reception of a control signal. If no response is received after a number of tries (set by the MAXErr command), or if a Disconnect is entered, the system returns to STBY. In the connected state the actual destination address is displayed.

With an exclamation mark (!) directly before the callsign (example: C !DL0WAA) it is possible to call a PACTOR station with syncpackets adapted for ARQ traffic over the long path. The cycle time increases to 1.4 seconds and the control delay becomes long enough for ARQ contacts to over 40.000 km (TRX-Delay 25 ms).

Z80-PTC systems with firmware-versions less than 1.3 will not recognize syncpackets with LONGPATH-OPTION and will not react.

Connections in LONGPATH will have a slightly decreased traffic throughput (abt. 90% of the normal setting).

When the AMTOR prompt is active, then the Connect command starts a connect attempt to try to create an ARQ link. Naturally, the AMTOR selcall of the called station must be entered instead of the callsign. For example,: C DFCJ. The station with the selcall DFCJ would be called in AMTOR ARQ. If the call is repeated, then the selcall can be omitted i.e. C <CR>.

5.6.16 CSDelay

Default setting: 6

Parameter: X   2... 10, delay in X • 5 msec.

Selection of time delay between the end of the RX packet and start of the first CS data bit. The time equals the value X multiplied by 5 milliseconds. The parameter influences the response time (controls) of the RX at RX start. With a large value of CSDelay even transceivers that have slow transmit-receive switching can be used for PACTOR. However, the maximum distance that can be covered is reduced, due to the time delay caused by the final speed of radio waves (more than 0.07 seconds for a wave to reach the other side of the globe). DX is only possible with fast transmit-receive switching. The default value will work fine with most modern transceivers.

5.6.17 CTExt

Default setting: 'PTC plus 68k Maildrop QRV...'

Parameter: String of 249 characters, maximum.

There is only **one** connect text for PACTOR and AMTOR. The C text is transmitted when CMsg is set to '1' and the PTC receives a connect.

As the CTEXT input operates over the command interpreter, the convention for the <CR> Character must be adhered to. A <CR> is represented in the C text string by a '#'.

For Example: `This is DL6MAA in Mindelheim`
             `The terminal is at the moment not active!`

             `73 de Peter.`

would be input thus:

CTE This is DL6MAA in Mindelheim#The terminal is at the moment not active!##73 de Peter.

The Command interpreter buffer is 256 characters long. Commands plus C text argument should not contain more than this number of characters, otherwise the C text will be truncated.

5.6.18 CTrlchr

Default setting: 22 (CTRL V)

Parameter: X   1... 127, decimal ASCII code of a character.

Defines the CTRL character. If the CTRL character is immediately followed by a-z or A-Z, the PTC will transmit a control-code (ASCII 1-26). With this simple convention, control characters that are used by your own terminal(e.g. QRT character, etc.) can also be sent to the other station. It is recommended to put all definable control characters in the control block. XON and XOFF can not be transmitted.

5.6.19 CWFilter

Default setting: 0

Parameter: 0   Low tone Filter bank with 1400 Hz.
              1   High tone Filter bank with 2100 Hz.
              2   Low tone Filter bank with 800 Hz.
              3   High tone Filter bank with 800 Hz.

This command enables the use of certain filter pairs (High or Low tone filters) for CW demodulation. The respective Mark frequency (1400 or 2100 Hz) is adjusted as the center frequency of the demodulator, by the software in EPROM.

If one filter pair is adjusted for 800 Hz (600 Hz and 800 Hz: see SYStest tune up routine) the transmit tone must also be switched to 800 Hz so that correct transceive operation is obtained.

The following settings are possible:

CWFilter	Filter bank	Tone frequency (Demod. and Modulator)	
0	Low tones	1400 Hz	
1	High tones	2100 Hz	
2	Low tones	800 Hz	The filter pair must adjusted
3	High tones	800 Hz	to 800/600 Hz with SYStest.

5.6.20 CWid

Default setting: 1

Parameter: 0 CW identification inhibited.
            1 CW identification enabled (Only for PACTORARQ).
            2 CW identification enabled (PACTOR ARQ and Unproto).
            3 CW identification enabled (PACTOR ARQ and Unproto /AMTOR ARQ).
            4 *CW identification enabled (Only for PACTOR ARQ).
            5 *CW identification enabled (PACTOR ARQ and Unproto /AMTOR ARQ).

Automatic CW identification is given after approximately 7 minutes, and after QRT. The CWid is keyed with the PTT line. FSK and AFSK remain stable at the Mark frequency during the CW Transmission. The AFSK signal amplitude is also keyed.

With CWid 1-3, the CW identification is only given when the QRT is given from one's own station. With CWid 4 and 5, it does not matter which station started the QRT procedure.

As CW identification, one's own callsign (MYCALL) is always used.

5.6.21 CWMoni

Default setting: 1

Parameter: 0 CW monitor tone inhibited.
            1 CW monitor tone enabled (TX).
            2 CW monitor tone enabled (TX and RX).

The functions of the CW monitor:

With CWMoni 1, the PTC produces a monitor tone over the internal buzzer, for the transmitted CW characters from the CW terminal.

CWMoni 2 also produces a tone from the received demodulated CW characters from the CW terminal.

5.6.22 CWSpeed

Default setting: 160

Parameter: X 40 - 1200, CW speed in LpM.

The CWSpeed command enables the CW speed to be set continuously between 40 and 1200 LpM (Letters per Minute - divide by 5 for approximate words per min)

The CW speed is set for the CW ID as well as the CW terminal transmit speed.

5.6.23 CWTerm

The CWTerm command activates the CW terminal of the PTC. The CW speed is set by the CWS parameter. The keying takes place using the PTT line as with the CW ID. FSK and AFSK remain constant on the Mark frequency. The AFSK signal amplitude is also keyed.

After activating the CW terminal, characters from the keyboard, that can be translated into Morse, are transmitted as Morse code by the PTC.

When nothing is input via the keyboard, (and the transmit buffer is empty), then the CW terminal is in receive mode.

When a command must be given to the PTC, (e.g. DD) then the ESC character (see 5.1 and 5.6.30) must be sent, as the PTC operates in converse mode when the CW terminal is in use.

When the CW terminal is in use, the AMTOR prompt is used, though the 'A' is replaced by a 'C'. As mode status (over the RS232 interface when Status Level = 1) is shown RTTY, as the function of the terminal in most respects resembles the RTTY module.

A CW signal must be so tuned that the tuning indicator on the PTC shows the upper most LED lit when a CW signal tone is present. As the PTC software calculates a very narrow filter for optimum CW reception, the tuning is quite critical. If only noise is present within the PTC receiving channel, only the lower LED's of the tuning indicator flicker. With a correctly adjusted CW signal, the traffic LED lights when the CW signal is there, and the idle LED when it is not.

The tone frequency of the CW signals is that of the Mark frequency. Correct transceive operation is ensured, as the transmit tone is also that of the Mark frequency (depending on individual need, either High tone or Low tone).

NOTE FOR SPECIALISTS:

If the 800 Hz tone is used for CW, as is quite usual, the transceiver must be switched to CW. Many amateur transceivers show a considerably cleaner TX keying than when SSB or FSK is used.

For reception, the demodulator must naturally be re-tuned: The filter pair that are NOT used for AMTOR/PACTOR/RTTY are used (i.e. if the High tone filters are used for data transmission, then the Low tone filters are tuned up for the CW tone frequency and 200 Hz lower.) For Low tones (for example), the Mark filter should be tuned to the CW tone of 800 Hz, and the Space filter to 600 Hz. This adjustment is supported by the SYStest command. However, in this case the corresponding set of potentiometers has probably to be exchanged for types with a higher maximum resistance.

The PTC's automatic CW decoder can operate with speeds between 30 and approximately 300 letters per minute, and scans this range within 10 seconds.

It will decode,	all letters from	a-z
	all numbers from	0-9
	special characters	, . : ? / - = SK# EB> AR* KN(VE+ KA!
	as well as the German Umlauts	ä, ö, ü, ch

All ambiguous signals are ignored.

Naturally, an automatic decoder can only decode relatively well sent Morse code signals. One hears unfortunately much badly sent Morse on the bands (not only amateur signals!!) where commonly the Mark/Space ratio is incorrect. One must then bear in mind that not all CW QSO's will be correctly decoded.

The CW terminal can be closed with the D command, or DD<CR> may also be used.

5.6.24 CWWeight

Default setting: 50

Parameter: X   5 - 95, weight of CW characters in %.

This command sets the weighting of the CW character, that is dot dash relationship, together with dot space ratio (between character elements). Standard CW shows a ratio between dots and spaces of 1. The dot dash relationship is 3 to 1. With lighter CW characters, the ratio between dot and dash length is larger than 3, and the space to dot relationship greater than 1.

With a CWWeight value of 50 (%), the PTC operates with normal ratios. With values greater than 50, the weight of the characters increase, and with smaller values, they decrease (percentage-wise). A weight of 25 means that the dot length would be only half that of the normal setting, the space length being respectively longer, this leading to a space to dot ratio of 3 to 1 The speed naturally stays the same, as the complete character length is not influenced by CWWeight.

The value of CWWeight influences the CW identification as well as the CW terminal.

5.6.25 DAte   remote

Default setting: none

Parameter: DD.MM.YY   Desired date.

Arguments are ignored during remote control.

DAte is used to set or read the PTC calendar. If DAte is entered without a parameter, the current date is displayed. When the date is set, leading zeros must not be omitted. The periods, however, may be omitted. All positions must be entered. Faulty inputs cause incorrect programming of the clock chip!

From 01.01.1990 up to 31.12.2089, the day of the week is automatically calculated from the date. Thus your PTCplus is well equipped for the future!

Example: required date Sunday 24th March 1991. For this the following settings are required:
DA 24.03.91 or DA 240391

5.6.26 DD

This command causes an immediate breaking off of the transmission ('Dirty Disconnect'). An existing link is not correctly terminated. Any text that remains in the transmit buffer is discarded.

DD leads in all cases back to the respective standby level.

5.6.27 DELete   remote

Deletes files in the PTC mailbox. Remotely it is only possible to delete self written files or files written to you. All files may be deleted locally, of course.

Examples:

DEL DL2FAK 1-   Erases all messages addressed to DL2FAK.
DEL DL2FAK 4   Erases message no 4 addressed to DL2FAK.
DEL DL2FAK 4-   Erases all messages from no 4 onwards, addressed to DL2FAK.
DEL DL2FAK 3-5   Erases messages no 3 to 5 addressed to DL2FAK.
DEL ALL 4-5   Erases own messages no 4 to 5 in directory ALL.

5.6.28 DIR   remote

Note: DIR can from the remote side be shortened to D.

If given without parameters, DIR shows the main directory and the free memory available in the mailbox.

If DIR contains as a parameter the name of a subdirectory, then the contents of this subdirectory will be listed (i.e. DIR test shows all files in the subdirectory 'test'. Also see 5.6.35 LIst)

Examples:

DIR without parameter appears similar to below.

```
Main Directory:

TEST        DL3FCJ      PTCPLUS     ALL

242222 bytes free

PATH: TEST>
```

Various subdirectories, the free memory (dependent on the RAM fitted) and the present subdirectory are displayed.

DIR DL3FCJ (Identical to LIST DL3FCJ) lists the contents of the subdirectory DL3FCJ. That can appear like so:

```
Directory of DL3FCJ:

NR     FROM          DATE        TIME        SIZE      TITLE
--     ----          ----        ----        ----      -----
1      P: DL1ZAM     02-MAR-94   17:13:45    1144      New Info
2      P: DK5FH      02-MAR-94   23:30:22    1502
3      P: DL2FAK     03-MAR-94   13:25:15    1362      Mistake!
4      P: DL6MAA     03-MAR-94   23:31:46    927       New Software
5      A: DL3FCI     04-MAR-94   20:05:10    501       Coffee on Sat

PATH: DL3FCJ>
```

Displayed is the file number, from whom the message originates, and in which mode it was sent, date and time, the size of the file in bytes, and, if available, the title of the message.

5.6.29 Disconnect

An existing link (including Unproto) is closed down correctly. If any text is still in the transmit buffer, this is first transmitted, then the PTC starts the QRT sequence.

5.6.30 ESCchr

Default setting: 27 (ESCAPE)

Parameter: X   1... 127, decimal ASCII code of a character.

Defines the ESCAPE character.

When the PTC is in the converse mode (ARQ, FEC, CW terminal or RTTY) an ESCAPE character is required in order to get a command prompt and input a command.

CAUTION: We recommend not to experiment with this character, since it is crucial to the control of the PTC.

5.6.31 FEc

This command starts an AMTOR FEC transmission (Mode-B). When the AMTOR prompt is active, then this command has the same effect as the CHO character.

NOTE: After approximately 4 minutes of idle transmission, an automatic QRT is carried out.

5.6.32 Help   remote

Help, without parameters, gives a list of various commands.

The PTC contains a short description of every command, so that the handbook does not need to be continually consulted. These descriptive messages can be obtained by using Help, followed by the required command. E.g. Help bau<CR> or in shortened form h bau<CR>

From a remote station, Help results in only those commands that can be remote controlled being listed.

In PACTOR:

```
<pactor remote commands>

h(elp)   q(rt)     da(te)   ti(me)
d(ir)    w(rite)   r(ead)   del(ete)
sh(ow)   v(ersion) p(hase)  lo(g)
cl(r)    l(ist)    s(end)   be(ll)


characters within brackets are optional.
for more information type: h(elp) command  (eg: help send).
```

In AMTOR:

```
#AMTOR REMOTE COMMANDS#

H(ELP)  Q(RT)    BE(LL)     DA(TE)   TI(ME)
D(IR)   W(RITE)  R(EAD)     DEL(ETE) LOGI(N)
P(HASE) SH(OW)   V(ERSION)  LO(G)    CL(R)
L(IST)  S(END)


CHARACTERS WITHIN BRACKETS ARE OPTIONAL.
FOR MORE INFORMATION TYPE: H(ELP) CMD  (EG: HELP LOGIN).
```

A thorough description of each command can also be obtained by the remote station, using Help <CMD> e.g. Help phase or Help bell.

5.6.33 LFignore

Default setting: 1

Parameter: 0   no insertion of <LF>.
             1   insertion of <LF> after each <CR>.

LFignore determines whether a <LF> is automatically appended to each <CR> that is sent to the terminal. For LFignore 0 the characters are passed exactly as the PTC receives them. For

LFignore 1 <LF>s' sent to the PTC are ignored. However, for every <CR> sent to the terminal a <LF> is appended (also see 5.6.2 ADdlf).

5.6.34 LIN

Default setting: 128

Parameter: X   20 - 128 Number of characters before an auto linefeed.

Auto linefeed (<CR> and <LF>, depending on the LFignore setting) after X transmitted characters (word wrap). The auto linefeed is turned off with the value 128.

5.6.35 LIst   remote

Lists the contents of a directory in the PTC mailbox.

The short-form L is also accepted by the remote station, as in this case no possible confusion with Listen can occur.

Examples:

L DK5FH	Lists all messages for DK5FH.
L DK5FH 4	Lists the message no 4 for DK5FH.
L DK5FH 4-	Lists from message no 4 onwards for DK5FH.
L DK5FH 3-5	Lists messages 3 to 5 for DK5FH.
L ALL	Lists all messages in the Directory ALL.
L ALL 4-5	Lists the messages 4 to 5 in the Directory ALL.
L 5	Lists message no 5 in the current Directory.
L	List all messages in the current Directory.

5.6.36 Listen

Default setting: 1

Parameter: 0   Listen mode inhibited.
             1   Listen mode enabled.

The Listen mode is turned on with Listen 1, so that it is possible to 'Listen-in' to what is being sent in PACTOR ARQ QSO's and to read Unproto transmissions. Listen is only possible in the STBY condition. The Listen operation can be aborted by the command Listen 0. If the Listen mode is active, then Connect packets are also displayed: [CONNECT-FRAME: CALL], e.g.[CONNECT-FRAME: DL6MAA] means that a station is trying to connect with DL6MAA. With poor signals, it is possible that the complete CALL is not displayed, only that part correctly decoded being shown.

No Channel busy status is given in Listen mode.

5.6.37 LOCk

Default setting: 0

Parameter: 0   Lock off.
             1   Lock on.

By this command it is possible to save PTC parameters against accidental change. LOCk 1 switches the function on, LOCk 0 switches it off.

The following commands are not affected by LOCk: CLR, Connect, D, DD, Del, DIR, Help, List, LOCk, LOG, Qrt , Read, RESEt, SHow, Unproto, Version, Write.

5.6.38 LOg   remote

This command reads the PTC log page. The last 16 PACTOR/AMTOR contacts are displayed (except Unproto contacts). The Log page can only be erased with a RESTart (a total reset.)

The following extra information in the callsign field is also available:

S: CALLSIGN   PACTOR (SYSOP call)
P: CALLSIGN   PACTOR (RX call)
A: CALLSIGN   AMTOR

Amtor links are only entered in the Logbook after a successful LOGIN!

5.6.39 LOGIn   remote

In order to allow access to the PTC mailbox in AMTOR, a user station must first 'Login' using the LOGIn command e.g. LOGI DL1ZAM. The user's callsign is thus made available to the PTC mailbox. Only after a correct LOGIn can the AMTOR user station send, read or delete files from the mailbox. A successful LOGIn also writes the user's callsign into the log book file.

LOGIn can also be used by the SYSOP. This allows the callsign of the other station to be entered into the PTC to enable full mailbox access, without the station having to go through the full LOGIn procedure. In PACTOR, this would be needed only in exceptional circumstances, as an automatic LOGIn is performed. The call of the other station is essential for the correct operation of the PACTOR QRT protocol, so that changes during a link could influence the QRT procedure.

In the STBY condition, LOGIn allows the default call of the other station (used in the Connect command without argument) to be seen, or to be set (LOGIn without argument).

With a remote access using PACTOR, a LOGIn command will cause an error message.

5.6.40 MAil

Default setting: 1

Parameter: 0   New messages not reported.
              1   New messages reported on connect.

On connect, reports if new messages for the caller are at hand. Only messages that have NOT been read by the caller are counted.

To report mail for the SYSOP that has not been read (filename = MYCALL), the CHO-LED is used. It lights continuously during STBY operation if new, unread mail is available for the SYSOP.

5.6.41 MAXDown

Default setting: 6

Parameter: X   2... 30, number of error packets before speed down.

Selection of the speed down parameter for automatic speed changing. MAXDown determines how soon the system steps down from 200 baud to 100 baud during poor channel conditions (2=fast / 30=slow). Example: MAXDown 6 i.e. the PTC switches down to 100 baud after receiving 6 error packets in a row.

5.6.42 MAXErr

Default setting: 70

Parameter: X   30... 255, maximum number of retries or errors.

MAXErr defines the time-out value. When initially calling a station, this value sets the maximum number of sync packets that the PTC sends without a response from the other station (also see 5.6.15 Connect).

When connected, MAXErr determines how many faulty blocks or controls are permitted before the connection is aborted (***TIMEOUT: DISCONNECTED).

Request blocks or request controls are not interpreted as errors, and reset the error counter to zero.

In AMTOR, the timeout is automatically doubled, so that with the default setting (70), a total of 140 packets (63 seconds) will be transmitted, until the system timeout and the complete breaking of the link. The rephase timeout for AMTOR is fixed at a value of 32 packets.

5.6.43 MAXSum

Default setting: 30

Parameter: X   5... 60, maximum count for memory ARQ.

MAXSum is the timeout value for the memory ARQ counter. It determines the maximum number/sum of faulty packets. If MAXSum is exceeded, the sums are deleted, since it can be assumed that crude errors have entered the sum, and that further summation of the packet will not restore it. The optimum value of MAXSum depends on the condx on the HF channel. The worse the condx, the higher should MAXSum be set, in order to be able to pass any information at all.

5.6.44 MAXTry

Default setting: 2

Parameter: X   1... 9, maximum number of 'speed up' attempts.

MAXTry determines how often the PTC repeats 200 baud packets during an attempt to 'speed-up' the transfer rate.

5.6.45 MAXUp

Default setting: 3

Parameter: X   2... 30, number of error free packets before speed up.

Selection of the speed up parameter for automatic speed changing. MAXUp determines how soon the system steps up from 100 baud to 200 baud during good channel conditions (2=fast /

30=slow). Example: MAXUp 3 i.e. the PTC switches to 200 baud after receiving 3 *correct* packets in a row.

5.6.46 MOde

Default setting: 1

Parameter: 0   TX mode ASCII-8 bit character set.
               1   TX mode ASCII-7 bit with Huffman data compression.

Selects the TX data format. In most cases (plain text transmissions), the best results are obtained with Huffman data compression, which can improve speed up to 80% (effective character length 4.5 to 5 bit). 8 bit mode will be useful only if the text contains non ASCII characters, or many uppercase letters.

In both modes, ASCII control codes (decimal 1... 26) can be transmitted by prefixing them with the CTrlchr (see 5.6.18 CTrlchr).

In the Huffman mode only the ASCII-Characters 0 - 127 (7 bit) can be transmitted. To transfer certain IBM/ATARI special characters (umlauts), the PTC converts these characters according to the following table:

Umlaut	ASCII	Transmitted Charac-
ä	132	14
ö	148	15
ü	129	16
Ä	142	20
Ö	153	21
Ü	154	22
ß	225	23

Table 6: Conversion of German special characters.

The PTC firmware looks at each packet determining whether HUFFMAN or ASCII coding will be more efficient for transmission, and selects the better one. This feature is only active in MODE 1 (HUFFMAN). Manually selecting MODE 0 (ASCII) makes the controller transmit ASCII anyway. Doing this should only be necessary in very special cases.

Automatic mode also works on characters exceeding 127 decimal. Therefore 7PLUS files may be transferred without any user intervention.

5.6.47 MONitor

This command switches to AMTOR listen mode (Mode L). In AMTOR listen mode, an existing AMTOR ARQ link between two stations can be read on screen.

As the AMTOR listen mode requires a lot of computer time, it is NOT possible to receive any FEC transmissions or answer PACTOR or AMTOR connect requests in this mode.

By using the CHO character, it is possible to re-synchronize at any time.

If the PTC does not switch back to letters, due to poor reception conditions (a weakness inherent in the AMTOR protocol), using <CTRL-B> will force a letter shift.

5.6.48 MYcall

Default setting: ROM callsign

Parameter: ADDR   Callsign, 2 to 8 characters.

The callsign can only be set during STBY. Without a parameter, the actual callsign is displayed. Whenever the callsign is received during STBY, the PTC performs slave synchronization, and responds with a control signal.

With an active AMTOR prompt, MYcall sets one's own Selcall.

5.6.49 NULl

Default setting: 1

Parameter: 0   Case switching inhibited.
              1   Case switching enabled.

This command only refers to the AMTOR side of the PTCplus.

The SCS-PTC supports the PLX-APLINK convention for case switching. This means that AMTOR files from the PTC, with upper and lower case letters may be distributed throughout the worldwide APLINK network. Users with compatible systems can read these files in AMTOR, with upper and lower case.

The upper/lower case convention is activated with the command NUL 1. This method is fully compatible to the AMTOR system without case switching, but slightly reduces the already somewhat slow transmission speed.

Switching is inhibited with the command NUL 0.

5.6.50 Phase   remote

Default setting: 0

Parameter: X   -120... +120, phase correction in ppm.

Note: The parameter setting is ignored during remote operation.

This command allows fine adjustment of the system clock, and displays the accumulated phase correction during a PACTOR contact. All PTC timing is derived from an internal crystal oscillator, and it is sufficient to adjust the crystal frequency to 6.144000 MHz once during the initial alignment. However, a frequency drift due to temperature and other effects may occur. These offsets can be corrected by use of the Phase command.

For example, a system clock running 10 ppm too fast can be compensated by typing P -10. The entered correction parameter becomes valid when the next PACTOR contact is started. During slave mode, the PTC software automatically issues the appropriate phase correction setting, so that exact synchronization between the master and slave station will be established within a few minutes after start of the contact, provided the initial clock difference did not exceed 30 ppm. When called without an argument, the actual total phase correction, manually and system-generated initial values, are displayed. This is a powerful feature that you can use for aligning your PTC crystal oscillator, without any measuring instruments, following these steps:

1. Perform a master call to a station with a known highly accurate PTC clock frequency.

2. After at least five minutes of contact, you can read out the phase correction data from the reference station, by sending a remote control P command. Enter the phase correction data from the reference station as a new initial value for the Phase command, inverting the preceding factor (i.e. '-78' becomes '+78').

If a timeout occurs under 5 minutes, your system clock offset is probably too great to be compensated by the automatic phasing. In this case, the data readout will only show a tendency.

5.6.51 PT

Returns to PACTOR from the AMTOR, RTTY or CW modes. Activates the PACTOR input prompt.

5.6.52 Qrt   remote

From the terminal side, identical to the Disconnect command. For a remote station, the Qrt command causes a change-over, and the message:

```
hiscall de mycall>

<qrt>
```

and then initiates a disconnect.

5.6.53 QRTChr

Default setting: 4 (CTRL-D)

Parameter: X   1... 127, ASCII-Code (decimal).

Sets the QRT character, which causes the system to go QRT (close the link). It can also be sent whilst receiving data, which then becomes active at the next transmit-phase. In RTTY, it switches from transmit to receive. It is an alternative to the Disconnect command, and can also be put at the end of a text to be transmitted, so that at the end of the transmitted text, the link is closed down.

5.6.54 Read   remote

This command is used to read out files from the PTC mailbox. The remote controlled reading of files may be broken off with a change-over. If Read is used by the SYSOP in the connected condition, then this does NOT cause a transmission of the chosen file (see 5.6.59 Send).

Examples:

R	Reads message no 1 in the current directory (if only 1 message exists). Outputs the contents of the current directory if more than 1 message exists.
R 3	Reads message no 3 in the current directory.
R 3-6	Reads messages numbers 3 to 6 in the current directory.
R DL2FAK	Reads message no 1 for DL2FAK if only one message exists. Outputs the contents of the DL2FAK directory if more than one message exists.
R DL2FAK 1-3	Reads messages numbers 1 to 3 for DL2FAK.
R TEST 3	Reads message number 3 in the TEST directory.
R PTCPLUS 4-	Reads from message number 4 onwards in the PTCPLUS directory.

5.6.55 RELOad

ATTENTION: RELOad overwrites the present BBS contents!!

RELOad enables a BBS backup file to be read back into the BBS. After the RELOad command, the PTC awaits a valid BACKup file. As soon as the PTC receives a correct header ('###PTCBAK'), it begins to load the BBS files. The RELOad procedure is prematurely aborted if the fileheader is faulty or if the file is too large for the PTC RAM fitted (if for instance a 256k-BBS file is loaded into a 32k PTC). At the end of the loading procedure, the PTC performs a checksum comparison, and then gives a message saying whether during the BAKup/RELOad procedure an error had occurred or not. The RELOad procedure can then be ended with a Plus character.

5.6.56 REMote

Default setting: 1

Parameter: 0   Remote control inhibited.
             1   Remote control enabled.

This command enables the access to the Remote control commands to be allowed or disallowed. With REMote 1 the remote commands are enabled. The opposite station can now use all the commands signified with **remote**. All such commands must, however, have the remote control characters // prefixing the commands (e.g. '//Write test' or '//Dir') if the Box command is set to '0' or '2' (see 5.6.10 Box). The data transparency is thus somewhat limited.

Multiple remote control commands are allowed. Each command must end with a <CR>. A single command does not need the <CR> to end it, if a CHO character immediately follows the command. System messages of the remote controlled PTC are transmitted in lower case, as this gives better Huffman compression, and a clearer display.

The Remote control access may be blocked with REMote 0.

5.6.57 RESEt   remote

Soft reset of the System. ATTENTION: This command may be used at any time and causes an uncontrolled disconnect while connected! The parameters entered and the PTC mailbox as well as the log are **not** deleted.

5.6.58 RESTart

Causes a complete re-initialization of the PTC!

ATTENTION: This command may be used at any time, and causes an uncontrolled disconnect while connected! Customized parameters are replaced by the defaults from the ROM, and the mailbox messages, as well as the log, are erased.

5.6.59 Send   remote

The Send command operates exactly the same as the Write command for remote operation (for compatibility with other mailbox systems).

The Send command, whilst connected, allows the SYSOP to send a file to the opposite station. All additional information concerning the file (File header, EOF text, path text) is suppressed, so that for example, station descriptions and other FIXTEXTs' may be received as per the original on the screen of the other station.

Send, in the disconnected condition, is identical to the Read command. Again here, all extra information (file header, EOF text, path text) is suppressed.

5.6.60 SFile

The SFile command (send file), works exactly as the Send command, except that the additional information (file header, EOF text, path text) is NOT suppressed. The SFile command is **not** available from the remote station.

5.6.61 SHow   remote

Default setting: None.

Parameter: A   (ALL) displays all parameters.
                  C   (CHARACTERS) displays all the control character settings.
                  P   (PARAMETERS) displays the system parameters.
                  B   (BUFFER) repeat of the last 2048 characters entered.

ATTENTION: SHow B is inhibited for Remote operation.

The SHow command without parameters displays the present link parameters. The slave response time is only shown if the PTC is acting as Master (i.e. the station that has initiated the QSO). The slave response time is defined as the time between the last send bit (bit end) and the start of the first receive bit. In CW terminal mode, the present CW receiving speed is displayed, instead of the link parameters. E.g. SH could show the following:

```
Number of RECEIVED packets / control-blocks:

TRAFFIC:    2 / 5
REQUEST:    0 / 0
ERROR:      0 / 0
MEMO-ARQ:   0 / 0


SLAVE RESPONSE TIME (MS): 58
```

The link parameters remain stored after the QRT, so that evaluation may be made after the QSO.

SHow C shows information on all the control character settings of the PTC. It is thus quick and easy to see if essential characters have been changed.

```
QRT-CHARACTER = ASCII: 4
ESCAPE-CHARACTER = ASCII: 27
CONTROL-CHARACTER = ASCII: 22
CHANGE-OVER-CHARACTER = ASCII: 25
BREAK-IN-CHARACTER = ASCII: 25
```

Show P displays the essential system parameters. The timing for the transceiver control and the parameters that influence the link quality are shown.

```
CS-DELAY: 5
TX-DELAY: 4
*** TIMEOUT-PARAMETER: 70
*** SPEED-DOWN-PARAMETER: 5
*** SPEED-UP-PARAMETER: 4
*** SPEED-UP-TRY-PARAMETER: 2
```

5.6.62 SQuelch

Default setting: 45

Parameter: X   0 - 100 Value for the RTTY squelch setting.

The trigger point for the software squelch (noise suppression) for Baudot RTTY can be set using the SQuelch command, with values between 0 to 100. With the value 0, the squelch is always open (noise-suppression turned off). With the value 100, on the other hand, the squelch is always closed (all signals suppressed). With a value of about 40, the squelch remains closed on a totally free channel, but is very sensitiv to changes in the signal spectrum on that channel. Even very weak and noisy RTTY signals should correctly open the squelch, when it is set to the standard value of 45. An open squelch is displayed on the PTC front panel by either the Idle or Traffic LED lighting (depending on the received RTTY signal).

5.6.63 STatus

The status word polling in the PTCplus is permanently turned on. The status command has only been retained out of compatibility reasons. Any argument is ignored.

This command facilitates polling of all operational states of the PTC via the serial interface. This is useful for mailbox systems, or more luxurious terminal programs.

The status byte is called by the RS character (ASCII decimal 30). This definition of the status request byte does not impose any restrictions on data transparency. PACTOR uses ASCII 30 (decimal) as the *idle byte* which can only be transmitted via a supervisor sequence.

The PTC's status reply always begins with an echo of the RS character (ASCII decimal 30), to facilitate unique identification of the status information following. The actual status byte follows this *header*.

This modular status level concept facilitates an expansion of the status information in the future, i.e., in a higher status level, even several bytes containing status information can be implemented. The status bytes (incl. header) are sent in direct sequence.

During the transmission of status information new status requests are ignored.

The status information is processed totally independent from the current XON/XOFF state of the serial interface.

Hints for programmers: Through the PACTOR software the status reply may be delayed by 150 ms. After a system boot (power on, RESTart, or RESET), the status polling is ready after the first `cmd:` prompt.

Construction of the status byte (status-level 1):

Bit	7	6	5	4	3	2	1	0
Meaning	1	MODE			D	STATUS		

Bit 7   always 1 to avoid control codes (XON/XOFF, etc.)

Bit 3   (DIRECTION bit) reflects the state of the SEND LED. This bit is 1 when the PTC is the packet sender.

The fields mode and status have the following meaning:

Bit 2	1	0	STATUS-Bits	Remark
0	0	0	ERROR	
0	0	1	REQUEST	
0	1	0	TRAFFIC	
0	1	1	IDLE	Idlebyte in packet, does not exclude traffic bytes in the packet!
1	0	0	OVER	The system is busy with a change-over. ERROR, REQUEST, TRAFFIC, and IDLE are ignored.
1	0	1	PHASE	AMTOR only.
1	1	0	SYNCH	Active immediately after first half of a selcall or the first 4 decoded PACTOR address bytes.
1	1	1	IGNORE	Status currently not defined (e.g. STBY.)

Bit 6	5	4	MODE-Bits	Remark
0	0	0	STANDBY	
0	0	1	AMTOR-ARQ	
0	1	0	PACTOR-ARQ	Active no more than 20 ms after the end of the SYNC sequence in the received SYNC packet, or for a MASTER start no later than the begin of the data packet.
0	1	1	AMTOR-FEC	
1	0	0	PACTOR-FEC	
1	0	1	RTTY / CW	
1	1	0	LISTEN	AMTOR or PACTOR.
1	1	1	Channel-Busy	RF channel busy.

When in the STBY condition, an occupied HF channel is indicated by a status value of 247 (Channel busy) being given over the serial interface. This feature is mainly for auto - forwarding operations. An optical output is also given, with the TRAFFIC LED lighting up when the channel is busy.

The Channel busy status is ONLY given in the STBY condition, and NOT in Listen mode (L=1)!

An occupied channel is defined as all signals that are audibly distinctly different from noise, but, however, having a speed < 250 Baud. Packet-Radio (300 Baud) is virtually ignored. Furthermore, strong carriers on the channel are NOT evaluated as Channel busy.

5.6.64 SYStest

ATTENTION: The system test is not normally required by the PTC user, but has been included here for the sake of completeness. SYStest, is purely a tool to diagnose and rectify faults in defective PTCs'. In normal operation, this function is not needed. It is strongly advised not to try to re-adjust the demodulator filter, as the filter is adjusted for optimum results during manufacture.

SYStest starts the routine for the system test and the demodulator adjustment. It shows the following message:

```
PTC System Test Utility
-----------------------
```

```
(L)eds  (A)lign  (R)AM  (B)eep  (M)easure  (O)ffset  (P)TT  (F)SK  (Q)uit
```

The following possibilities are available for use:

(L)eds: All LEDs are activated for approximately 2 seconds.
(A)lign: Starts the converter adjustment routine.
(R)AM: The amount of RAM expansion is measured and the number of RAM
              bytes displayed.
(B)eep: The buzzer of the PTC is activated for approximately 2 seconds.
(M)easure: The measured value of the ADC is displayed at half-second intervals. End
              with (Q)uit.
(O)ffset: Displays the converters zero value (Offset).
(P)TT: Toggles the PTT line with <CR>. End with (Q)uit.
(F)SK: Toggles the FSK output with <CR>. End with (Q)uit.
(Q)uit: Leave SYStest.

The converter adjustment routine enables the converter filter to be re-tuned. This is, for example, required if a filter bank is to re-adjust to for the 800/600 Hz CW tones. The adjustment routine announces itself with:

```
Demodulator Filter Alignment Utility
------------------------------------
TRX cable must be disconnected...


(H)igh (L)ow (C)W Tones?  - press Q to quit
```

The meanings are:

(H)igh tones: Tune the High tone filter to 2300/2100 Hz.
(L)ow tones: Tune the Low tone filter to 1400/1200 Hz.
(C)W tones: Tune either the Low tone or the High tone filter to 800/600 Hz

To tune up the CW tone it is necessary to input which filter bank is required to be tuned to the CW tones.

```
CW Tones:
(H)igh (L)ow Tones filter bank? - or (Q)uit
```

The tune up is done by trimming the requisite potentiometer for the maximum value (given on the screen). Normally, the maximum value lies between approximately 170 to 180.

5.6.65 Term

Default setting: 0

Parameter: 0   Simple terminal mode.
            1   Terminal mode with delayed echo.
            2   Same as (1) but with splitscreen.
            3   Enhanced splitscreen.
            4   Splitscreen with command prompt recognition.

With this command it is possible to make the PTC support splitscreen terminals.

- In simple terminal mode text is not sent to the terminal when the PTC receives commands from the user. The textstream is interrupted by the first command given to the PTC. At maximum 2000 characters are stored. The terminal must have local echo (halfduplex).

- Terminal mode 1 is for use with simple splitscreen terminals. The incoming text, and the text to be sent out, should be displayed in separate windows on the screen. All transmitted characters are echoed by the PTC, as soon as they are correctly received by the station the PTC is connected to (delayed echo).

- In terminal mode 2 the PTC completely controls the switchover between the two windows on the screen. In one window the system information of the PTC and the text to be transmitted appears. The other window shows the received text and the delayed echo-text. The PTC sends CTRL-A as a changeover character to the TX/information window and CTRL-B as a changeover character for RX/delayed echo window. The windows should be scrollable independently.

- Mode 3 arranges the delayed echo to be signaled by a CTRL-C, not a CTRL-B, as is in mode 2. The normal RX text is still signaled by a CTRL-B. This convention makes it possible to divide the screen into three parts. One part for system information and TX text, the second part for RX text and the third part for delayed echo text.

- Mode 4 differs from TERM 3 in that the PTCplus sends a CTRL-D before every command prompt. TERM 4 considerably eases the terminal programming, in that the continuous search for prompts ("cmd", "**-A-**", etc) is no longer required. Also, the PTCplus always sends a pseudo prompt when the command interpreter is closed again (on Connect, on switching to the CW or RTTY modes, etc.). This contains only a <CTRL-D>, followed by a <CR>, thus complete control over the (command) input window is maintained, and there is no ambiguity concerning the <CR> sent from the PTC. It is recommended that the <CR> from the keyboard, signalling the end of a command, is not shown as local echo in the input window, but just ignored. This minimises unneccessary empty lines in the input window.

The TERM command is valid for PACTOR and AMTOR simultaneously.

5.6.66 TIme   remote

Default setting: none

Parameter: HH:MM:SS   Desired time.

Arguments are ignored during remote control.

TIme is used to set or read the internal clock. If TIme is entered without a parameter, the current time is displayed. When the clock is set, leading zeroes must not be omitted. The colons can be omitted.

Example: TI 09:56:05 or TI 095605.

5.6.67 TOnes

Default setting: 0

Parameter: 0   Low tones (1200/1400 Hz).
                    1   High tones (2300/2100 Hz).

TOnes switches the PTC between Low tone and High tone operation.

0   Low tones
   1400 Hz = Mark frequency.
   1200 Hz = Space frequency.
   If TR = 0 (default), then, in RTTY and AMTOR, the TRX must be switched to USB opera-
   tion.

1   High tones
   2100 Hz = Mark frequency.
   2300 Hz = Space frequency.
   If TR = 0 (default), then, in RTTY and AMTOR, the TRX must be switched to LSB or
   FSK (normally FSK operates on lower sideband).

5.6.68 TR

Default setting: 0

Parameter: 0   TX and RX shift normal.
             1   Only RX shift reverse.
             2   Only TX shift reverse.
             3   TX and RX shift reverse.

ATTENTION: Only valid for RTTY and AMTOR.

Inverts the TX and RX audio shift (mark and space tones).

5.6.69 TXDelay

Default setting: 4

Parameter: X   1 - 16 PTT delay in X • 5 msec.

Sets the TX keying delay (x times 5 msec). The TX keying delay (TXDelay) is the time be-
tween activating the PTT and the sending of the first data.

5.6.70 UMlauts

Default setting: 1

Parameter: 0   No umlaut in Huffman.
             1   German umlauts in Huffman.

With UMlauts, the umlaut convention (for German umlauts) for Huffman coding is activated
or de-activated. The coding table is described in the MOde command. Usually the activated
umlaut convention is used, as this considerably increases the transmission speed of German
plain language texts. The very often occurring umlaut is then being transmitted within a
Huffman packet.

Unfortunately, within the ranks of PTC clones, there is equipment that cannot convert the um-
laut (Multimode controller from the USA). In order to remain compatible with these systems,
the PTC allows the umlaut coding table to be turned off (UMlauts=0).

5.6.71 Unproto

Default setting: 1*2

Parameter: 1   Unproto Transmission with 100 Baud.
            2   Unproto Transmission with 200 Baud.
            *2 to 5   Number of Packet Repetitions.

This command allows the transmission of broadcasts (CQ calls etc.) without acknowledgment from the receiving station(s). An optional parameter sets the baud rate and the number of repetitions of packets, in the transmission. This parameter can be set according to prevailing conditions.

Example: U *3 sets every packet to be repeated 3 times. Now, with the command U 2, a 200 baud transmission can be started.

The Unproto mode may be terminated with a QRT character, a Disconnect or DD.

A repetition rate of 3 does not mean that the text appears on the screen of the receiving station 3 times. In this case, the PTC increases the redundancy of the signal by repeating it. The transmission takes longer, but there is a correspondingly greater chance of receiving it correctly. At the receiving station, once a packet is correctly received, it will not be received again. A data packet may be repeated 3 times, but will only appear once at the receiving station(s). It is recommended that the repetition rate should be adjusted according to propagation conditions. A greater repetition rate, and lower baud rate, for poor conditions, and conversely a lower repetition rate, and higher baud rate, for better conditions.

5.6.72 USOs (Unshift On Space)

Default: 0

Parameter: 0   Unshift on space disabled.
            1   Unshift on space enabled.

Has effect only on RTTY reception. With USOs switched on, every received space character sets the Letter/Figures shift to Letters. This has the advantage that the manual shift switching (CTRL-B) required with weak or noisy signals, (to mitigate the figures printed due to a false Figures shift being received, or Letters shift being missed) can be virtually dispensed with. The long strings of numbers often recieved from DX stations, instead of the actual text, is now virtually a thing of the past. (Early dedicated RTTY microprocessor systems have sometimes included this feature). A problem can however occur with a switched on USOs, when a string of figures are received with only a space character in between, and the transmitting station fails to send a new Figures-shift after the space, to denote that the next character(s) are figures.

5.6.73 VERify

This is identical to the RELOad command, except the BBS file is NOT loaded into the PTC. The checksum is calculated instead so as to check the file integrity, without destroying the BBS contents.

5.6.74 Version   **remote**

Shows a short version and copyright message:

```
PTCplus System / written by H.-P. Helfert (DL6MAA)
Version P.1.11  (C) 1993/94  SCS GmbH - Germany
```

5.6.75 Write   **remote**

Enables files to be sent to the PTC mailbox. The end of the file is indicated, in the case of direct input from the terminal, by an ESCAPE-Character (see 5.6.30 ESCchr). In the case of a remote station sending a file via PACTOR to the mailbox, the end is indicated either by a change-over, <CTRL-Z>, or NNNN. In AMTOR, the end of the file is indicated by the change-over (+?), or NNNN. An ESCAPE character from the SYSOP breaks off the remote controlled file input. The remote control sequence '//' may be contained within files, as, during the file input, the sequence has no meaning.

The Write command may also contain two parameters: Write filename [Title]. The filename is essential for mailbox operation. The filename is the name of the subdirectory in which the message will be stored. If this is missing, then the PTC reacts with a message: `*** missing filename`. The message can additionally be given a title. The title is not necessary, and can be left out. The length of the title should not exceed 32 characters. Contrary to most Packet-Radio mailboxes, the title is not automatically requested.

Examples:

W DL3FCJ	Stores a message for DL3FCJ (without a title).
W DL1ZAM Board Layout	Stores a message for DL1ZAM entitled 'Board Layout'.
W DL6MAA This is a test	Stores a message for DL6MAA entitled 'This is a test'.

6 Circuit Description

6.1 The Processor section

The processor section of the PTC is based on a 68000 processor, together with the respective peripheries. A Motorola MC68EC000 (U1) clocked at 14.7456 MHz and using 8 bits, together with a 68HC901 (U2), a multi-function peripheral (MFP) IC form the core of the PTCplus. The firmware is contained in a 64 kByte CMOS-EPROM type 27C512 (U3), which provides enough free space for future extensions. Various RAM sizes are possible varying from 32 to 256 kBytes, depending on the kind and number of chips used. Two 32 pin DIL sockets are provided, only one of which is used in case of the smallest possible RAM size. The PTCplus automatically detects the RAM size during the power up procedure, thus there is no need for any additional configuration by the user.
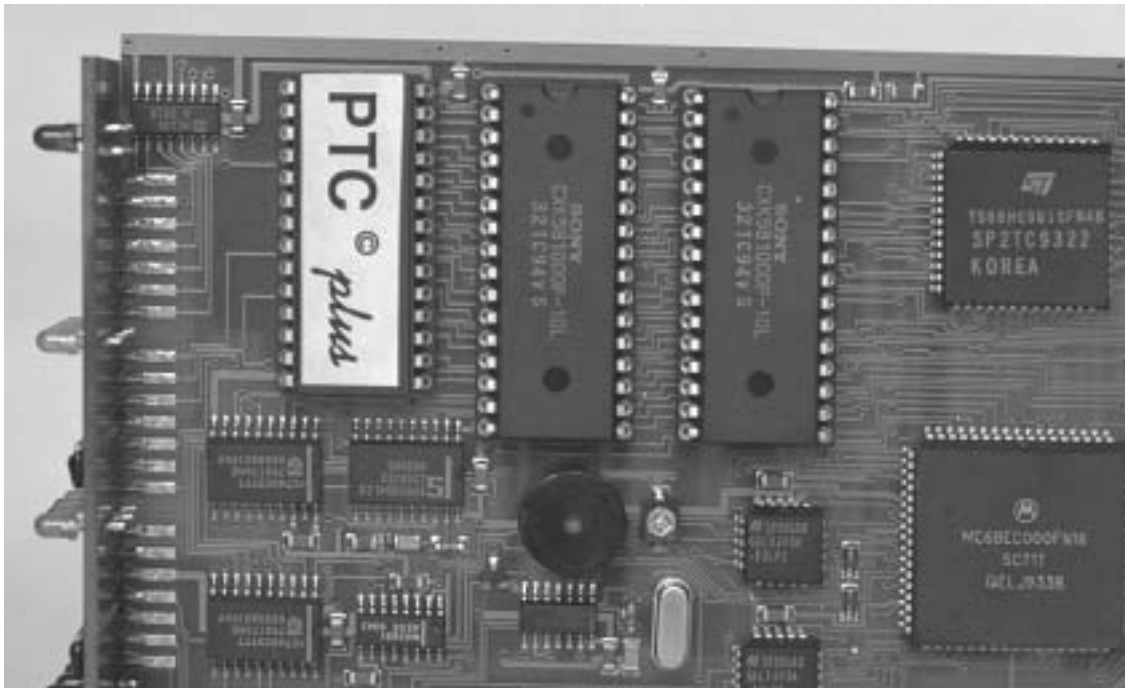
Figure 11: Processor, RAM and EPROM.

Two 16V8 type GALs (U6 and U7) are used for the address decoding and the clock preparation for the MFP. U8 is the real time clock. Reset, watchdog function and backup battery power management of the lithium cell are done with a MAX691A (U9) chip.

As interface to the host computer a MAX232A (U15) is used. All I/Os are filtered by EMI suppressor filters to decrease electromagnetic interference with the receiver as well as susceptibility against electromagnetic fields, produced by all radio transmitting equipment. If the computer serial interface chip should become damaged, it can easily be exchanged as it is inserted in a socket. A 9 pin Sub-D socket is used as the terminal connector. This enables enough space to be available for other useful controls on the rear panel. There are no internal jumpers used in the PTCplus. All adjustments may be done from outside. The baud rate to the terminal is set using a rotary switch on the rear panel, and can be between 300 and 38400 Baud. The panel is printed, so it is no problem to find the correct controls or settings.

6.2 The analogue section

The analog input, filter and demodulator section is, in its major parts adopted from the previous Z80-PTC because it has proven to work very well. In comparison with an ideal FSK de-

modulator programmed on a DSP, the conventional hardware shows no significant difference when working on the air. For this reason an expensive DSP has not been used in the PTCplus.

The input forms a 6th order high pass filter, with a cut-off frequency of 1 kHz, using U19. This is followed by an 8th order low pass filter using a switched capacitor filter chip (U18), which together form a steep sided band pass characteristic. U18 also contains an extra OP-AMP which is used as a limiter, and is followed by the actual discriminator filters (U20A/U20B). The demodulated signal passes through another 4th order low pass filter (U20C/U20D) before it reaches the analogue digital converter (U10). This filter is calculated for a 200 baud data-rate for optimum immunity to interference.
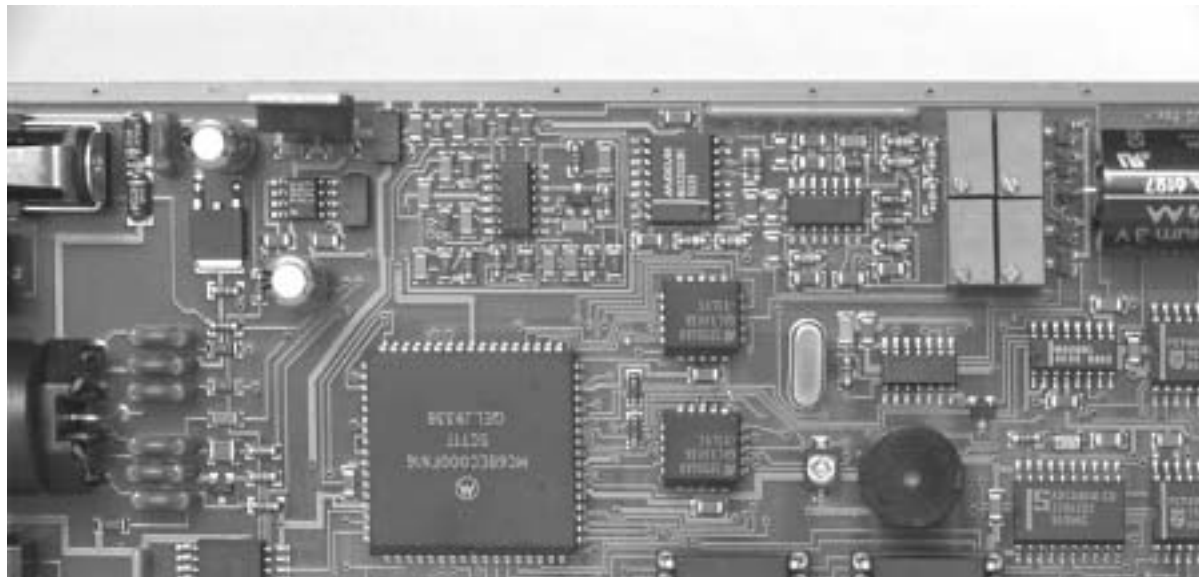
Figure 12: The analogue section.

The switching between high and low tones is done via a software command. To make this possible, two sets of trimmers are used, switched by V-MOS-FETs. Switching between high and low tones therefore requires no further adjustments.

The AFSK tone frequency is produced by the MFP as a square wave. This is now passed through the 8th order switched capacitor filter, which was originally intended only for receive. This filter now cuts off all harmonics of the AFSK tones, and a pure sine wave AFSK is passed on to the transmitter. The AFSK level is adjustable by means of a potentiometer on the rear panel (P5). It is thus absolutely unnecessary to open the PTC for adjustments.

The RX section of the PTCplus is muted by the V-MOS-FET Q2 while transmitting in order to prevent any receiver noise from being fed through and transmitted as well. It is probable that not many transceivers are absolutely silent on their AF output while transmitting. When using a separate receiver and transmitter the muting is essential and has to be done anyway.

FSK operation is of course also supported. Due to the use of an 8 pin DIN socket, the AFSK and the FSK signals are simultaneously available for use, so that nothing needs to be linked or jumpered. As with the RS232 connector, all pins of the 8 pin DIN socket are also filtered with EMI suppressor filters.

6.3 The Power supply

The PTC requires 9 to 20 Volt DC. Current consumption is only approximately 200 mA, despite of the more than doubled processor clock frequency. The supply voltage may be connected to the separate DC connector at the rear panel, or fed into the transceiver connector. This allows the PTCplus to be supplied from the transceiver with only one cable between

transceiver and the unit itself, thus minimizing cabeling and decreasing the chance of constructing groundloops. Both supply inputs are filtered and protected against reverse polarity.

Real time clock, mailbox, logbook and all user settings are as previously mentioned, naturally backed up with a lithium cell.

6.4 The PTCplus construction

The PCB is constructed using thin track technology and the underside of the board contains large ground areas to make clear the trend towards better interference immunity. The components are almost all surface mounted, and the processor, MFP as well as the GALs are in square PLCC packages. Only the RAMs, EPROM and the interface chip MAX232A still have sockets to provide the capability of future hard and software upgrades and of an easy exchange in case of a damaged chip. All transistors are V-MOS-FETs. The PTT line is switched by an especially robust type.
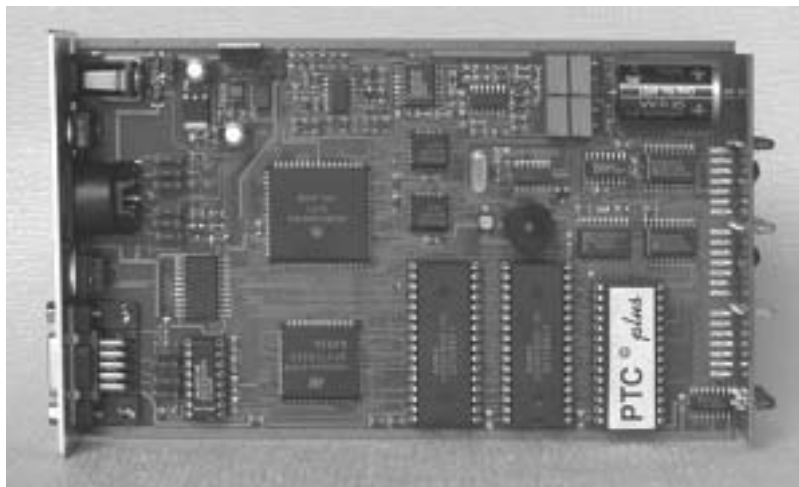
Figure 13: The whole PTCplus board.

The enthusiastic home constructor will no doubt have tearfully noted, that building it yourself is unfortunately no longer possible. The components are sometimes so small, that 100 of them would fit in a thimble!

7 Technical Data

AF input impedance:	27 kΩ
AF input level:	100 mV - 2V
AF output impedance:	1 kΩ
AF output level:	max 1.2V (open circuit)
Filter:	6th order high pass. 1 kHZ cutoff freq.
	8th order low pass, switched capacitor
	Cutoff freq. low tones 1536 Hz
	Cutoff freq. high tones 2457.6 Hz
FSK output:	TTL level
	High - mark, Low - space.
Serial interface:	9 pin Sub-D socket (AT type)
	300 - 38400 Baud
ROM:	64 kByte
RAM:	Max. 256 kByte
	Expandable in 4 steps (32k, 64k, 128k, 256k)
Processor:	Motorola MC68EC000 32 bit CPU
	Clocked at 14.4756 MHz
Front panel:	Labeled
	A total of 20 LED's, separated into 4 functional groups.
Rear panel:	Labeled
	Power supply input socket
	AF output level control
	Socket for transceiver connection
	Switch for serial interface baud rate
	Socket for serial interface connector
Power supplies:	+9 to +20V DC, 250 mA max.
	Reverse polarity protected
Dimensions:	Width 104 x Height 41 x Depth 165 mm
Weight:	450 g
Operating temperature:	-20 to +50 deg. C

8 Connector pin-outs

Here is to be found the collected pin-outs for all three connectors used in the PTC. The views are from the back of the PTC.

8.1 The Power supply socket

The PTC can be powered from the coaxial low voltage socket, on the rear panel, where the center conductor is positive, the outer conductor being connected to ground. The center pin has a diameter of 2.1 mm. The socket is intended for a plug with an outside diameter of 5.5 mm.

8.2 The 8 pole DIN socket

The 8 pole DIN socket is connected as follows (looking at the back of the PTC):
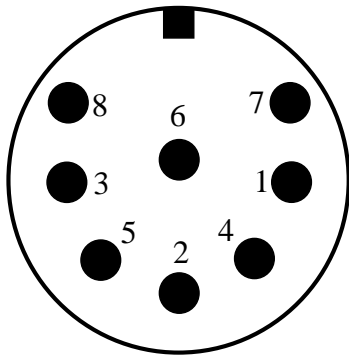
Figure 14: Radio connector.

Pin 1: AFSK output from PTC to transmitter.

Pin 2: Ground.

Pin 3: PTT output. (to transmitter PTT line)

Pin 4: AUDIO from receiver to PTC (from L/S or appropriate AUX/ACC socket).

Pin 5: Optional power supply input.

Pin 6: ABST 2 (output for an external tuning indicator).

Pin 7: FSK output from PTC to transmitter.

Pin 8: ABST 1 (output for an external tuning indicator).

Important note: In some countries (e.g. the USA) two different kinds of 8 pole DIN plugs are available, which appear almost identical. However only one of them fits into the socket properly. The other type has thicker pins and a wider spacing between the upper two pins!

8.3 The 9 pole SUB-D socket
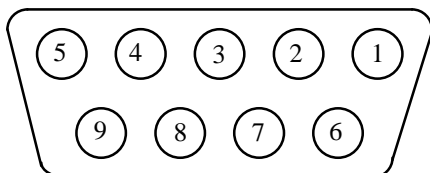
Figure 15: Serial connector.

Pin 1: Output connected (DCD).

Pin 2: TxD - Output transmit data.

Pin 3: RxD - Input receive data.

Pin 4: not connected.

Pin 5: Ground (GND).

Pin 6: not connected.

Pin 7: Input, no function.

Pin 8: not connected.

9 System and Error-Messages

*** COMMAND LOCKED!
Command is unavailable due to the Lock-Command.

*** COMMAND ONLY AVAILABLE ON AMTOR AND RTTY
The command is only useful in AMTOR or RTTY modes (e.g. TR).

*** PLEASE ENTER YOUR CALLSIGN FIRST: USE MYCALL COMMAND
MYCALL contains no valid callsign (*SCSPTC*).

ERROR: Checksum NOT OK
An error has been discovered in the EPROM. The EPROM checksum is wrong.

*** ERROR: INVALID FILE HEADER
The backup file does not conform to the specification.

*** ERROR: INVALID RAM SIZE
RAM size is not large enough to contain the backup file (e.g. backup of a 128k PTC in a 32k PTC).

PLEASE DO NOT USE //-JUST TYPE: YOUR COMMAND FOLLOWED BY (CR).
The PTC is in Box mode and a // remote control sequence was input.

*** TRANSMITTING CW-IDENTIFICATION
The PTC is sending out its CW ident.

*** SYSTEM BUSY
Multiple access to the mailbox by the SYSOP and the remote user which is not allowed.

*** CLR
Transmit buffer erased.

YOU ARE NOT LOGGED IN YET-USE: LOGIN URCALL
In AMTOR, the PTC mailbox access is only possible after a LOGIN.

ERROR: PACTOR PROVIDES AUTOMATIC LOGGING!
An automatic LOGIN is done in PACTOR, an extra LOGIN is not necessary.

*** ACCESS DENIED
Access refused e.g. erasing messages not input by and not addressed to you.

*** MISSING FILE NUMBER
The filenumber for a Read, Write or Delete is missing.

*** EOF
End of the message (End Of File).

*** BBS FULL - WARNING: FILE TRUNCATED
The PTC mailbox is full. Message not completely stored (end cut off).

*** FILE NOT FOUND
Message not found in the mailbox.

*** FILE EMPTY - NOT SAVED
Empty messages are not stored.

*** NO ENTRIES
No entries available (e.g. logbook after RESTart).

*** BBS EMPTY
The PTC mailbox contains no messages.

*** SUB-DIRECTORY EMPTY
The subdirectory contains no messages.

*** MISSING FILENAME
The filename for a Read, Write or Delete is missing.

*** BBS-MEMORY FULL
The PTC mailbox is full.

*** REMOTE REJECTED
The command not allowed for remote-control.

*** QRT IN PROGRESS - TEXTINPUT TERMINATED
The PTC is closing down the link (QRT Sequence). No further text input is accepted.

*** RTC ERROR DETECTED
An error has been found in the real time clock.

*** BAD ARGUMENT
False argument, or argument outside the allowed area.

*** ERROR: PSE TYPE HELP
False or incorrect command input.

10 Parts list

| QTY	Reference	Specification
1	BAT1	3V Lithium Battery
1	BZ1	Piezo Beeper
2	C1, C57	22 pF
3	C2,C10,C13	33 nF
1	C3	150 pF
7	C4,C5,C6,C12,C21,C22,C48	10 nF
28	C7,C8,C11,C19,C20,C29,C30,C31,C32,C33, C34,C35,C36,C37,C38,C39,C40,C41,C42, C43,C44,C45,C46,C52,C53,C15,C55,C56	47 nF
1	C9	3,3 nF
2	C14,C23	2,2 nF
8	C18,C24,C25,C26,C27,C28,C50,C51	100 nF
1	C16,C54	10 µF
2	C17,C49	100 µF
1	C47	220 nF
11	F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,F11	Murata EMI-Filter
4	P1,P2,P3,P4	200 Ω Potentiometer
1	P5	1 kΩ Potentiometer
1	Q1	XTAL 14,7456 MHz
7	Q2,Q3,Q4,Q5,Q6,Q7,Q8	2N7002
1	Q9	IRFR110
1	RP1	5*10 kΩ
2	RP4,RP5	5*10 kΩ
2	R1,R15	2,2 MΩ
4	R2,R32,R33,R21	10 kΩ
4	R3,R20,R29,R12	180 kΩ
2	R4,R28	6,8 kΩ
2	R9,R34	47 kΩ
3	R5,R6,R8	56 kΩ
2	R7,R16	15 kΩ
3	R10,R11,R23	27 kΩ
5	R17,R18,R22,R24,R25	3,3 kΩ
3	R14,R20,R26	270 Ω
3	R27,R19,R13	1 kΩ
2	R30,R31	39 kΩ
1	S1	BCD-Switch
1	TC1	2..45 pF Trimm C
1	U1	MC68EC000FN16
1	U2	TS68HC901FN8
1	U3	27C512-PTC+
2	U4,U5	62256 / 628128
1	U6	GAL16V8-15LVC
1	U7	GAL16V8-15LVC
1	U8	RTC72423A
1	U9	MAX691ACSE
1	U10	ADC0804LCWM
2	U11,U13	74HC377D
1	U12	74HC138D

1	U14	74HC00D
1	U15	MAX232ACPE
1	U16	ICL7660CBA
1	U17	µA7805
1	U18	MAX297CWE
2	U19,U20	TLC274CD
2	V2,V1	BYM10-400
2	V3,V4	BZV55C18V
6	V5,V6,V7,V8,V9,V10	LL103A
1	X1	DC-Socket
1	X2	8-POL-DIN41524
1	X3	9-Pol SUB-D female

11 Parts-Layout

D9 D10 D11 D12

RP3

D13 D14 D15 D16

RP2

D17 D18 D19 D20

D1 D2 D3 D4 D5 D6 D7 D8
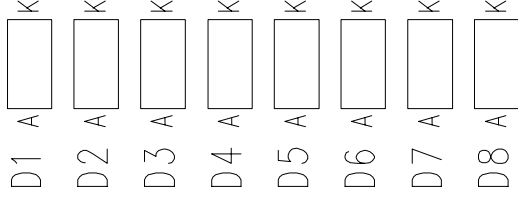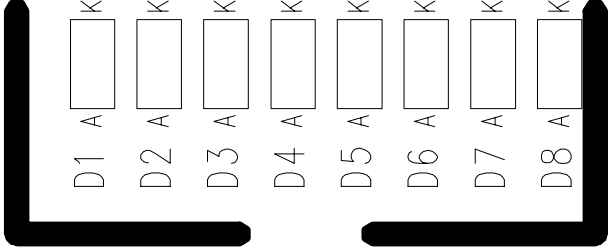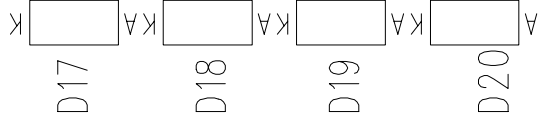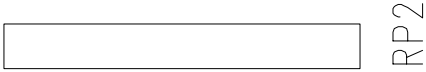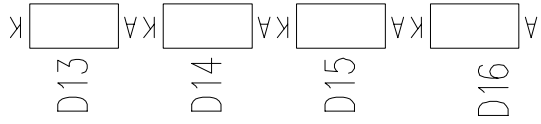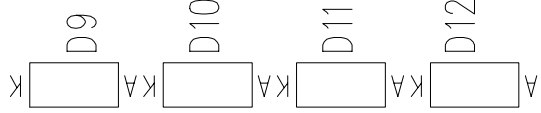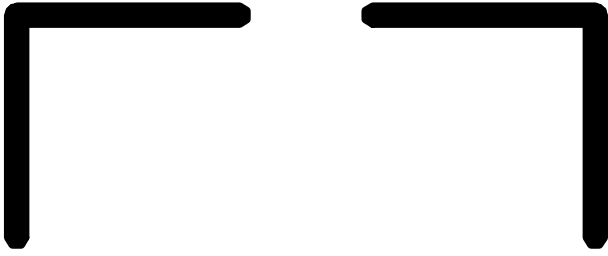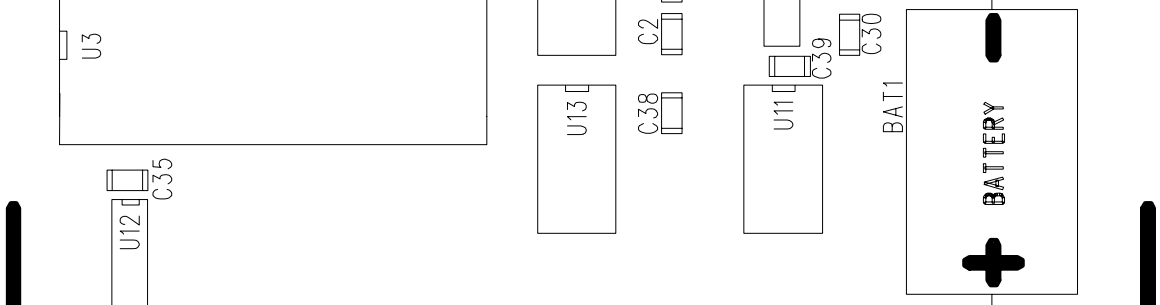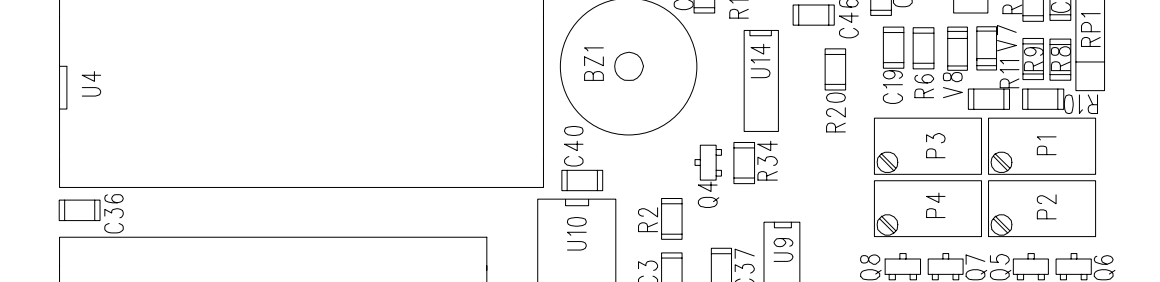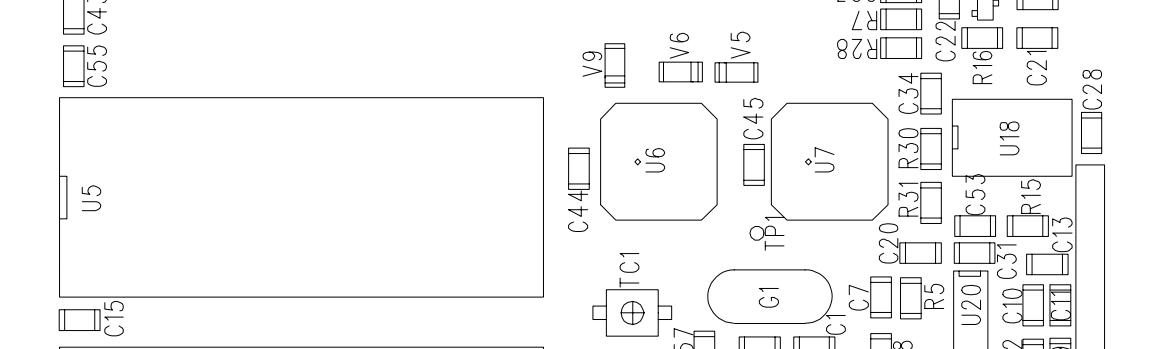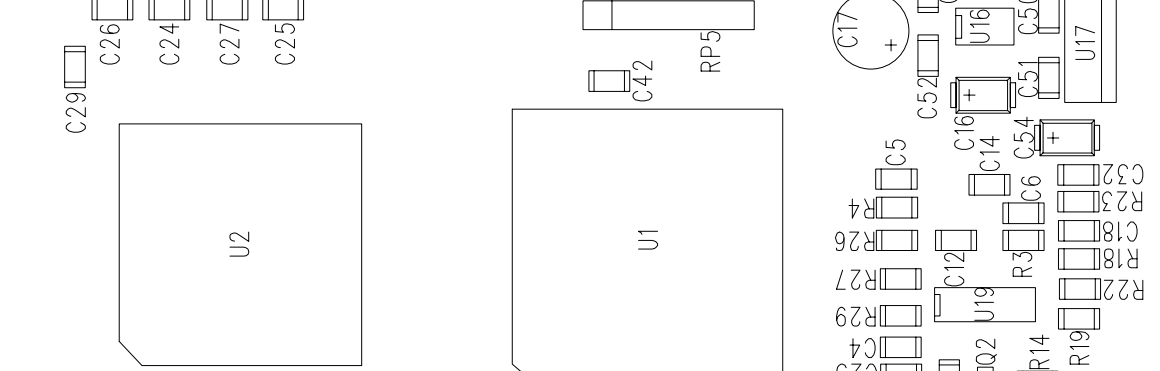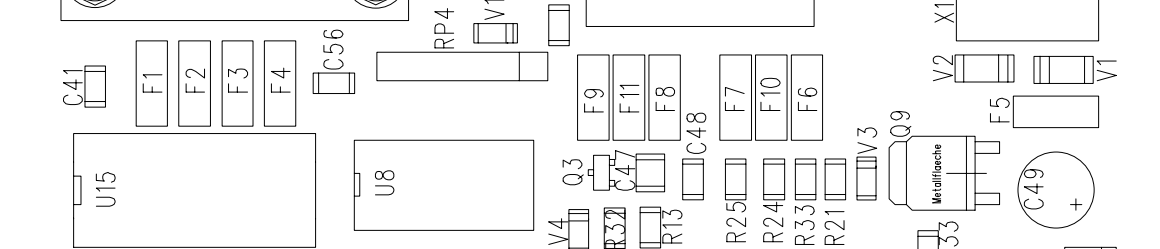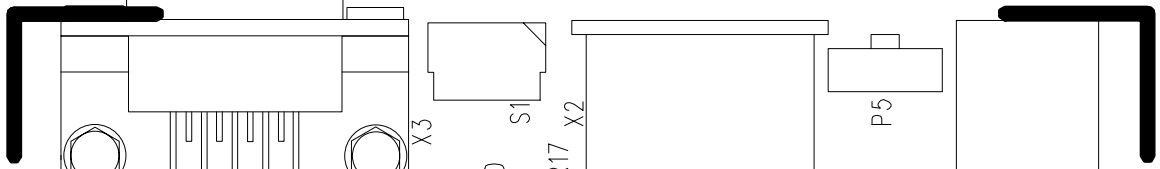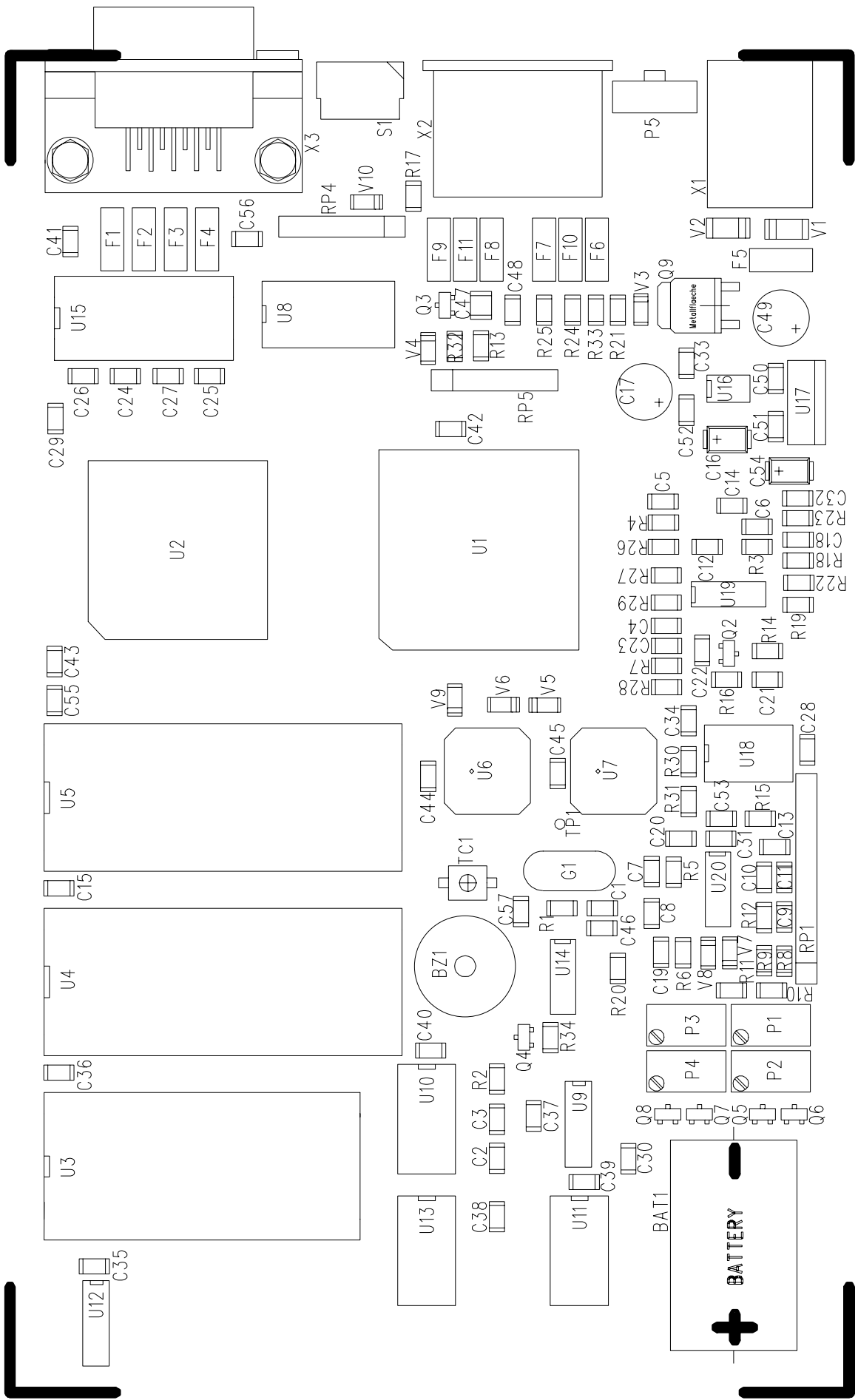
12 How it all began

Two German hams (Ulrich DF4KV and Hans-Peter DL6MAA) initiated the PACTOR project. As early as 1986, experiments with modified AMTOR protocols began. In tedious tests, the noise conditions on the HF-Bands were investigated, and the best transmission parameters were determined. Additionally, a lot of mathematical calculations were performed, and the PACTOR protocol deduced from these results.

The first PTC's were wire-wrapped on bread-boards. DL6MAA built his PTC based on a SMD Z80 single-chip processor, while DF4KV wire-wrapped his PTC in conventional Z80 technology.

The third station that got on the air in PACTOR was Tom (DL2FAK). His PTC was based on DL6MAA's SMD Z80 version. DL2FAK and DL6MAA ran a lot of tests that resulted in considerable improvements to PACTOR. In the fall of 1989 Tom developed a *PT-link* system that facilitated access to packet radio nets from PACTOR. Tom also took on the difficult task of a project manager to coordinate the various proposals, comments, and critiques that came pouring in from the ham community.

Since the SMD based PTC of DL6MAA was too difficult for home construction, and DF4KV's version contained too many parts, it was decided to develop a completely new hardware design.

DL3FCJ developed the digital section of this hardware, DL6MAA developing the modem, and carried out software adjustments. The software was rounded out with inclusion of an RTTY and AMTOR routine from DK4FV. DL1ZAM revised the circuit diagram and produced the printed-circuit-board layout, and so the well known PTC came about, and quickly covered the globe.

In 1993 the production of a component needed in the PTC, the Z80-STI, was ended. This was then the opportunity for the present PTC to be developed. The PTCplus, being based on the MC68000 processor, is the springboard to a totally new dimension in modern HF communications.

This handbook is built up from a collection of articles by DL1ZAM, DL6MAA and DK5FH. DL3FCJ collected the various parts together, improved and completed them, and made them suitable for use as a handbook. DJ0OW did the English translation and DJ0MCS the final draft. The handbook is written using Microsoft Word 6.0 for Windows and printed on an HP Laserjet 4m.

13 Problems ?!

If you have questions, problems, proposals, or comments relating to the PTC or PACTOR, please contact the following address.

SCS

Special Communications Systems GmbH
Röntgenstr. 36
D-63454 Hanau
Germany
Fax.: +49 6181 23368

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