

# ***V5.0 Supplement***

***TPS Version 5.0 Network***

V5.0 Supplement  
Issue: 1.01 16/03/97  
TPS Version 5.0 Network  
Copyright Micro SciTech Ltd. 1991-1998

Information in this document is subject to change without notice and does not represent a commitment on the part of Micro SciTech Ltd. The software described in this document is furnished under a licence agreement or nondisclosure agreement. The software may be used or copied only in accordance with the terms of the agreement. It is against the law to copy the software on any medium except as specifically allowed in the licence or nondisclosure agreement. No part of this manual may be reproduced or transmitted in any form or by means electronic or mechanical, including photocopying and recording, for any purpose without the express permission of Micro SciTech.

Copyright Micro SciTech Ltd., 1991-1998. All rights reserved.

TPS and TPS M4 is a trademark of Micro SciTech Ltd.

Windows, MS-DOS, Windows NT, Windows for Workgroups and Windows 95 are registered trademarks of Microsoft Corporation.

Pentium is a registered trademark of Intel Corporation.

This page is intentionally left blank.

1	About This Document.....	5
2	What's New in V5.0.....	6
3	Contents and Installation.....	8
	3.1 Making a setup disk from the zip file .....	8
	3.2 Before you install TPS.....	9
4	Upgrading to Version 5.0.....	10
	4.1 Display Pages .....	10
	4.2 System Pages 0 and 9999.....	11
5	Windows 3.1, NT/95 Compatibility Issues.....	12
	5.1 Display Pages Interchangeable across all Models .....	12
	5.2 NT/95 and 3.1 'Integer' Datatype and Format .....	12
	5.3 TPS for Windows NT/95 486DX and Pentiums Only.....	12
	5.4 TPS for Windows NT compatible with Windows 95 .....	12
	5.5 TPS for Windows NT and 95 Performance Differences .....	13
	5.6 TPS for Windows 95 TCPIP Network .....	13
6	New Features Detailed .....	14
	6.1 Enlarged and Variable Window Size.....	14
	6.2 Standard Display and Sample Pages .....	16
	6.3 Online Configuration of Backup Time Period.....	19
	6.4 Automated Display Page Backup .....	19
	6.5 Extra files present .....	20
	6.6 All text files '.TXT' now viewable with Windows Notepad .....	21
	6.7 Settings Save.....	22
	6.8 Bi-directional Serial I/O .....	24
	6.9 Enhanced Serial I/O and Recording .....	25
	6.10 Printing.....	28
	6.11 Menu Modifications .....	29
	6.12 Intelligent Online Configuration .....	29
	6.13 Copy From Revised .....	29
	6.14 Copying View-ports .....	30
	6.15 Super Commutation .....	31
	6.16 Sub Commutation .....	31
	6.17 Super-Commutation of a Sub-commutated Parameter .....	31
	6.18 Single-Sampled Parameters.....	31
	6.19 Multiple Packet Streams - Sync. Handling .....	31
	6.20 Step-mode Handling Modified .....	32
	6.21 Page Changing and Alarms, Record, Filters .....	32
	6.22 Test Data packet generation rate.....	32
	6.23 Maximum no. of view-ports increased from 256 to 1024.....	32
	6.24 Auto-tune replaced by Over-clocking.....	32
	6.25 Over-clocking - 1KHz, 4KHz replay rates.....	33
	6.26 CCSDS Dialog Box .....	34
	6.27 CCSDS Transfer Frame Handling .....	35
	6.28 Installing TPS and TPS CCSDS .....	36
	6.29 System Display Message Bar.....	42
	6.30 TCPIP/UDP Ethernet Network.....	43
	6.31 Sample Averaging.....	44
	6.32 Offline Display Configuration.....	45

	6.33 Double clicking disallowed on an empty page.....	46
7	Known Limitations.....	47
	7.1 Dialog box hidden from view .....	47
	7.2 Cancelling Plot-ports edits.....	47
	7.3 Adding Plot-ports when max port allocation exceeded.....	47

## **1 About This Document**

This document describes all the new features incorporated into TPS V5.0 Network since the release of V4.0. This document includes information on all releases covering V4.01, V4.1 and V5.0.

This is the only printed documentation describing, in detail, the new features in V5.0.

The TPS Online Help has been fully updated to include all information supplied herein. The Online Help is fully integrated and, rather than treat V5.0 as a separate supplement, it gives all information as would be expected for a complete TPS V5.0 Manual.

## 2 What's New in V5.0

**Ethernet networking:** TPS Version 5.0 is the very latest release of TPS since Version 4.1 and features TCP/IP/UDP ethernet networking enabling TPS to exchange data at megabit rates between global Internet sites or local area networks (also called 'Intranets').

The networking capability is only available for on the 32-bit TPS for Windows 95/NT model. Although the TPS for Windows 3.1 has been upgraded to include all other V5.0 modifications and fixes, it does not come with TCP/IP/UDP networking.

**4KHz TPS for Windows NT operation** - TPS for Windows NT can perform all operations at up to 4KHz enabling packet processing rates of up to 4000 packets/second. When running under Windows 95, the same NT model will only run to 1KHz operation as for Windows 3.1.

**Sample Averaging** - TPS can average parameters over a sliding window of up to 65536 previous samples.

### V4.1 Features

In addition to the new V5.0 capabilities, the following major features were added to V4.1 and are present in V5.0.

**TPS for Windows 95** - The true 32-bit TPS for Windows NT model is now 100% compatible with Windows 95 - they are one and the same model.

**1KHz TPS for Windows 3.1 operation** TPS for Windows 3.1 can perform now all operations at up to 1KHz enabling packet processing rates of up to 1000 packets/second.

**Enlarged and variable display window** - The maximum TPS display area has been quadrupled and can be varied in size up to a virtual screen size of 1280 \* 960 pixels. Thus, four pages can now be stored on what was a single page. Scroll bars have been added to view the virtual display on lower resolution monitors.

**Super/sub-commutation** - Multiple occurrences of the same parameter in a packet (super-commutation) and sub-multiples of a parameter not appearing in every packet (sub-commutation) can now be displayed, plotted, recorded etc. as for a standard single sampled parameter.

**Enhanced serial I/O and recording** - Online configuration of the file flush period, timeout period, serial I/O and record buffer sizes, plus a host of internal modifications, now enables high performance, serial data receive and logging of incoming data.

**ALL settings saved** - This includes alarm limits, parameter recording settings etc. Once setup, you no longer need to configure such things as alarms every time TPS is started.

**Bi-directional serial I/O** - A serial port can now be open for either Input, output or both simultaneously; previously, separate ports had to be used for input and output.



**Quick file replay** - The file menu now shows the last four accessed files which can be instantly replayed by selecting them from the menu.

**Packet synchronisation filter** - This is a new switch allowing TPS to read multi packet streams without losing sync on unrecognised packets. It can thus ignore unwanted packet types in a mixed packet stream.

**CCSDS compliance** - Transfer frames, defined according to the CCSDS's 102.0-B-4 Packet TM standard and ESA's PSS-04-106, can be processed and the virtual channel packet data selectively stripped for processing by TPS.

**Automated Display Page backup** - Edits to the current display page are now automatically saved and can be restored in the event of a TPS or Windows crash.

These and many other new features are described in more detail further in this document.

### 3 Contents and Installation

This section is provided for existing TPS V4.0, 4.1 users. If you are new to TPS and have recently purchased V5.0, please see the 'Release Notes' Document for full details on Contents and Installation.

TPS V5.0 is provided as an upgrade to existing users either on a single 1.44Mb floppy disk or as a single zipped file from which a setup disk must be generated. The zip file is only sent when ftp'ing an upgrade.

The following files are usually ftp'd as a V5.0 upgrade to existing users:

W1650nn.ZIP	TPS for Windows 3.1 zipped setup disk
W3250nn.ZIP	TPS for Windows 95/NT zipped setup disk
S50nn.ZIP	Zipped samples disk, all Windows models
DOCS50nn.ZIP	V5.0 Documentation incl. this document
TW1650nn.ZIP	TPS for Windows 3.1 Toolkit disk
TW3250nn.ZIP	TPS for Windows 95/NT Toolkit disk

Where the last two letters 'nn' of each root filename form the TPS minor version number. For example, '1h' for the first commercial release of version 5.0.

#### 3.1 Making a setup disk from the zip file

To make a setup disk, using either W1650nn.ZIP or W3250nn.ZIP, you must first unzip it and proceed as follows:

1. copy the zip file W3250nn.ZIP (or W1650nn.ZIP) and PKUNZIP.EXE to a temporary empty directory on your hard disk

2. unzip the contents

```
pkunzip w3250nn.zip
```

3. delete the zip file and unzip program from the temporary directory

```
del w3250nn.zip  
del pkunzip.exe
```

4. copy the entire temporary directory contents to a clean 1.44Mb floppy disk. This disk setup disk.

### **3.2 Before you install TPS...**

In case you encounter later problems, DO NOT DELETE YOUR OLDER TPS M4 INSTALLATION but install this V5.0 to a new directory.

Always make a backup of your existing installation just in case!

Display pages can be ported from your existing TPS installation by recompilation using the version 5.0 page compiler PGCKW.EXE (installed to the TPS directory upon setup). Notes for porting display pages are given in a following section.

**Please see the Release Notes for full installation details.**

Once setup is complete, proceed to the next section to convert your pages to V5.0.

## 4 Upgrading to Version 5.0

Please read this section if you are upgrading to TPS version 5.0.

### 4.1 Display Pages

You will need to port your display pages if you fit any of the following criteria:

Using a TPS for Windows 95/NT version **OLDER** than the V5.0 test version **V5.01e**, i.e V5.01d, V4.1, V4.0 etc

Using TPS for Windows 3.1, any version.

Although V5.0 display pages are not directly compatible with previous TPS versions you can easily port your existing pages by re-compiling them using the, as supplied, page compiler PGCKW (do not use any older copies of PGCKW). Because the TPS development model is supplied as a complete setup disk, the pre-supplied pages (0, 10-14, 9998 and 9999) have already been converted and, thus, you only have to recompile pages you, yourself, have developed.

DO NOT RECOMPILE THE PAGES 0, 10-14, 9998, 9999 (1)

(1) Page 9999 may be recompiled, see the next sub-section.

V5.0 has new pages 0, 10-14 and 9998. As you will have invariably changed the system settings, namely the packet format, serial port configuration or system colors, you will have to re-do the changes online. If you have changed the parameter record 'tag' on page 0, you will have to do this offline after doing your online system configuration. See the 'PGCKW and Offline Configuration' document or the online help - search for the keyword 'tag'.

To port your own developed pages, follow these instructions:

1. Copy your page files (PAGEnnnn.TXT where nnnn = page number) from your old directory to your new V5.0 directory.

e.g.

```
copy c:\tpsm4\pagennnn.txt c:\tpsv5
```

2. Run the TPS page compiler PGCKW by selecting the Windows 95/NT4 Start, Run menu command or the Windows 3.1/NT3/.51 program manager File, Run menu command and entering C:\TPSV5\PGCKW.EXE.

3. From within PGCKW, select the File, Compile menu item

4. Enter the page number to compile when the dialog box appears. PGCKW will then compile the page. PGCKW will report a successful compilation in the PGCKW window; if there are any red error messages, please contact Technical Support.

5. Do this for every page you have added or modified.

**If you have problems:**

PGCKW will generate a blue-line warning message for non-serious problems and a red-line error message for serious problems. Blue warning messages will still allow you to view the page using TPS but red error messages will not.

TPS V5.0 has been developed to be backwardly compatible so that all pages that compiled on earlier versions, without errors or warnings, will compile similarly with V5.0.

For blue warning messages, study the message, it may be sufficiently self-explanatory such that you can rectify the problem online when viewing the page.

For red error messages, make a note of the error and contact contact Technical Support. Alternatively, send contact Technical Support the text page file PAGEnnnn.TXT (where nnnn = page number) and we will try and resolve the problem for you.

**4.2 System Pages 0 and 9999****Page 0**

When you install TPS, because page 0 contains the following system settings, you will have to reconfigure these settings online:

- Packet format
- Serial com port settings
- Background/foreground colors

Please do not copy your old page 0 to your new installation as page 0 has been modified quite extensively.

**Page 0 tag parameter**

If you have changed the parameter recording tag parameter, defined on page 0 and can only be configured offline, you will have to re-do the change offline. This is described in the online help - search for the keyword 'tag'.

**Page 9999**

As of V4.1, users were given the freedom to offline modify the system page 9999 for the purpose of configuring view-ports to appear on every page.

Additionally, you can move existing system view-ports online by the usual method for moving a view-port. You can also offline configure their attributes such as color etc. This is documented separately in the document 'PGCKW and Offline Configuration' supplied electronically on the Documentation Disk.

If you made any such changes above, to page 9999, then you may copy your older page 9999 file, PAGE9999.TXT, and recompile this.

## **5 Windows 3.1, NT/95 Compatibility Issues**

Only TPS for Windows 95/NT supports version 5.0's TCP/IP/UDP ethernet networking, TPS for Windows 3.1 does not. Otherwise, the visual appearance and functionality of all TPS for Windows models is the same and they only differ in their internal architecture. The Windows 3.1 model is a '16-bit' model built for any Intel 386 compatible processor or higher, i.e. 486 and Pentium. The Windows 95/NT version is a true 32-bit model optimised for the Windows 95 and Windows NT operating system running on any Intel compatible 486 or Pentium processor.

### **5.1 Display Pages Interchangeable across all Models**

Display pages are compatible across ALL Windows models, i.e. display pages generated using the TPS for Windows 3.1 model can be directly viewed with the TPS for Windows NT/95 model without re-compilation.

As a consequence of page compatibility, a separate samples disk is not supplied for each model.

### **5.2 NT/95 and 3.1 'Integer' Datatype and Format**

Although pages are compatible across ALL Windows platforms 3.1/NT/95, if you have configured your display pages using 3.1 and are now converting to NT or 3.5, you may (only may) have integer data-type incompatibilities.

Integers on Windows 3.1 platforms are 2 bytes long whereas they are 4 bytes long on the NT/95 platforms. Since TPS internally stores the view-port 'Datatype' and display 'Format' (see the view-port settings dialog box), as a byte length and not simply the ambiguous term 'integer', there should be no problem - please be aware of this if your view-ports suddenly start to show large, i.e. 32-bit numbers instead of 16-bit.

### **5.3 TPS for Windows NT/95 486DX and Pentiums Only**

As of V4.1, the TPS for Windows NT/95 model is only compatible with an Intel compatible 486DX processor (not 486SX) or higher, i.e. a Pentium or compatible. V4.0 could run on a 386 but this has now been scrapped. Note, the Windows 3.1 model can still run on any Intel 386 processor.

### **5.4 TPS for Windows NT compatible with Windows 95**

TPS for Windows NT is now completely compatible with Windows 95 and can be run on Windows 95 with no modifications. This means that the TPS for Windows 95 is a true 32-bit version of TPS optimised for 486 and Pentium processors.

Windows NT users will be glad to know that NT and 95 compatibility was not achieved by any reduction in NT's capability.

## **5.5 TPS for Windows NT and 95 Performance Differences**

The behaviour of TPS when running under Windows 95 is slightly different to that when running under Windows NT. Notably, the performance under Windows 95 is inferior as Windows 95 retains some older Win 3.1 compatibility features. See section 6.25 on Over-clocking for more details.

When running TPS under Windows 3.1 or 95, the simultaneous receive and transmit (echo) of serial data can present a considerable interrupt load to the host Windows operating system with the result that TPS can appear to run very slow. Windows NT seems to handle serial I/O extremely smoothly and is the recommended platform for high performance TPS operations (not just serial I/O).

With over-clocking on, or simply running with a loop-time of less than approximately 5ms, you may find dialog boxes hidden out of view (you hear a beep but see no dialog box) - press the ALT key to recover the dialog box, i.e. bring it to the foreground. This is a known problem when running under Windows 3.1/95 on slow machines, see section 7 for more details.

## **5.6 TPS for Windows 95 TCPIP Network**

Whereas TCPIP is installed native to Windows NT, the default Windows 95 Operating system does not install TCPIP by default - you have to configure it. Please see your network administrator to check whether TCPIP is installed.

## **6 New Features Detailed**

### **6.1 Enlarged and Variable Window Size**

The maximum TPS display area has been quadrupled since V4.0 and can be varied in size up to a virtual screen size of 1280 \* 960 pixels (was 640 \* 480). Thus, four pages can now be stored on what was a single V4.0 page. Scroll bars have been added to view the virtual display on lower resolution monitors such as the standard 640 by 480 VGA.

When you first start TPS, it will size itself to fill the entire display, i.e. as for a window maximise operation. You can, at any time, re-size the window using the standard Windows sizing methods, i.e. dragging the border. The next time TPS loads, it will be sized according to its size when last terminated.

The default starting page 10 is markedly different from V4.0. Firstly, the colors have been changed and, more importantly, it comprises all the information on the old V4.0 pages 10-14. Use the scroll bars and the Home and End keys to have a quick look around the entire display. More information on page 10 is given in the next section.

When you quit TPS, the current displayed size will be used the next time TPS is restarted. TPS automatically saves this information without prompting - you do not need the display lock off to change the screen size, neither will you be prompted to save the size as a system setting when quitting TPS. Note, TPS does not save the current scroll position and always sets it back to the top left of the page when starting.

More details are given in the online help - search for the keywords 'Display Overview'.

### **Scrolling**

All standard Window's scroll bar operations have been implemented. TPS only refreshes the display at the end of the scroll operation (releasing the left mouse button) which is standard for all Windows scroll operations except when clicking and holding down the scroll bar arrow - TPS will not refresh the display until the mouse button is released. This is to avoid TPS continually refreshing the display at the Windows typematic rate.

Scrolling also works with the keyboard left, right, up and down arrow keys as for a standard windows application. The HOME and END keys are also operable. Note, the END key sets the window to the bottom left of the page (not bottom right).



**Maximum number of view-ports increased to 1024**

Because you can now fit more view-ports on a page, the allowed maximum number of view-ports has been increased from 256 (V4.0) to 1024 and TPS's memory tables have also been extended to cater for this increase.

**Moving the System Display View-ports Online**

Prior to V4.0, the system display could not be changed in any way online. This has now been slightly relaxed so that the system display ports can be re-positioned, i.e. moved using the standard drag and drop operations.

Because the system view-ports occupy rows 32 to 35 inclusive, they now appear to hang in the middle of the large physical screen instead of being at the true foot of the screen, i.e. rows 77 to 80. Thus, you may well wish to move them.

If you move a system view-port, it will stay at the new position when you change a page. You will not be prompted to save the page when changing to another page because moving a system view-port is considered a system change and only affects page 0 which is always visible. Thus, you save system view-port changes by saving the system settings either from the Options, System, Save menu item or when prompted upon exit of TPS.

Because TPS now automatically makes a backup of all changes, even if you quit and forget to save, you can retrieve the settings from the system backup page (PAGE0000.BAK), see the section 'Automated Backup'.

**Copying the System Display View-ports Online**

Not only can the system display be moved, each view-port can also be copied but any copy will automatically be placed on the current page and NOT system page 0. Thus, any copy you make will be specific to the current displayed page.

**View-port Dimensions**

The maximum view-port width remains unchanged at 80 characters, thus, you cannot create a single 160 character view-port that stretches across the entire display. This also applies to plots.

## 6.2 Standard Display and Sample Pages

The standard display pages are 0,10-14,9998, 9999.

The Samples pages are pages 1-69 on the Samples Disk.

### Page 10

This has been radically revised so as to show all the information that was previously on all five pages 10-14. Additionally, many other parameters have been added to show the complete configuration state of TPS.

You are referred to the Online Help topic 'What you see' (main contents) for a detailed description of ALL parameters on page 10.

### Page 11

This is now redundant but has been retained for backward compatibility. All the information is now stored on the new page 10.

Additionally, page 11 has been merged with what was the old V4.0 page 10.

V4.0 page 10 occupied the top 35 rows of the screen (the old maximum screen depth) and, what was V4.0 page 11, has been correspondingly moved down 35 rows. Press the END key to quickly scroll it into view.

### Page 12

This is now redundant but has been retained for backward compatibility. All the information is now stored on the new page 10.

### Page 13

This is now redundant but has been retained for backward compatibility. All the information is now stored on the new page 10.

See also the samples disks pages 65-69 for a complete packet dump of byteindices 0 - 1511 in the same format as page 13.

### Page 14

This is now redundant but has been retained for backward compatibility. All the information is now stored on the new page 10.

## Pages 0 and 9999

These modifications are not directly visible but have been made to enable users to offline configure page 9999 so that view-ports can be displayed on every page without having to individually configure the same view-port on every page.

Page 0 houses all system view-ports (those that make the blue-banded system display) except the TPS Message Bar (just above the system display) which has been left on page 9999 so that you can remove it if you want (not advised). Note, the Message Bar was introduced in V4.01p. See further in section 6 for full details.

## Samples Disk

The Samples disk has been considerably enhanced and added to. Of most interest is the addition of pages 25-30 and pages 65-68 which make display of your packet contents quick and easy to see. Pages 25-28 display the numeric value of every byte and 2-byte integer in a packet; pages 29 and 30 plot every byte and integer. Pages 65-68 display a hexdump of the first 1536 bytes of a packet with side-by-side ASCII translation. There are also two additional pages 33 and 34 that show the CCSDS frame and packet headers.

Furthermore, samples page 24 is new to V5.0 and is used for TPS performance measurement and tuning TPS.

Page 24 Performance measurement and Tuning Statistics.

Page 25 Displays each byte of the first 240 bytes of the packet as an unsigned hexadecimal value in its own view-port. Switch on the test data to get a good idea of the page's function.

Page 26 Similar to page 25 except the bytes are displayed as unsigned decimal integers.

Page 27 Displays each of the first 240 2-byte integers of the packet as a 4-digit hexadecimal value in its own view-port. Each integer starting on an odd or even byte boundary.

Page 28 As for page 27 but the numbers are displayed in decimal as real (floating point) values with a linear polynomial  $a_1=1.0$ ,  $a_0=0.0$  applied to convert from the 2-byte integer raw datatype to the displayed real format "%5.0f".

Page 29 63 plots of the numeric value of each of the packet bytes from byteindex 6-69 inclusive. They start at byteindex 6, instead of 0, so as to skip the CCSDS 6-byte frame header, however, the page is not CCSDS specific.

Page 30 63 plots of the numeric value of each of the packet 2-byte integers from byteindex 6-69 inclusive. They start at byteindex 6, instead of 0, so as to skip the CCSDS 6-byte TM packet header, however, the page is not CCSDS specific.

Page 33 CCSDS Transfer Frame Header parameters

Page 34 CCSDS Telemetry Packet Header parameters

Page 65 Hexadecimal packet dump bytes 0 - 383, as for the standard page 13 on the setup disk.

Page 66 Hexadecimal packet dump bytes 384-767

Page 67 Hexadecimal packet dump bytes 768-1151

Page 68 Hexadecimal packet dump bytes 1152-1536

See the README.TXT file on the samples disk for full details of all pages.

### 6.3 Online Configuration of Backup Time Period

The time-period for the periodic backup (Options, System, Backup menu item) can now be configured online. Previously, in V4.0, it was hard-coded to a 29 second period and could only be switched on or off.

The 'Options, System, Backup' menu item now displays a numeric dialog box allowing you to enter a time-period in seconds. The period can be anything between 1 seconds and 86400 seconds, i.e. 1 day. To switch it off completely, set it to 0.

When set to a value other than 0, TPS will regularly save the following files to disk.

Packet record data files		same file
Parameter record files	same file	
CCSDS virtual channel files	same file	
DEBUGMSG file		same file
TPSERR.TXT - the TPS error file	same file	
System settings (page 0)	PAGE0000.BAK	
Display page configuration info.	PAGEnnnn.BAK	
System display config 9999	PAGE9999.BAK	

We recommend that you make this value at least 30 seconds, especially if you are recording (parameters or packets) high rate incoming serial data. If you are editing displays, you may wish to set it lower to, for example, 10 seconds so that changes are saved at virtually the rate you make them.

See also the next section on detailing the new automated backup of display page configuration information.

### 6.4 Automated Display Page Backup

When the Backup option is on (any non-zero backup period, see the Options, System, Backup menu item), TPS now automatically makes a backup of the current display page if edits have been made to it.

Previously, users could only rescue their last saved changes, by offline recompilation of the text pages PAGEnnnn.TXT, where nnnn is the page number padded with leading zeros

The backup page has a filename of the form PAGEnnnn.BAK. This is a backup of the binary page file PAGEnnnn.BIN which is the usual file to which the display page configuration information is stored. Note, if you have made changes to the display but not saved them, the '.BAK' file will contain the most recent changes. Thus, if Windows or TPS crashes (hopefully never), the .BAK file will contain the most recent display page configuration.

When you do need to restore a page from the backup, rename the old PAGEnnn.BIN file (in case you need it later) and then copy the PAGEnnnn.BAK file over the PAGEnnnn.BIN file. If you want the text version (PAGEnnnn.TXT) also, then reverse engineer the .BIN page either online by unconditionally saving the page when viewing it OR by using PGCKW.

### A quick summary of TPS page files

Page display information is stored in up to four separate files:

PAGEnnnn.BIN	(that which TPS reads and writes to when saving)
PAGEnnnn.TXT	(that which TPS calls PGCKW to generate from PAGEnnnn.BIN)
PAGEnnnn.BAK	(that which TPS generates when the backup option is enabled)
PAGEnnnn.LST	(that which PGCKW generates when compiling the text page)

PAGEnnnn.BAK is automatically generated every time the backup period expires (default 29 seconds).

PAGEnnnn.BIN and PAGEnnnn.TXT are only ever generated when a page is saved (Display, Save menu item).

PAGEnnnn.LST is the output file from PGCKW when PGCKW compiles PAGEnnnn.TXT. This is actually identical to PAGEnnnn.TXT when there are no compilation errors - there should not be any errors if PAGEnnnn.TXT has been reverse engineered (automatically done online when saving) using PGCKW rather than manually edited offline.

### Recovering Pages in the event of a crash

If, for some reason, TPS or Windows crashes such that you can no longer use TPS to save your page, any one of the three files can be used to retrieve your last online edits.

Unless you saved your page within 29 seconds of the crash, the backup page PAGEnnnn.BAK should be copied over the old binary file. It is probably wise to keep a copy of the old .BIN file before overwriting it, for instance.

```
copy PAGEnnnn.BIN PAGEnnnn.OLD
copy PAGEnnnn.BAK PAGEnnnn.BIN
```

If both the .BIN and .BAK are corrupt (unlikely but possible), it is possible to simply recover the last saved .BIN file by recompiling the .TXT file using PGCKW.

If you have the .BIN file or .BAK file but no .TXT file, you can either use PGCKW offline to reverse engineer the .BIN to a .TXT file or let TPS trigger PGCKW to do it automatically by saving the page online. This can, of course, be done regardless of whether the page has had any changes made to it.

Lastly, you can use PAGEnnnn.LST in place of PAGEnnnn.TXT. However, since the list file '.LST' is a compiler output file, it may contain error lines (these start with the asterisk characters '\*\*'). These lines will have to be removed by text editing the list file prior to recompiling.

## 6.5 Extra files present

Due to various V4.1 additions, you will now find the following extra files generated by TPS.

TPSVID.CFG    TPS screen size (file stored in the home directory only)

PAGEnnnn.BAK        Backup of PAGEnnnn.BIN where nnnn = page number (current page directory)

## 6.6 All text files '.TXT' now viewable with Windows Notepad

The following TPS text files

TPSERR.TXT  
DEBUGMSG  
Parameter record files  
Ascii Hex format packet record files  
PAGEnnnn.TXT  
PAGEnnnn.LST

can now be directly viewed with Windows Notepad.

In TPS V4.0, because the files only had a linefeed character (ASCII code hex 0x0a) Notepad couldn't read them properly, i.e. it didn't interpret each line properly and put all separate lines on one single line. DOS EDIT did, however, perform a correct translation.

TPS V4.1 terminates each line with both the carriage return character and the linefeed character so you can use any text editor without the need for the editor to perform automatic translation of linefeeds to the carriage-return/line-feed combination.

## 6.7 Settings Save

Other than a chosen few settings, all configuration settings are now saved. TPS still distinguishes between view-port specific settings, which are saved with each page they appear on, and system settings which affect global TPS operations and are saved in the system page 0.

System settings can be saved at any time by use of the 'Options, System, Save settings' menu item.

### Page Settings Cover...

Parameter settings, ALL dialog box entries

Parameter alarm settings

Parameter recording settings

Packet filter parameter

### System Settings cover...

Serial and network configuration

Foreground and background colors

Packet format settings

Last four replayed packet files added to the file menu

Last server connected to

File, Replay, Open on EOF state

File, Record, Flush Period

File, Record, Buffer Size

Transfer, Echo Pkts state

Transfer, Ascii out state

Transfer, Test Data State

Transfer, Serial, COMn Configuration

    In/Out state

    Baud

    Databits

    Stopbits

    Parity

    Timeout Period

    Buffer Size

Transfer, Network

    TCPIP Port no

    UDP Port no

    Buffer Size



---

- Transfer, Custom API state
- Transfer, Packet Format
  - Sync
  - Length
  - Sync loss reporting
  - CCSDS - all flags and virtual channels switches
- Options, Switches
  - Diagnostics
  - Monochrome
  - Sound
- Options, System
  - Over-clocking
  - Backup
  - Colors - Foreground and Background

**Not Saved...**

By design, the following settings are not saved

- Print Settings
- Command State (Transfer, Command menu item)
- Display Lock (always loads to ON for safety)
- Loop-time (this must always load to the default 10ms rate)
- Step-mode (to ensure no data loss upon start-up)

## 6.8 Bi-directional Serial I/O

A serial port can now be open for either 'Input', 'Output' or both simultaneously. Previously, separate ports had to be used for input and output. The Serial Configuration dialog box has autonomous check boxes for Input and Output which can be switched independently of each other. The older V4.0 'Off' check box (actually a Windows 'Radio button') has been removed. TPS assumes the off state when both the Input and Output check boxes are unchecked.

Whilst bi-directional I/O between serially connected TPS stations is not of any use when passing the same packets between them, it is of use when a TPS station is receiving data from an external source. In which case, you can send telecommands out to the external device whilst receiving data along the same serial line. This was the prime motivation for implementing bi-directional I/O.

### Serial Settings Error Prompt

When a serial port cannot be opened, there is now only a single error prompt. Previously, there were two prompts. The first prompt issued a low-level error number really only of use to ourselves as developers; the second prompt issues a general message. Only the second prompt has been retained.

## 6.9 Enhanced Serial I/O and Recording

TPS has been greatly improved to handle simultaneous serial data input and file recording. The improvements have enabled TPS to receive and record data with no sync loss at 115Kbits/sec on standard PC hardware.

Key modifications include

- Fully blocked, no-wait I/O
- Configurable Cache/buffer flush period
- Configurable serial I/O buffer Sizes
- Configurable file record/replay buffer Sizes
- Configurable serial I/O timeout period

### Fully blocked, no-wait I/O

All V4.1 serial I/O is performed in blocks rather than at the byte level, i.e. TPS makes requests to read complete blocks of data, equivalent to half the buffer size (see below) and store the block data in an intermediate internal buffer (cache) where the high-level packet processing functions can perform fast access at the byte level. In V4.0, serial I/O was a mix of byte and block I/O.

Additionally, all V4.1 serial read operations (all models) and all write operations (Windows NT only) are done in 'no-wait' mode, i.e. they are queued for the host operating system to complete and do not wait for the incoming bytes before continuing TPS operation. In V4.0, only read operations were performed in no-wait mode, the write operations were not which meant that the serial echo could cause TPS to loop with a loop-time equivalent to the theoretical transmission time of the outgoing packet (measured 147ms for the default 128 byte packet at 9600 baud).

### Configurable Flush Period

The 'Flush Period' is the maximum time, in seconds, between repeated flushing of recorded incoming data to disk.

When TPS is recording data, version V4.0 flushed data from its internal cache to disk every 500ms or when the TPS internal buffer (cache) was full, whichever was the shorter time period. This could cause disk thrashing at high data rates. The problem was compounded with the potential in V4.1 to simultaneously record up to 8 virtual CCSDS channels, i.e. 8 disk cache flushes every 500ms. To remedy this, the flush period has now been made online configurable and has been set to a lower default of 10 seconds. The only real desire to keep the flush period low is when the disk file is simultaneously being read by another application, usually another TPS. This is a requirement when running the two-TPS CCSDS system.

The Flush period is configured via the 'File, Record, Flush period' menu item.

The new flush period becomes effective immediately after it is set.

A flush period of 0 switches timed flushing off. Note, the buffers are always automatically flushed when full so, if the flush period is longer than the time taken to fill the buffers, the flush period is ignored. Therefore, the flush-period is best used in conjunction with configuration of the buffer size which is also online configurable within TPS, see further below.

If no other TPS is reading from a file simultaneously being written to by another TPS, there is no need to set this to a high rate such as 1s. The default setting is set at 60 seconds. The lower and upper limits are 1 and 86400 seconds, i.e. 1 second to 1 day.

The current value is saved as a system setting.

### **Configurable Serial Buffer Size**

The serial buffer is an internal TPS storage area containing incoming and outgoing data primarily used to hold data whilst TPS serial I/O is temporarily suspended (another task running).

To ensure smooth data receipt during periods when TPS is temporarily disabled (other tasks running, intense disk access etc.), TPS employs extensive buffering of incoming serial data. Previously these internal buffers had been fixed at 4kbytes but, as of V4.1, they are now online configurable and have been set to a new default of 8kbytes upon starting TPS. Similar buffers are used for transmitting, i.e. echoing data.

The serial buffer size is configured via the 'Transfer, Serial, Buffer size' menu item

If TPS is already receiving/transmitting serial data when the value is changed, TPS will prompt before re-opening the serial ports with the new values. If you choose to re-open the serial port, data may be momentarily lost while the re-open operation is performed.

The buffer size is the same for each open serial port. Bi-directional ports have the same input and output buffers sizes since, invariably, data is usually echoed at the rate at which it is received.

The default size is 8kbytes and the range is 1 to 64 kbytes (TPS for Windows NT/95) and 32kbytes (TPS for Windows 3.1). The Windows NT/95 maximum 64k will be increased to 1Mb in the next release.

### **Configurable File Buffer Size**

The file buffer is an internal TPS storage area containing recorded and replayed data identical to a standard disk cache.

TPS records data in its own internal buffers (caches) and flushes the data to disk when either the buffer is full or the file is closed, i.e. the recording stopped. Thus, the bigger the buffer size, the longer the period between flushes and consequently reduced disk access. The default buffer size is set at 16kbytes and so, if data is incoming at 4kbytes per second, then every four seconds the buffer would be flushed to disk. If the flush period is less than four seconds (see above), this would be over-ridden and the buffers would never fill completely.

Similarly, TPS replays data by reading complete blocks from the disk into its internal cache before reading individual bytes.

The buffer size is configured via the 'File, Record, Buffer size' menu item.

The current value is saved as a system setting.

The default value is 16kbytes and the range is 1 to 1024 kbytes, i.e. 1 Mbyte maximum.

The new buffer size doesn't take effect until a new recording is started. Any recording in progress when the change is made is not immediately effective and the recording continues to use the old buffer size.

### **ALWAYS SET THE BUFFER SIZE BEFORE YOU START A RECORDING**

If the disk is being thrashed, usually when recording high rate data, e.g. 10kbyte/second or more, then it is recommended you increase the buffer size to a much larger value, say 32kbytes - the only limitation is memory size which is not usually a problem on most Windows PCs, especially NT and 95.

### **Serial Timeout Period**

The 'Timeout Period' is the time, in seconds, between TPS detecting no incoming or outgoing serial data and triggering a reset (close and reopen) of the serial port.

The timeout period should always be set to a period larger than the longest period between regular transmissions of data, i.e. if data comes in bursts every 60 seconds, the timeout period should be greater than 60 seconds. This is because, when a timeout occurs, TPS closes and re-opens the serial port during which time TPS cannot receive any data and will therefore lose data if the timeout period expires during periodic bursts of data.

The timeout period is configured via the 'Transfer, Serial, Timeout Period' menu item.

For continuous, or near continuously received data, the timeout period could, in principle, be as low as 1 second. However, this is not really practical unless not receiving data within one second is a serious error to which the user should be alerted.

The default value is 60 seconds and the range is 1 second to 86400 seconds.

To switch off completely, set the value to 0.

The reset of a serial port upon timeout was necessary in older PCs which had problems with the serial UART stalling (interrupts stopped occurring) - usually at high rates. However, modern PCs and the Windows operating system, especially NT, handle serial I/O much better and the short timeout period used by TPS in older versions is no longer realistic (this has varied between 5 seconds and 35 seconds in the past).

The current value is saved as a system setting.

## 6.10 Printing

An extra option 'Visible region only' has been added to the Print dialog box. When checked, TPS will only print the visible region of the screen. When unchecked, TPS will print the entire 1280 by 960 TPS window EXCEPT for graphics prints - these are only ever the visible region. Note, even on lower resolution monitors, it is still possible to size the TPS window to 1280 x 960 pixels and, hence, print the entire graphics region even if not completely visible. This is done by moving the Window partially off the display (drag the Window title bar) and then size the Window - do not use maximise as this only ever fills the visible screen.

## 6.11 Menu Modifications

### Saving System Settings

The system settings can now be saved at any time during TPS operations by selecting the 'Options, System, Save settings' menu item. Previously, this could only be done upon exit.

### File Menu Extended

The file menu has been extended to contain the full paths to the last four replayed or recorded files. Any file on the list can be instantly replayed by selecting it from the menu except when that file is being recorded to (the recorded filename is also added to the list).

### Edit menu items disabled if blank page, page 0 or 9999.

If the page is empty (1) or the current page is a system page, either 0 or 9999, the menu items that allow edits to be made are now disabled. The menus appear identical to when the display lock is on. This is to avoid accidental edits to the system pages and empty pages. Previously, this illegal action was possible.

(1) An empty page is possible if you delete a page. TPS stays on that page, albeit, it is considered invalid.

## 6.12 Intelligent Online Configuration

If a display format is changed, any polynomial calibration values are now automatically converted to the new format. In V4.0, this was particularly a nuisance when converting from integer to float or vice-versa as the integer number was reinterpreted as a float without true conversion. This resulted in a simple number such as 1 appearing as a garbage float value such as 1e300.

If you switch off calibration by selecting the calibration function 'dummy\_calibfn', 'dummy\_calibfn1' or 'dummy\_calibfn2', the display 'Format' is now automatically set to the raw 'Datatype' format.

If you change the format of a sub-com tag parameter then the sub-com limits, as defined in the any parameter that references the sub-com tag (not the tag itself), are also changed.

## 6.13 Copy From Revised

When you double click the mouse on an empty space on the display and then select the 'Copy from' button from within the dialog box that appears, TPS will now automatically copy any subsequent selected parameter to the position where the mouse was double clicked rather than to its original position, as occupied on the page it was copied from - which was the older V4.0 action.

## 6.14 Copying View-ports

### Copying Alarms, Parameter Record, Filters

View-ports, with alarms configured, can be copied on the same page or to another page. The new copy will maintain the same alarm settings as the original except in the case where the original alarm view-port was recording to a file. In this case, the copied view-port has no recording enabled. This is done by design so as to maintain consistency with the overall TPS philosophy of prohibiting more than one object ever writing to a single file within TPS. The EXCEPTION to this is when copying a recorded parameter to another page, in which case, there will be no clash of recording parameters and so the recording state is copied.

In view of the above note on alarm recording, it can be deduced that copying a view-port with a parameter recording in progress will, similarly, not result in the recording being copied.

Sub-com tag parameters are not copied. However, a sub-com parameter that references a tag can be copied with the sub-com settings also copied.

Filter parameters are not copied. A Packet filter can currently only be selected on a single parameter.



## 6.15 Super Commutation

A super-commutated parameter is that which is sampled (appears) more than once in a packet. Generally, every packet contains the super-commutated sample but it is possible to also process a super-commutated parameter which only occurs in every *n*th packet, where '*n*' is two or more. This case is referred to as a super-commutation of a sub-commutated parameter.

The remainder of this section has been moved online to the help topic 'Super-commutated Parameters'.

## 6.16 Sub Commutation

A sub-commutated parameter is one which is not sampled in every packet, i.e. it may appear in only every second, third or fourth packet. In the packets it doesn't appear, its place is occupied by another parameter, itself being sub-commutated.

The remainder of this section has been moved online to the help topic 'Sub-commutated Parameters'.

## 6.17 Super-Commutation of a Sub-commutated Parameter

This case occurs when a particular parameter does not appear in every packet but, when it does appear, it is then sampled more than once in the packet.

TPS can handle this case according to the same rules for super and sub-commutation as described in the online help topic 'Super and Sub-commutated Parameters'.

## 6.18 Single-Sampled Parameters

The handling of these parameters has not changed, albeit, they are now considered as a special case of super-commutation and the super-commutation edit boxes 'Increment' and 'Count', (see the view-port settings dialog box), default to the appropriate values to ensure full backward compatibility. You do not need to make any modifications to your existing view-ports.

## 6.19 Multiple Packet Streams - Sync. Handling

From V4.1 onwards, TPS can optionally switch off the 'Lost Sync 0001' error from being reported when it encounters a packet with an unrecognised sync pattern. This permits TPS to read a multi-format packet stream and select only those packets with the current, configured synchronisation pattern without generating a lost sync error. TPS M4 version V4.0 and earlier could always filter packets according to the configured sync pattern BUT would generate a lost sync error when a packet with another sync was encountered. Although harmless, this did fill up the error file with unwanted errors.

To switch on or off the Lost Sync error reporting, unlock the display and select the Pkt-Format menu item from the Transfer menu. Then check the Sync loss reporting check box to switch off the error reporting. The default state is on, i.e. TPS will report all lost sync errors.

The state of the Sync loss reporting switch is stored as a system setting.

## **6.20 Step-mode Handling Modified**

The Step-mode state can now be toggled at any time by pressing the ESC key. The Options, Switches, Step-mode menu item is still available but effectively redundant. Previously, in V4.0, pressing ESC was only valid when TPS was replaying a file.

If TPS is not receiving serial data, pressing ESC when step-mode is off will pop-up a dialog box prompting to switch step-mode on. If switched on, pressing ESC a second time will automatically switch off step-mode without prompting.

If TPS is receiving data from the serial port, a specific warning prompt is issued to inform the user of possible data loss when step-mode is on.

If TPS is replaying, pressing ESC instantly toggles step-mode as before in V4.0.

Step-mode is unconditionally switched off upon TPS reaching the end of a file replay. Previous versions of TPS would leave step-mode on and, since the file replay is automatically switched off when the end of file is reached, it meant that step-mode could only be switched off via the Options, Switches, Step-mode menu item.

## **6.21 Page Changing and Alarms, Record, Filters**

TPS no longer issues a warning prompt if parameters are being recorded or alarm monitored and a page change is requested. This is because alarm and parameter recording settings are now saved with the page. If any alarm or parameter record settings have been changed you will, instead, receive a prompt to save the page settings.

## **6.22 Test Data packet generation rate**

The rate at which test packets are generated is computed from the output serial port settings NOT the input settings.

## **6.23 Maximum no. of view-ports increased from 256 to 1024.**

Up to 1024 view-ports can now be configured on a single display page. The internal TPS memory tables have also been accordingly increased.

## **6.24 Auto-tune replaced by Over-clocking**

The Options, System, Auto-tune option has been removed as it was limited and too coarse in its tuning. Note, it only tried to determine the fastest loop-time and did not tune any other aspect of the system. On modern 486 and Pentium PCs, the loop-time can go to 1ms and the auto-tune was simply not effective, manual operation being superior. In the place of Auto-tuning is the Over-Clocking feature described following:

## 6.25 Over-clocking - 1KHz, 4KHz replay rates

In place of Auto-tune (above), is a new menu item 'Over-clocking'

Firstly, please do not confuse kilohertz over-clocking rates with bit rates - the frequencies given refer to packet rates. With most packets greater than 100 bytes long, this is effectively equivalent to megahertz bit rates and beyond.

Over-clocking is the method used by TPS to run TPS for Windows NT at up to 4KHz and TPS for Windows 3.1 and 95 at up to the 1000Hz.

This basically means that TPS can, in principle, receive packets at 4KHz (NT) and 1KHz (3.1/95). Previously TPS for Windows NT was limited to 1KHz in V4.0 and TPS for Windows 3.1 and 95 was limited to 20Hz in V4.0.

Although the TPS for Windows NT model is the same as the TPS for Windows 95 model, their performance under Windows 95 is different due to Windows 95 operating system differences. It would seem that, for backward compatibility purposes, Windows 95 tries to emulate Windows 3.1. Indeed, so much so that the TPS internal timer resolution remains at 20Hz (that of the old DOS clock - exact value 18.2Hz). Thus, TPS for Windows 95, when running under Windows 95, can only replay files at 20Hz as for TPS for Windows 3.1 EXCEPT when the 'Over-clocking' is enabled.

**Behaviour under Windows 3.1/95:** With over-clocking enabled (default disabled), TPS will internally loop at the theoretical rate demanded by the Loop-time which can be set from 1ms upwards (default 10ms). On V4.0, whilst the demanded Loop-time could be any value 1ms upwards, the actual achievable rate was never greater than 50ms, i.e. 20Hz, due to the poor 20Hz timer resolution. In V4.1, over-clocking enables TPS to actually run at the demanded rate so that the demanded Loop-time is equal to the measured Loop-time (see page 10).

! Warning ! When over-clocking is used with TPS for Windows 95, on slow machines, dialog box prompts can appear hidden from view. This problem is noted in section 7.0 of this manual.

**Behaviour under Windows NT:** With over-clocking enabled (default disabled), TPS will internally loop at four times the theoretical rate demanded by the Loop-time which can be set from 1ms upwards (default 10ms). For example, if the loop-time is left at the default 10ms, enabling over-clocking will cause it to run as if the loop-time were set to 2.5ms. Of course, you could set the loop-time to 2.5ms and achieve the same effect. The real benefit is when the loop-time is set to 1ms which is the lowest it can be set. Prior to V5.0, this lower 1KHz limit was a problem because modern Pentium PC's could handle this with ease. With the demanded loop-time at 1ms and over-clocking enabled, TPS can now effectively operate at 4KHz, i.e. a theoretical loop-time of 250 micro-seconds.

With the pace of hardware advance out-stripping TPS's ability to soak it up, over-clocking is actually a pre-cursor to implementing micro-second control in a future versions - stay tuned.

Note, over-clocking will take CPU time away from other Windows tasks so ensure this is not a problem to other tasks running, if any.

**Caveats:** Achieving the 4KHz on Windows NT requires a good spec. machine, e.g. Pentium 133 with PCI disk controller. At the time of writing, 300MHz Pentium II processors are now on the market.

## 6.26 CCSDS Dialog Box

As of V4.1, TPS can process incoming CCSDS Transfer Frames - discussed in detail in the following section. A new CCSDS configuration dialog box has been added to select the following options

- individual virtual channels for processing

- Frame Error Control Word state on/off

Configuration of these items is achieved via the CCSDS dialog box obtained by clicking the CCSDS button in the Packet Format dialog box. (Transfer, Pkt format menu item).

The CCSDS dialog box shows an overall master switch 'On' which, when checked, switches TPS to reading Transfer Frames, i.e. it assumes the incoming data are transfer frames and translates the 6-byte header accordingly.

The Frame Error Control Word is assumed present in the Transfer Frame when this item is checked. Note, TPS does not check its value, it merely reduces the Frame Data Field by two so that the control word is not extracted as part of the frame data.

The Virtual Channels group allows selective On/Off processing of each of the 8 channels (0-7). Any combination of channels can be processed.

If all 8 channels are disabled, i.e. unchecked, TPS will still treat the incoming data as CCSDS Transfer Frames if the master 'On' item is checked. Conversely, if the individual virtual channels are selected but the master 'On' item is cleared, TPS will not strip out any virtual channel data for any channel.

Please also see the earlier section on 'Enhanced I/O configuration' when processing virtual channels. The section offers some advice on how to alleviate any intense PC disk activity arising as a result of virtual channel recording.

Note, virtual channel data is unconditionally recorded to a separate file (VCDATAN, n=channel number 0-7) for each channel enabled in the dialog box - you do not need to select the File, Record menu item to start recording individual virtual channels. Of course, if you wish to additionally record the incoming transfer frames, in their entirety, you do need to manually start a recording.

## 6.27 CCSDS Transfer Frame Handling

As of V4.1, TPS can process Transfer Frames and split out the virtual channel packet data into telemetry source packets - these can then be processed by a second TPS. The Transfer Frame format is as specified in ESA's PSS-04-106 'Packet Telemetry Standard' specification document which is based upon the CCSDS 102.0-B-2 'Blue Book'.

TPS V4.1 is a partial implementation of the full PSS-04-106 standard. The implementation will be refined and expanded in the next TPS release V5.02.

TPS V4.1 Performs the following CCSDS processing

- Read transfer frames of any length, with/without Reed Solomon Encoding
- Selectively strip out and record one or more virtual channels
- Read multiple TM packet streams per virtual channel and filter a particular channel according to the TM packet Application ID (used as a synchronisation pattern).

TPS V4.1 does NOT currently process the following:

- Reed Solomon check symbols (input but not used)
- Variable length or segmented telemetry packets
- Frame Error Control Word (input but not used)

Variable length packet processing will be added for the next TPS version 5.02.

**The remainder of this section has been moved online to the help topic 'CCSDS'.**

## 6.28 Installing TPS and TPS CCSDS

To read transfer frames, strip the virtual channel packet TM data and then process it, all in real-time, requires two separate installations of TPS either on the same or another PC. For simplicity, the following installation notes will run both TPS's on the same PC.

For this example, the TPS installation used to directly read Transfer frames is termed TPSCCSDS and the TPS installation used to process the stripped virtual channel packet data is termed TPSTMPKT.

To process Transfer Frames, follow these steps:

1. Install TPS as standard, i.e. 'a:setup' to directory TPSTMPKT. This will become TPSTMPKT.

When installed, the Windows environment will contain the standard TPS Windows group. You will now have to make a new group and copy the icons to this group so that it does not conflict with the installation of TPSCCSDS that follows. (The second use of Setup overwrites the original Windows TPS group).

2. To do this, create a new group (folder) called '*TPSTMPKT and TPSCCSDS*' by selecting the Windows Program Manager File, New menu item. Click the Program Group button and enter the group name '*TPSTMPKT and TPSCCSDS*' (after installing both, it is convenient if they both appear in the same group box, albeit, with separate icons).

3. Before copying the icons, change the executable icon's descriptive name to TPSTMPKT by selecting the Windows program manager File, Properties menu item and changing the 'Description' box. Do not change the 'Command Line' box.

4. Now copy all the icons in the original TPS group to the '*TPSTMPKT and TPSCCSDS*' group by holding down the control key and dragging and dropping the icons.

5. You can now delete the original TPS Group. To do this, highlight each icon and press delete. When you install TPSCCSDS (further below), it will actually replace the original icons so a delete is not strictly necessary - just tidier.

6. Now Install the second TPS (TPSCCSDS) from the same setup disk, exactly as before but install to a separate directory TPSCCSDS.

Once installed, you will once again have to copy the new executable icon in the TPS group to the '*TPSTMPKT and TPSCCSDS*'. Ignore the README and HELP icons as they have already been copied for the TPSTMPKT installation in step 6 above.

7. Before copying the icons, change the executable icon's descriptive name to TPSCCSDS by selecting the Windows program manager File, Properties menu item and changing the 'Description' box. Do not change the 'Command Line' box.

8. Now copy the executable icon TPSCCSDS to the '*TPSTMPKT and TPSCCSDS*' group by holding down the control key and dragging and dropping the icons.

At this stage, you should have a Windows group '*TPSTMPKT and TPSCCSDS*' containing four icons: TPSTMPKT, TPSCCSDS, README and HELP. You can now delete the TPS group if so desired - see step 5 above.

If you are installing TPS for Windows 3.1 on a Windows 3.1 PC, you will not, before making the following mods, be able to simultaneously run both. When using TPS for Windows NT/95, this is possible so, in principle, you could skip some of the next steps. However, to keep things simple, we will keep the procedure the same for all windows's platforms.

Basically, because TPS for Windows 3.1 cannot run multiple copies native, the procedure is to rename one of the TPS executables to another name - this fools Windows 3.1 and allows multiple copies to run.

9. To do this, from a DOS window, change to the TPSCCSDS directory and make copies of the TPSXNET.\* files, i.e.

```
copy tpsxnet.exe tpccsds.exe  
copy tpsxnet.chk tpccsds.chk
```

Do not delete or rename the old files, just make copies, TPS requires the original files for its startup checks.

TPSCCSDS.EXE will now become the actual executable run from Windows. Thus, you now need to change the icon properties to recognise this new name, step 10 below.

10. Return to the '*TPSTMPKT and TPSCCSDS*' Windows Group and change the executable icon by highlighting TPSTMPKT, select the Program Manager, File, Properties menu item and change the 'Command line' entry from TPSXNET.EXE to TPSCCSDS.EXE - leave the full path intact as it was.

11. Once complete, you are now ready to concurrently run both TPS's. Don't do this quite yet, instead:

Start TPSCCSDS

12. Now to online configure TPSCCSDS to read transfer frames: this is only a matter of configuring the TPS 'Packet Format' Please see the online help CCSDS topic for details on all assumed frame sizes etc. and how they are derived.

Double click the display to unlock it and then select the Transfer, Pkt format menu item and enter the following values:

Synchronisation Pattern	0x1ACFFC1D
Packet Length	1279 (ADJUST according to actual size <sup>*</sup> )
Sync loss reporting on	Check

<sup>\*</sup> 1275 is the Transfer frame length for Reed Solomon encoded frames with an interleave depth of 5 - the extra four bytes making it 1279 bytes, in total, are for the Attached Synchronisation marker which TPS includes in the total frame length. You will have to adjust the 1279 value for any other interleave depth or if the Transfer frame does not have a Reed Solomon code block. See the previous section for full details.

Press the CCSDS button to present the CCSDS dialog box

CCSDS switch on

Switch on Frame Error Control Word (if present) and select the desired Virtual channels to be processed. (Check or clear each box accordingly).

Press OK to clear the CCSDS dialog box and accept the settings

Press OK to clear the Packet format dialog box and accept the settings

13. Now save the settings - select the 'Options, System, Save settings' menu item.

This is all that is required. TPSCCSDS is now ready to read Transfer Frame data either from a file or via the serial ports.

If you have transfer frame data in a file, it must be in raw binary format, i.e. an exact copy of the data as it is normally received from the outside world. This is, of course, not a TPS proprietary format so we will assume this is the case.

Before replaying your data, we advise you first put TPSCCSDS into step-mode so that you can see what's happening and slowly gain some confidence.

14. Replay your data (TPS File, Replay , Raw binary menu item) and, whilst observing the TPS error view-port, press ENTER to read the first packet whilst in step-mode.

The standard TPS page 10 is useful for the first few frames of replay. If you are confident that the frame synchronisation is ok, try page 33 on the samples disk which displays all the Transfer Frame header fields.

Check the error view-port doesn't show a 'Lost sync 0001' error. If it does, the 1279 Transfer Frame length has probably been incorrectly assumed, see step 12. Check the assumptions in the previous section and also verify your data file is not corrupted.



Pages 65-69 on the samples disk displays the first 1536 bytes of the frame in the familiar hexadecimal packet dump format, you may find these pages useful to diagnose the data in the event of problems. Furthermore, try the TPS diagnostics (Options, Switches, Diagnostics menu item) which dumps the raw incoming data to the TPSERR.TXT file in a readable ASCII format when lost-sync errors occur.

Assuming you can step through the frames ok, you may wonder what is now happening.

TPSCCSDS will now strip the Frame data field for each virtual channel and put that data in a raw binary file, filename VCDATAN.DAT where 'n' is the virtual channel number 0-7. TPSCCSDS will only strip data which is not 'IDLE'. The files will reside in the TPSCCSDS installation directory.

The VCDATAN.DAT files contain ALL the frame data field and so probably contains several different multiplexed TM packets. The replay of VCDATA files and the de-multiplexing of the TM packets is the responsibility of TPSTMPKT.

#### 15. To read the VCDATA files

start TPSTMPKT

Now we must configure it to read a selected TM packet. As for TPSCCSDS, this is done via the Packet format configuration dialog box.

As a synchronisation pattern, this V5.0 implementation uses the 2-byte Packet Identification field as the sync. - see the previous section.

#### 16. Configure TPSTMPKT packet format as follows, (Double click the display to unlock it first)

Synchronisation Pattern	2-byte packet Identification
Packet Length	user defined (not extracted by TPS from the header, hence, V5.01 cannot process variable length packets - to be remedied in V5.02).
Sync loss reporting	OFF

Press CCSDS button to present the CCSDS dialog box

CCSDS switch OFF (OFF not ON! see note below)

All other switches can be left as they

Press OK to clear the CCSDS dialog box and accept the settings

Press OK to clear the Packet format dialog box and accept the settings

Note, the CCSDS processing state is OFF for TPSTMPKT unlike TPSCCSDS. The TM packets must also be of fixed length (variable length to come in the next TPS release). The 'Sync loss reporting' is also OFF. This is so that TPSTMPKT will not report a sync loss when it reads packets other than those with a packet identification used for the synchronisation pattern. If your frame data contains many different packets, i.e. different application IDs, TPS will lose sync when it meets an unrecognised ID.

17. One extra step which must be performed is to set the 'Open-on-EOF' TPS option on so that TPSTMPKT will not close the VCDATA file when it reaches the end. This is because TPSCCSDS will be continually writing to it and, invariably, TPSTMPKT will usually read to the end of the VCDATA file before TPSCCSDS has time to put more data in it. Normally, with Open-on-EOF switched off, as soon as TPS reaches the end of a file, it will switch the replay off.

Switch Open-on-EOF by selecting the 'File, Replay, Open-on-EOF' menu item.

18. Now save the format settings as before for TPSCCSDS, see step 13.

This is all that is required. TPSTMPKT is now ready to read the virtual channel data processed by TPSCCSDS.

When first testing, leave TPSTMPKT step-mode OFF when replaying VCDATA - this is so that you can see if any VCDATA is generated. Because of the disk caching latency effect (discussed below), Using Step-mode on TPSTMPKT will only exacerbate real-time receipt of virtual channel data by TPSTMPKT.

Suppose your desired TM packets are in virtual channel 5, then you must replay the TPSCCSDS file VCDATA5.DAT.

Select the TPSTMPKT File, Replay, Raw binary menu item and browse to find the VCDATA5.DAT file in the TPSCCSDS home directory (this is, of course, not the default directory for TPSTMPKT).

**FILE LATENCY:** When running both TPSCCSDS and TPSTMPKT concurrently, there is a latency between TPSCCSDS generating virtual channel data and TPSTMPKT reading the data. TPS buffers virtual channel data before writing it to disk. The 'File, Record, Buffer size' is a new configuration option. By default, the size is set to 16Kb for each separate channel. 16Kb is approximately 14 frames of virtual channel data (at 1279 bytes per Transfer frame). Thus, if you are reading an infrequently transmitted virtual channel, you will not, in principle, see any TM data arrive at TPSTMPKT until 14 frames of the same virtual channel have been received and processed by TPSCCSDS. Rather than decrease the recording buffer size (of TPSCCSDS) to increase the frequency, it is preferable to configure the TPSCCSDS record buffer 'Flush Period' so that TPS flushes the buffer regularly rather than wait for it to fill. See the section 'Enhanced Serial I/O and Recording' in this manual for more details.

Note, you must set the 'Buffer Size' **BEFORE** switching on CCSDS - use the master switch in the CCSDS dialog box to temporarily switch CCSDS On/Off without having to switch any other options or change the packet format etc.

### **Excessive Disk Use - 'disk thrashing'**

It may well be that with high rate (10Kb/sec plus) incoming frame data, and one or more virtual channels being processed, the host PC disk is getting severely exercised - see the section 'Enhanced Serial I/O and Recording' in this manual for details on how to alleviate this problem. Read also the 'File Latency' Notes immediately above.

### Other Points

Because the packet format was configured with the 'Sync loss reporting' OFF, you will not be able to see lost sync errors if the TM packets length do not match the length configured. Instead, observe the hex dump and the page 10 PKTSRD parameter. If PKTSRD increments, then TPSTMPKT is reading TM packets ok. If you do see the bytes incoming on the hexadecimal packet dump display, but the PKTSRD counter does not increment, then you will see many Lost Sync errors ('LOSTSYNC' increments) and so it is very likely the packet length is incorrectly configured.

Pages 65-69 on the samples disk displays the first 1536 bytes of the packet in the familiar hexadecimal packet dump format, you may find these pages useful to diagnose the data in the event of problems. Furthermore, try the TPS diagnostics (Options, Switches, Diagnostics menu item) which dumps the raw incoming data to the TPSEERR.TXT file in a readable ASCII format.

The standard TPS page 10 is useful for the first few TM packets of replay. If you are confident that the packet synchronisation is ok, try page 34 on the samples disk which displays all the Packet header fields.

That's it... Now let TPSCCSDS and TPSTMPKT simultaneously run through the data by switching off step-mode on TPSCCSDS.

## 6.29 System Display Message Bar

A message bar (also termed the 'status bar') was introduced in V4.01p as part of the system display and appears on all pages. It occupies a whole line on the display and appears just above the system display. It is marked on the far left-hand side with an arrow '>' character. See the top line in the display below:

```
> .....  
Page   Operational Data      0010 NO ERRORS. LAST ERROR AT Step 0..3..6..9..c..f  
  10                               Wed Feb 11 16:48:05          OFF ↑
```

As it is on system page 9999, you can remove or make it page specific (see further below) but this is not now recommended as it is now used extensively by TPS and is especially useful for real-time messages.

Full details are given in the online help - search for the keywords 'Message Bar'.

## 6.30 TCPIP/UDP Ethernet Network

TPS Version 5.0 primarily features TCPIP/UDP ethernet networking which enables TPS to exchange data at megabit rates between global Internet sites or local area networks (LANS - also called 'Intranets').

TPS V5.0 networking capability is only available for the 32-bit TPS for Windows 95/NT model. Although TPS for Windows 3.1 has been upgraded to include all other features and fixes, it does not come with TCPIP networking.

Full details are given in the online help - search for the keyword 'Network'.

### Page 10 Network Statistics

What were once the V4.1 serial statistics on page 10, found in the two, green background blocks headed 'Serial Read Dbg' and 'Serial Write Dbg' are now entitled 'Buf'd\_Read\_Dbg' and 'Buf'd\_Write\_Dbg' and pertain to both serial and ethernet I/O. The *Buf'd* abbreviation refers to 'Buffered I/O'. For instance, the page 10 statistic 'BBYTESRD' ('Buffered Bytes Read'), shows the number of bytes read/received, in a single call, from the serial port or network. Since both serial and ethernet input sources cannot be concurrently active, there is no conflict.

### 6.31 Sample Averaging

TPS can average parameters over a sliding window of up to the previous 65536 samples.

To use the feature, the parameter must be polynomially calibrated - use a standard 1:1 linear polynomial if no calibration is wanted, i.e. set the polynomial coefficients  $a_1=1$  and all others equal to zero.

The number of samples over which to average the parameter is specified in the new V5.0 edit box `Average count` found in the polynomial calibration dialog box. The default value is 0 which disables averaging. A value of 1 also disables averaging. Any value  $n$ , greater than 1, will instruct TPS to average over the last  $n$  samples, for example, a value of four will average over the last four samples etc.

The maximum number of samples is 65536. However, this consumes a massive 512k per parameter. Put four such parameters on a page and you will have consumed over two megabytes. Note, each sample consumes 8 bytes regardless of its data type. For example, although a long integer is strictly speaking, four bytes, TPS will internally store the samples as 8 bytes each because it uses a common 8-byte numeric format for all numbers.

Note, if the Average Count is, for example, 30 then TPS will only be truly averaging over 30 samples when 30 or more samples (commonly one per packet) are received. When, for example, only 10 samples have been received, TPS will average over all the first 10 samples, steadily accumulating a running total until 30 samples have been received. The 30 sample window then slides along as more data is received.

## 6.32 Offline Display Configuration

Offline configuration is the process of configuring TPS display pages from outside of TPS using a separate text editor and the TPS display page compiler PGCKW. TPS stores the display configuration information in text files which can be modified offline. Offline configuration allows you to perform all the standard online configuration operations, such as changing a view-port's colors or its position, plus some more powerful editing features not currently available online.

For instance, offline configuration is superior to online configuration for the following operations:

- Global page changes of view-port attributes, e.g. changing all view-port's background color.

- Adding/deleting whole groups of parameters quickly.

- Adding/deleting parameters from telemetry parameter database files.

- Including pre-defined pages.

- Defining a view-port to appear on every page  
(configure the view-port on system page 9999).

Offline Configuration is also a necessity for the following operations which cannot be performed online.

- Changing the parameter record 'tag parameter'.

- changing the system page 9999 view-port attributes,  
e.g. moving/deleting the message bar or changing its color.

Offline editing is best used for changing existing attributes rather than creating new ports or adding attributes. Creating a new port is always best done online and performed by copying an existing port rather than creating a new port (which is, ultimately, just a copy of a template port pre-defined on page 9998). However, adding a port by simply cutting it from another page file (or any text file for that matter) is a good quick method of adding ports and brings with it the benefits of a **parameter database** concept.

Full details are given in the '**PGCKW and Offline Configuration**' manual - see the Documentation Disk as this manual is not supplied pre-printed.

### **6.33 Double clicking disallowed on an empty page.**

TPS does not allow double click edit operations to be performed on an empty page. It has been possible, in previous versions, to copy view-ports from another page to an empty page by using the double click and Copy To button.

An empty page is that with no view-ports. Although technically illegal, but harmless, it is possible to obtain an empty page by deleting every view-port present. When the last view-port is deleted, TPS automatically deletes the page (a warning is issued first). Deleting the page in its entirety using the Display, Delete menu item, also leaves the appearance of an empty page since TPS does not change to another page once deleted.

If you want to create a new page with only one view-port, copy a view-port from a different page to the new page by pressing the 'Copy-to' button shown in the parameter options dialog box (obtained upon double clicking a view-port). Alternatively, you can use the 'Display, Save as' menu-item to rename an existing page as a new page.



## **7 Known Limitations**

### **7.1 Dialog box hidden from view**

This problem only seems to happen when running TPS under Windows 3.1 or 95. It has not been seen using Windows NT. It is usually only seen when either the machine is very slow, e.g. 386SX, or the processing load is very high (over-clocking enabled, 1ms loop-time).

If TPS is consuming considerable CPU time then, when selecting any menu item or pressing any hot-key combination that results in a dialog box, e.g. ALT+Q to quit, the resulting pop-up dialog box can be hidden from view behind the TPS Window. You will hear a beep, but will not be able identify from which dialog box or Window it originated from.

The solution is to press the ALT key on its own - this will bring the dialog box to the fore, i.e. on top of the TPS window.

TPS can consume considerable CPU when one or more of the following are in operation

- Over-clocking enabled with a low loop-time, i.e. < 10ms default.

- displaying a large number of plots of super-commutated parameters with high-rate incoming data.

- simultaneous serial transmit and receive, especially above 9600 baud.

### **7.2 Cancelling Plot-ports edits**

When editing the plot settings: If any plot settings are changed, but CANCEL is pressed in the Plot dialog, the modified settings are still accepted if the OK button is clicked in the parent Y view-port settings dialog box.

### **7.3 Adding Plot-ports when max port allocation exceeded**

If a page has its maximum limit of 1024 view-ports (actually 4 below this as TPS uses 4 for workspace) you will still be able to edit existing view-ports. However, if you add a plot to a view-port the maximum view-port limit will stop the plot from being created and actually delete both the plot and the view-port when OK is pressed.