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PG5 Up/Downloader
User Manual

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Contents

1. Introduction

This document describes the stand-alone up/downloader package, which can be installed without the presence of the entire Saia PG5. It also needs no software license to use it.

The package consists of three applications:

S-Conf : Online Configurator
S-Conf (Sconf.exe) is a stand-alone configurator for Saia PCD hardware. It allows the connected PCD's memory, communications and password to be configured online. It also has commands for displaying information from the PCD, uploading/downloading programs and data, controlling the CPU's status (Run/Stop/Restart), and even for downloading new firmware into the PCD.

Sload5 : Command-line Up/Downloader
Sload5.exe is a *command line interface* for the SAIA PCD up/downloader, for uploading and downloading SAIA PCD programs and hardware settings from the command prompt or from a batch file. It can also be invoked by other applications.

S-Dat : Data Transfer Utility
S-Dat (Sdat.exe) is a program for saving and loading a PCD's Register, Flag, Timer, Counter, Input/Output and/or Data Block values to/from text files.
It has two modes, interactive mode and command-line mode. In interactive mode, it has a built in text editor for viewing, modifying or creating the address and data files which define the addresses and data to be up or downloaded. Command line mode up/downloads files using a command line and shows only the 'progress' dialog boxes.

2. Installation

The package is installed by running 'Sload513.exe'. This installs the communications driver and applications. If the PG5 is already installed, existing PG5 files will not be replaced.

3. S-Conf : Online Configurator

3.1 Introduction

S-Conf is a stand-alone configurator for Saia PCD hardware. It allows the connected PCD's memory, communications and password to be configured online. It also has commands for displaying information from the PCD, uploading/downloading programs and data, controlling the CPU's status (Run/Stop/Restart), and even for downloading new firmware into the PCD.

Hardware Settings are viewed and edited online, or can be downloaded from a file or saved in a file, type '.5hw', which is the file used by the PG5 Project Manager to hold a CPU's settings.

When S-Conf starts, it uses the online settings of the PG5 Project Manager's active CPU, or the last active CPU if Project Manager is not running. If the 'Auto Connect' option is enabled, then S-Conf will connect as soon as it starts (unless it's a dial-up modem channel).

S-Conf can be used even if another PG5 application is already online via the same serial port. Several PG5 applications can share the same port as long as they use the same communications channel.

Invocation:
C:\Program Files\Saia-Burgess\PG5 1_3> Sconf32.exe

3.2 Main Window

Online Settings
> If online, this shows the online settings of the connected CPU. If offline it shows the online settings of the CPU to be connected. The settings from the PG5's active CPU are used by default when S-Conf starts. Note that changing the online settings with S-Conf will not affect the online settings of the active CPU.
> **Tip:** Before going online, check this to verify that you will connect to the correct CPU, especially if on a network where the S-Bus station number should be checked. You can turn off the 'Auto Connect' option so that S-Conf won't connect automatically when it starts.

PCD Type
> The connected PCD's type and subtype, e.g. PCD2.M480.

Version
> The PCD's firmware version number. If it begins with 'B' then it's a Beta version. If it begins with '$' then it is a pre-release development version for testing or special purposes.

Program
> The name of the program in the PCD. This is the first 8 characters of the PCD file name.

Date / Time
> The PCD's date and time, read from its internal real-time clock. This can be set using the 'Online /Clock' menu command.

Day / Week
> The day of the week (1..7) where 1 is Monday and 7 is Sunday, and the week of the year (1..54) which conforms to ISO 8601.

Status
> The status of the connected CPU:
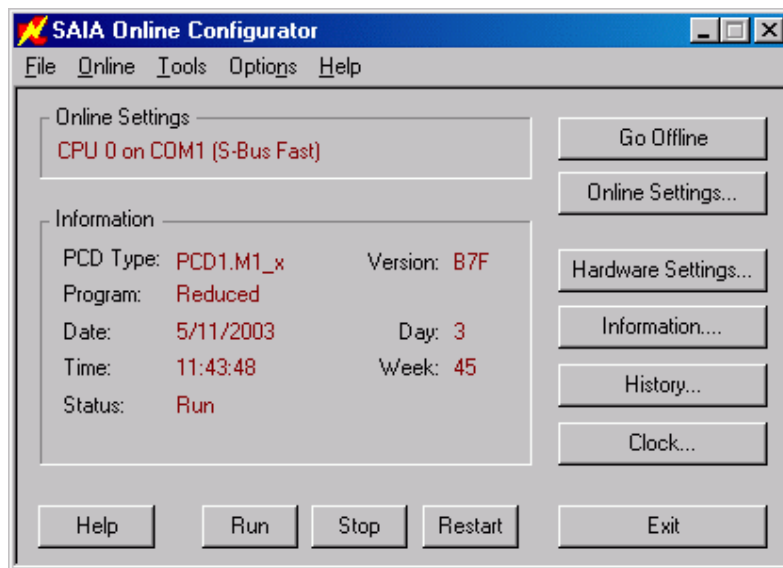> **Run**: The program is running.
> **Conditional Run**: The program is running but a breakpoint has been set.
> **Stop at XXXXXX**: The program has stopped at address XXXXXX.
> **Halt at XXXXXX, dd/mm/yy hh:mm:ss**: The program has halted at address XXXXXX, the date and time of the halt are also shown. The next line shows the halt reason, such as "NO PROGRAM", see Halt and History messages.

Buttons

The buttons, such as 'Go Online' and 'Clock...' have the same functionality as the commands on the Online menu.

3.3   Menus

3.3.1 File menu

Open Hardware Settings File...
Opens an existing '.5hw' file for viewing, editing or downloading. Hardware Settings files are usually created by the PG5 Project Manager for each CPU, and can also be created by using the 'Online / Hardware Settings' command and pressing the 'Save As' button.

1, 2...
The list of most recently opened or created Hardware Settings files (.5hw). Click on a file name to open it.

Exit
Closes S-Conf.

3.3.2 Online menu

Go Online / Go Offline
Puts the PCD on/off line via the channel shown in the 'Online Settings'. If it fails to connect, check the Online Settings (see below), check the cable between the PC and PCD, make sure the PCD is switched on, then re-try the connection by pressing the 'Go Online' button again.

Online Settings...
Displays the 'Online Settings' dialog box which allows a communications channel to be configured for connection to the PCD, and also allows a CPU, S-BUS station number and/or telephone number to be entered. The appearance of the dialog box depends on the selected channel type.

NOTE
The 'Online Settings' command configures the channel for S-Conf only. If the Online Configurator is called from the Project Manager, changing the communications channel from the Online Configurator does NOT change the channel used by the PG5's active CPU. The CPU's channel must be configured using the Project Manager's 'Online Settings' command.

Hardware Settings...

Uploads the hardware settings from the connected PCD and displays them in the Hardware Settings dialog box. If OK is pressed, then the hardware settings are written back into the PCD, with or without the memory allocation which causes the user program(s) to be deleted.

Clock...

Sets the PCD's internal real-time clock, see the Set Clock dialog box.

S-Bus Station...

Allows only the S-Bus station number to be changed online, without stopping or resetting the PCD. (Downloading the full S-Bus configuration from the Hardware Settings dialog box always restarts the PCD.) If connected over an S-Bus network, S-Conf will reconnect to the PCD using the new station number.

Information...

Displays the Information dialog box which shows details of the PCD's hardware and software versions.

History...

Displays the History dialog box which shows the PCD's history table, and has a button for clearing the table.

Flash Backup/Restore > Backup User Program To Flash...

Flash Backup/Restore > Restore User Program From Flash...

Copies the user program to or from the PCD's Flash memory, if fitted. See Backup/Restore User Program To/From Flash.

Run

Puts the CPU into Run mode. If the Run button is disabled it means the PCD is already running. Both Run and Stop are disabled if the PCD is in Halt.

Stop

Puts the CPU into Stop mode, program execution stops at the current location, which could be anywhere in the user program. If the Run button is disabled it means the PCD is already running. Both Run and Stop are disabled if the PCD is in Halt.

Restart

Resets the CPU and moves its instruction pointer to the start-up XOB 16 (if XOB 16 is not present the instruction pointer is moved to the start of COB 0). The CPU remains in Stop mode until a Run command is done.

WARNING

If online to CPU 0 of a PCD4 or PCD6 with more than one CPU, these commands will control **ALL** the CPUs.

3.3.3 Tools menu

Download Program...

Downloads a user program from a '.pcd' file, see Download Program.

Upload Program...

Uploads a user program into a '.upl' file, see Upload program.

Upload All...

Uploads everything in the PCD's memory (code, text, data, media values etc) and saves it in a file. This command is often used before changing a battery or memory chip. See Upload All.

Download All...

Downloads everything into the PCD's memory from a file created by the 'Upload All' command. See Download All.

Online Debug

Opens S-Bug, the Onlone Debugger.

Download Firmware

Opens the Firmware Download Utility which allows the firmware in more recent PCD models to be updated from a file distributed by Saia. Firmware updates can be obtained from your Saia representative or from the SBC Support website.

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3.3.4 Options menu

Auto Connect

S-Conf normally connects to the PCD when it starts, unless the configured channel is for a dial-up modem which is not online. Uncheck this option if you don't want S-Cont to try to connect whenever it is opened. If unchecked, then you must use the 'Go Online' button or menu command to connect.

Always On Top

Toggles the 'always on top' state. When checked, S-Conf is always displayed in front of all other windows.

Channels...

Displays the Channels dialog box, allowing the settings of each available channel to be viewed or configured, and new channels to be created.

3.3.5 Help menu

Help Topics

Displays the Contents/Index/Find help dialog box.

About S-Conf...

Displays the About dialog box.

3.4 Dialog Boxes

3.4.1 S-Bus Station dialog box

This command allows the connected PCD's S-Bus station number to be changed without restarting the PCD. This is useful if you need to change the station number of a PCD which is in use, because it does not interrupt program execution..

If communicating via S-Bus, the PCD will stay online using the new station number.

To change other S-Bus settings in the PCD use the Hardware Setting's S-Bus page.

3.4.2 Information dialog box

Displays information about the PCD's firmware, hardware and fitted communications cards. Information from the communications cards requires a full protocol (PGU) connection.

Production Information group

Production information which is programmed into the PCD's non-volatile memory during manufacture. Not all PCD models contain this data, a "Production Information not available" error will occur if the connected PCD does not have this data.

PCD Type

The PCD model type.

System ID

The PCD model subtype. Known types are shown as texts, e.g. "M110", "M220". If "?" is shown then the model is unknown (new PCD model, or invalid). Its hex value is shown in brackets.

Firmware Version

The version of the PCD's operating software, e.g. 002. If the version contains an 'X' or a '$' it signifies that the firmware is a pre-release or custom version.

Hardware Version

A single ASCII character which identifies the PCD hardware version. It is normally a letter between 'A' and 'Z'. This letter can also be found on the printed circuit board after the part number. Its hex value is shown in brackets.

Modifications

Shows which hardware modifications are present, 1..8. E.g. "1 2 3 5". Each number indicates a particular hardware modification or feature, whose values depend on the PCD type. "None" is shown if there are no modifications. Its hex value is shown in brackets (bit 0=mod.1, bit 7=mod.8).

Fab. Date (year/week)

Fabrication date. The year and week when the PCD was manufactured. Years earlier than 1996 are probably invalid, as are values containing the letters 'A'..'F'.

BAD CHECKSUM (was xxxxh, expected yyyyh)

The production information has a checksum so it can be validated. This message is displayed if the PCD has production information but its checksum is wrong. This probably means that the production information data has not been programmed. The data is displayed anyway, but may not be valid. The expected and actual checksums are shown in hex.

The following fields are shown only for the PCD3.

Serial Number

Each PCD has a unique serial number.

MAC Address

The 'Media Access Control' address, see below for details.

Slot B1, Slot B2 groups

These show information about the communications cards fitted in Slot B1 and Slot B2, if available. Not all PCD types and firmware versions can provide this information, so the fields may be empty. They are not shown for PCD3 types.

Type

The card type, e.g. PCD7.F650. **<unknown>** will be shown if the PCD's firmware cannot provide the information or if it's a reduced protocol connection. **<none>** will be shown if there is no card fitted, or if it's a non-intelligent card which cannot provide any information. The PCD2.F510 (LED display only) always shows <none> because it's not an intelligent card.

Version

The revision of the card.

Modifications

List of modifications made to the card.

Fab. Date (year/week)

Fabrication date, the year and week when the card was manufactured.

MAC Address

The 'Media Access Control' address, a hardware address that uniquely identifies each node of a network. In IEEE 802 networks, the Data Link Control (DLC) layer of the OSI Reference Model is divided into two sublayers: the Logical Link Control (LLC) layer and the Media Access Control (MAC) layer. The MAC layer interfaces directly with the network medium. Consequently, each different type of network medium requires a different MAC layer.

3.4.3 History dialog box

The History is a list of all PCD errors which have occurred since the table was last cleared.

The three most common entries, listed below, are always present. These have a 'count' value which indicates the number of occurrences of the error in the Count column, the address of the last occurrence in the Address column, and the date and time of the last occurrence. If no error has occurred since the last time the history table was cleared, the date and time values show the date and time the history table was cleared. The 'Clear History' button deletes all entries except these four most common errors.

The window may contain additional entries for individual errors which are less likely to occur. These do not contain a count. If more than 12 of these errors have occurred, preceding errors are lost. The history table only logs the last 16 errors.

These are the three errors which are always shown, with counts. Other errors are listed in Halt and History Messages.

BATT FAIL
> The battery on the memory module or CPU card needs to be replaced. Data in battery-backed RAM may be lost if the PCD is powered off.

IR OVERFLOW
> Index register overflow. The user program contains an error which causes the Index Register to be incremented beyond its maximum value. The "Address" shows where the problem occurred, usually the line after the offending instruction. The user program should be corrected.

ERROR FLAG
> The error flag was set because of an error in the user program. The "Address" indicates where the problem occurred. The user program should be corrected. The error flag can be set by things like a divide by zero, or sending data to an uninitialized serial port.

3.4.4 Halt and history messages

If the PCD detects a fatal error it loads the 'Halt Reason Register' with a text.

For non-fatal errors, the 'History Table' is loaded with a text. The History Table stores the last 12 errors in a circular buffer. The four most common errors have fixed positions at the end of the table, and have counters which indicate how many of these events have occurred. If the History table is cleared then these counters are set to zero and the time and date are set to the time the history was cleared. This table can be viewed with the History command.

The messages are listed in alphabetical order.

68K ADDR ERROR	Attempted to access an odd address.
68K CHK INSTR	Internal system firmware error.
68K INVALID OPC	Invalid 68000 instruction executed. Often caused by a missing end of block instruction or corrupted RAM memory.
68K TRAPV INSTR	Internal system firmware error.
>32 ST/TR ACTIVE	Too many active Graftec tasks (TRs).
>7 CALL LEVELS	PB/FB call nesting depth overflow.
BAD MEM EXT INIT	Extension Memory or EMI segment corrupted.
BAD MODEM STRING	Invalid modem configuration string, or string too long.
BAD TXT/DB TABLE	Text/DB memory corrupted. Can also be caused by an out-of-range Text or DB address.
BAD USER MEMORY	Wrong type of Flash EPROM installed, or Flash EPROM is write-protected.
BATT FAIL nnn	The memory backup battery must be replaced.
BLOC NONEXISTANT	Call to missing PB, FB, SB, ST or TR.
BUS QUIT FAILURE	Program attempted to access a non-existent card.
CHECKSUM FAIL	Invalid user program checksum, EPROM only. Download the program again.
COB NBR TOO BIG	COB number out of range (0..15).
CONFIG TOO LONG	HW settings in Extended Header are too long for the EEPROM.
CPU 0 START FAIL	No CPU can be put into Run without a program in CPU 0.

CPU FIRMWARE MIX	If more than one CPU is fitted, they must all have the same firmware versions.
CPU NUMBER > 6	The CPU number set by the DIL switches on a PCD6 is invalid.
CPU SYNCH ERROR	SYNCH S2 timeout occurred.
CSF INV PAR NBR	Invalid parameter number for CSF instruction.
DIFF CFG CH x	Different configuration on Profi-S-Net port x.
DOUBLE TIME BASE	DEFTB and DEFTR instructions used in the same program.
DUART HW ERROR	One of the serial port UARTs is defective.
ERROR FLAG nnn	Error flag set, nnn indicates the number of times it's been set.
EVERYTHING IS OK	Normal power-up message.
EXT DEVICE FAIL	Hardware failure in plug-in card.
EXT HEADER FAIL	Extended Header is corrupted, download the Memory Allocation.
EXTHDR EEPR FAIL	Error in EEPROM Extended Header, download the Memory Allocation.
EXTERN PWR FAIL	Extension rack power failure.
FABINFO CRC FAIL	Invalid checksum of fabrication information, contact Saia-Burgess.
FB NBR TOO BIG	FB number out of range.
HALT INSTRUCTION	HALT instruction executed by the user program.
HALTED BY CPU 0	Co-processor has been halted by CPU 0.
HALTED BY LAN 2	LAN2 coprocessor has put the CPU into HALT.
HEADER FAIL	Bad memory allocation or header corrupted, download the Memory Allocation.
ILLEGAL AUTO VEC	Internal system firmware error, contact Saia-Burgess.
INCLUDED TEXT >3	Text nesting depth overflow in STXT.
INIT STEP FAIL	More than 32 Graftec Initial Steps (ISTs) have been defined.
INTERRUPT ERROR	Internal system firmware error, contact Saia-Burgess.
INVALID OPCODE	An invalid user program instruction has been found. Note that some instructions are not supported by new PCD types (DSP, OUTS, STHS, LAN2 instructions.
IO QUIT FAIL nnn	An I/O address has been accessed which is not present.
IP CH nnn NO MEM	Not enough memory to open TCP/IP channel in Open Data mode.
IP FAIL NO IPM	An IP function has been carried out, but the PCD has no IP configuration.
IP FAIL PORT n	Incorrect port number in Ether-S-Bus master SASI text.
IP FAIL SASI DBX	Error in node list configuration DBX.
IP FAIL SASITEXT	Error in SASI instruction text.
IP FAIL TOUT	Incorrect timeout value in Ether-S-Bus master SASI text.
IP SB GWY FAIL	TCP/IP S-Bus gateway could not be initialized.
IPM DON'T RESTART	PCD has restarted but IPM module doesn't respond.
IPM HAS OLD FW	Firmware in the IPM module is not compatible with PCD FW.
IPM NOT PRESENT	IP Module (for TCP/IP) not fitted, or wrong slot selected.
IR OVERFLOW nnn	Index register incremented beyond 8191.
IST NBR TOO BIG	IST number out of range.
LAN 2 WATCHDOG	The LAN2 FW watchdog has been activated.
LON FAIL	Invalid LON port assignment.
MANUAL HALT	CPU has been halted by the HALT switch.
MEDIA CORRUPTION	Battery backed RAM failed, stored media values may be invalid.
MEM EXT CORRUPT	Extension memory corrupt, or a Text/DB address is out of range.
MEM EXT ERROR	Extension memory corrupt, halts if extension memory cannot be re-initialized from the extension memory initialization (EMI) segment.
MEMORY LOSS	Caused by battery failure if RAM memory. Use the TEST 400 instruction to detect the error.
MGWAY INIT FAIL	Master gateway port configuration is invalid.
MISSING MEM PACK	Memory module not fitted.
MODIFIED PROGRAM	User program has been modified in the PCD's memory by a programming unit. This is only shown if memory is write-protected.
MODEM: ERROR	Unknown modem error.

MODEM: INIT FAIL	Error initializing modem.
MODEM: NO MODEM	No modem fitted, or modem defective.
MODEM: RESET FAIL	Error on modem reset command.
MODEM: UART FAIL	UART does not accept configuration.
NO COB	The user program does not contain a COB, it cannot be run.
NO PROGRAM	CPU has no user program to execute.
NOT RUN ON xx7HW	PG5 user programs cannot be run on xx7 hardware.
PARITY FAILURE	Data error on main external bus.
PB NBR TOO BIG	PB number out of range.
PRIVILEGE VIOL	Internal system firmware error.
PROF DP FAIL nnn	Invalid PROFIBUS DP port assignment, nnn is the error number, see list below.
PRT2 DBL ASSIGND	Port 2 assigned as S-Bus PGU and XOB 20 or 25 programmed.
PRT3 DBL EQUIPED	Port 3a and 3b are fitted on a PCD6.M3.
PSBUS GWY FAIL	Profi-S-Bus gateway could not be initialized.
PSBUS PGU FAIL	Profi-S-Bus PGU could not be initialized.
PS FAIL SAP	Incorrect SAP number in Profi-S-Bus master SASI text.
PS FAIL SASI DBX	Error in Profi-S-Bus node list configuration DBX.
PS FAIL SASITEXT	Invalid Profi-S-Bus SASI text.
PS FAIL TOUT	Incorrect timeout value in Profi-S-Bus master SASI text.
PSM NOT PRESENT	Missing Profi-S-Net (Profibus) module.
REG>4095 NOT SUP	The firmware or PCD type doesn't support Registers above 4095. Currently only the PCD2.M480 and PC3.Mxx have 8192 Registers.
RTC FAILURE	Real-time clock (RTC) is defective.
RTC NOT EQUIPPED	The real-time clock on the PCD4's memory module is not present or is defective.
SB NBR TOO BIG	SB number out of range.
SBUS PGU ERROR	Invalid S-Bus PGU port assignment. Check the Hardware Settings.
SF NOT LOADED	System Function (called by CSF) is not loaded, missing DBX 7.
ST NBR TOO BIG	Graftec Step (ST) number out of range. Max. ST number depends in the PCD type.
SYSTEM OVERLOAD	Too many block calls.
SYS TYPE ERROR	The system type in the Production Information is not correct.
SYS WDOG START	Restart caused by system watchdog.
TEXT SEGM. ERROR	Text/DB segment corrupted, or the user program contains extended data blocks (DBX) which are not supported by the PCD's firmware.
TR NBR TOO BIG	Graftec Transition (TR) number out of range. Max. TR number depends on PCD type.
TRACE	Internal system firmware error.
TEXT/DB HW ERROR	Text/DB memory failed, or incorrect memory allocation.
USR MEM HW ERROR	User memory test failed.
WATCHDOG FAIL	Restart executed by software watchdog timeout.
XOB NBR TOO BIG	XOB number out of range.
XOB 0 EXECUTED	XOB 0 executed during power down.
XOB 0 START EXEC	XOB 0 has been started.
XOB 0 WDOG START	XOB 0 executed by WDOG timeout.
XOB20/25 MISSING	Interrupt input active and no XOB 20 or 25 programmed.
ZERO DIVIDE	Internal system firmware error.

PROF-DP FAIL xxx Error Codes

xxxx	Description
0	Key word MODE: not found

0	Wrong mode specified
0	Key word CONF: not found
0	DBX key word not specified
0	DBX number error
0	DBX number to large
0	DBX does not exist
0	Key word DIAG: not found
0	Flag or output key word not specified in DIAG
0	Error in address of diag flag or output
0	Range error diag flag or output
0	Register key word not specified in DIAG
0	Range error diag register
1	PROFIBUS-DP HW card not present
2	Error in instruction
3	DBX structure error
4	DBX type not for DP master (no PROFIBUS DBX)
5	FW-DBX version not compatible
6	No IN RING message after timeout on initialization
7	Semaphore error for data exchange (info to PCD support)
8	DBX error: data transfer function not implemented
9	Incompatible PCD7.F750 and PCD hardware

3.4.5 Download Hardware Settings dialog box

Pressing 'OK' will writes the Hardware Settings back into the connected PCD.

Download To PCD
> Describes the destination PCD, it's type and channel etc. Verify that this is correct before downloading the settings. You will not be able to download the settings if the PCD type does not match the actual PCD type.

Which Settings group
> **Memory Allocation - the user program is deleted** checkbox
>> When checked, the memory will be reallocated, which deletes *all* the user programs in the PCD. This is normally only necessary if the memory size has been changed, or if memory partitioning on a multi-CPU PCD4 or PCD6 has been changed.
>> If you receive an error 'Not enough space for extended header', check this box to reallocate memory and make space for the configuration data.
>
> **S-Bus, Serial, Profi-S-Bus, TCP/IP, Gateway** checkbox
>> Downloads the communications settings.
>
> **Password** checkbox
>> Downloads the password. Note that this will *remove* password protection if the 'Password Protection' checkbox on the Hardware Settings dialog box is unchecked.

NOTES
- Changes made online to the hardware settings will *not* update the PG5's Hardware Settings file (.5hw). The changed settings can be uploaded to the project using Project Manager's 'Online / Hardware Settings / Upload' command.
- **To remove the S-Bus, Gateway, Modem and/or TCP/IP configuration**
  Uncheck the relevant checkbox on the Hardware Settings pages, then download the 'S-Bus, Serial .. Gateway' settings.
- **Operation not supported by PCD F/W version error**
  Some old hardware or firmware may not support all Hardware Settings options. This error is normally caused by one of the following :
  - S-Bus mode : old systems do not support Data Mode
  - Password : old systems do not support a password

- Extension Memory : old hardware does not have extension memory
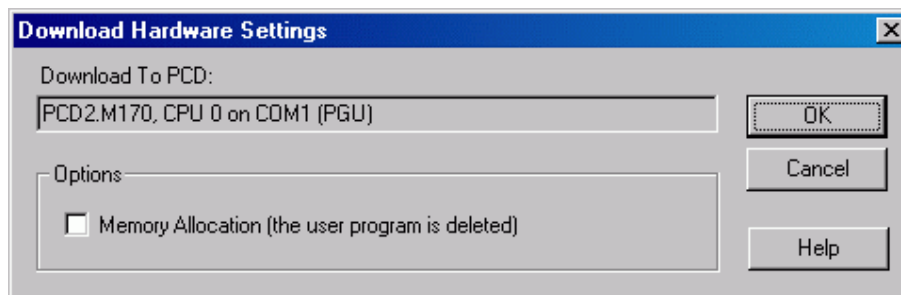For the S-Bus mode and password, a firmware upgrade may be available.

- **User memory write error**
This is usually caused by :
- missing memory chip or memory chip incorrectly inserted
- wrong type of memory chip
- wrong RAM/EPROM/FLASH jumper setting
- read-only jumper RO is in, and memory is write-protected
- USER PROG jumper (PCD2) incorrect for memory chip size

- **Changing communications settings**
If you change the PCD's communications settings, and these settings are being used for communications, you may put the PCD off line. For example, if communicating via TCP/IP and you then disable TCP/IP support in the PCD, then the PCD will go off line with a 'no response' error after the new settings are downloaded. Some firmware versions will return a 'NAK response' if you try to change communications settings which are in use.

4. Sload5 : Command-line Up/Downloader

NOTE
Users should normally use the Online Configurator, S-Conf, for up and downloading programs and hardware settings. Sload5 is an advanced tool for experienced users.

4.1   Introduction

Sload5.exe is a *command line interface* for the SAIA PCD up/downloader, for uploading and downloading SAIA PCD programs and hardware settings from the command prompt or from a batch file. It can also be invoked by other applications.

Because Sload5 command lines contain many switches, it can also be run in intercative mode, with a user interface to select the options and generate the command line text, which is then copied to the clipboard ready for pasting into a batch file.

Up/download operations require a PCD program file name (.pcd or .upl) or PCD memory image file name (.im5), and an optional hardware settings file name (.5hw) which is usually copied from the PG5 project. Instead of supplying separate file names, a single file name is used, and SLOAD5 will add the different extensions. For example, downloading the program file "C:\My Projects\My CPU\My CPU.pcd" will automatically use hardware settings file "C:\My Projects\My CPU\My CPU.5hw". This is because the PG5 Project Manager uses the same name for both files.

The hardware settings file contains the online settings (channel name, CPU number, station number etc). The hardware settings file can optionally contain the channel configuration (protocol, COM port, baud rate etc) which can be used to create a new channel on the target PC if it's not already configured. The channel settings must be added to the hardware settings file by pressing the 'Write Channel Settings To File' button. The hardware settings file is not needed if the hardware settings do not need to be downloaded and the communications channel is already defined on the target PC.

The customer who uses SLOAD5 for downloading a PCD program update will usually receive a program file, e.g. 'filename.pcd', the associated hardware settings file, e.g. 'filename.5hw', and a batch file, e.g. 'dodownload.bat', which contains the command to execute SLOAD5 with the correct command line. An indirect command filecan also be used instead of command line parameters.

Main Features
- Powerful command line for upload, download, run and restart operations.
- Download entire program or selected segments (code, text, extension memory).
- Download hardware settings or selected settings (memory allocation, S-Bus, Password).
- Upload a user program to a '.upl' file.
- Upload the hardware settings to a '.5hw' file. This can be used by the PG5.
- Upload All/Download All : saves/restores the entire PCD memory, for battery or memory change etc..
- Uses online and channel settings defined in a hardware settings file ('.5hw'), which is an editable file.
- Can create a channel if the desired channel is not already configured on the host PC. The channel configuration can be copied into the hardware settings file (.5hw), and SLOAD5 will create the channel if it does not already exist.
- Two modes of operation "batch mode" and "interactive mode". With command line switches it runs in batch mode and shows only the progress dialog box. Without the switches (or with the /GUI switch), it runs in interactive mode with a user interface for entering data and generating a command line text.
- Selectable Extension Memory Initialisation (EMI) segment: Full/Compact/None
- Options to "Copy To Flash" and "Copy From Flash".

- Can use an indirect command file instead of a command line to supply its commands, e.g.
  `SLOAD5 @"filename.cmd"`
- Can optionally put the CPU into Run after a successful download.
- Can be used to restart a CPU and put it into Run without doing a download.
- Option to use the PG5 Project Manager's upload and download dialog boxes, see the
  `/PG5DIALOGS` switch.
- Handles password protected PCDs, by using an encrypted password, see `/PASSWORD` switch.
- Can set the PCD's clock from the PC's clock.
- Serial ports COM1 to COM255 can be used, see `/COMn` switch.
- Can verify the target CPU using the CPU's unique serial number (currently PCS1.C8 only), see
  `/SERIALNO` switch.
- `/IPADDS=n.n.n.n` switch to set the TCP/IP address.

4.2   Command Line Parameters

SLOAD5 is invoked with this command line:

SLOAD5 ["*filename*"] [*switches*]

or

SLOAD5 @"*command_filename*[.cmd]"

Items in square brackets [..] are optional.

"*filename*"

The *filename* must be enclosed in double quotes. This can be the name of a PCD program file
(.pcd), PG5 hardware settings file (.5hw), or uploaded program file (.upl), depending on the
selected operation. You do not need to use an extension unless downloading a '.upl' file, because
SLOAD5 adds the file extension according to the operation. If you do use an extension, you
should use the right one: if downloading a program (`/DNLD` switch) use '.pcd' or '.upl'; if
downloading hardware settings (`/DNHW` switch) use '.5hw'; if up/downloading both a program file
and the hardware settings you can use either extension, '.pcd', '.upl' or '5hw'. For
'Upload/Download All', use '.im5'. SLOAD5 will create the file names it needs for each operation
by changing the extension.

@"*command_filename*[.cmd]"

This is the name of an indirect command file which contains the command line, preceded by an @
sign. The contents of this file is read and processed as if it was part of the command line. You can
also supply additional switches on the command line too. The default filename extension is '.cmd',
but any extension can be used. If the filename contains spaces it must be enclosed in double
quotes, e.g. `@"Command File Name.cmd"`. The command file should contain the
"*filename*" and *switches* exactly as they would be on the command line, except they can be
on one or more lines in the file.
Example:
To run SLOAD5 using command line parameters in file `command.cmd`, and force interactive
mode to be used. SLOAD5's dialog box shows the switch settings.

`SLOAD5 @command.cmd /GUI`

switches

Switches are one or more words beginning with a forward slash '/', see the list below. The switches
define the online connection, CPU and station number, and the operation(s) which will be done.
Switches can be in upper or lower case, e.g. `/DNLD` is the same as `/dnld`. Not all switches are
compatible with each other, for example, you cannot use `/UPLD` (upload program) and `/DNLD`
(download program) together, or `/COPYTOFLASH` and `/COPYFROMFLASH` together. SLOAD5 will
display an error message if incompatible or invalid switches are used.

The best way to create a command line is to open SLOAD5 in interactive mode, enter the file name and select the options you need, then press the 'Copy Command Line to Clipboard' button. This creates the command line for you, and you can then paste it into a batch file or other text document.

/ONLINE="*channel_name*"[,*cpu*[,*stn*]]
/ONLINE=PG5
/ONLINE=5HW

> This switch defines the 'online settings' - which channel, CPU and S-Bus station number will be used. If not used then the default is to use the settings from the Hardware Settings file (.5hw). *channel* must be one of these values :
>
> **"*channel_name*"** : The name of a channel which is already defined on the PC. The channel name must be enclosed in double quotes, e.g. "PGU".
>
> *cpu* and *stn* : The optional CPU and S-Bus station numbers. If the PG5 or 5HW options are used, then the CPU and station numbers are read from the Registry or '.5hw' file, but can be overridden with these options. If "*channel_name*" is used, *cpu* and *stn* will default to CPU 0 and station 0. The station number *stn* is ignored if it's not an S-Bus protocol channel.
>
> **PG5 :** Use the online settings of the currently active or last active CPU in the PG5's Project Manager. The PG5 keyword must *not* be in double quotes, e.g. use /ONLINE=PG5.
>
> **5HW :** The default if there's no /ONLINE switch. Uses the online settings and channel definition from the hardware settings file (.5hw). The PG5 always saves the CPU's 'Online Settings' in this file (see the [GoOnline] section). It does not save the channel settings. If the channel is not defined on the target PC, then SLOAD5 can create it from the channel definition in the '.5hw' file. If using PG5 V1.2, the only way to put the channel definition into the file is to use interactive mode's 'Write Channel Settings to File button. The 5HW keyword must *not* be in double quotes, e.g. use /ONLINE=5HW.
>
> Examples:
>
> To use channel S-Bus, CPU 0, station 12:
> > /ONLINE="S-Bus",0,12
>
> To use channel MyChannel, CPU 0, station 0 :
> > /ONLINE="MyChannel"
>
> To use the channel, CPU and station number defined in hardware settings file "MyFile.5hw" :
> > SLOAD5 "MyFile.pcd" /DNLD
>
> or
> > SLOAD5 "MyFile.pcd" /DNLD /ONLINE=5HW
>
> To use the Project Manager's active CPU's channel, CPU number and station (useful for add-on tools) :
> > /ONLINE=PG5
>
> **NOTES**
>
> On a PCD4 or PCD6, it is not necessary to be physically connected to the target CPU, programs can be downloaded through any CPU, but note that hardware settings can only be downloaded to CPU 0.
>
> The /ONLINE switch cannot be used with the /GOONLINE switch.

/GOONLINE="*filename*[.ini]"

> The online settings are read from the [GoOnline] section in file *filename*, which has the default file type '.ini' . This is similar to the /ONLINE=5HW setting described above, but a different file is used. The /COMn, /IPADDS, /PHONE, /STN and /FDLADDS override switches can still be used. The file's [GoOnline] section can be viewed and edited with the 'Online Settings…' button. Use the '>' browse button to choose an existing file. This switch cannot be used with the /ONLINE= switch.

/COM1 .. /COM255

> COM port override switch. To save defining a new channel for each serial COM port, this switch can be used to override the COM port in the online settings. It is used only for serial RS-232 or RS-485 channels. Only one switch is allowed on the command line.
> These switches cannot be configured from interactive mode.

/IPADDS=*n.n.n.n*

IP address override switch. Used only with TCP/IP channels. This overrides the IP address in the online settings. It is ignored for non-TCP/IP channels.
This switch cannot be configured from interactive mode.
Example:
```
/IPADDS=192.168.12.125
```

/PHONE="*nnnnn*"

Telephone number override. Overrides the telephone number defined in the online settings, if used. Used only for a dial-up modem channel. It must be enclosed in double quotes. It can contain any characters allowed by the modem, e.g. ',' = 500ms delay.
```
/PHONE="0041,,,26 666 12 34"
```

/STN=n

S-Bus station number override. Range is 0..253.

/FDLADDS=n

FDL address override switch. For Profi-S-Bus (PG5 1.3 and later) only.

/PASSWORD=*nnnnnnnn*

This switch must be provided if the PCD is password protected. *nnnnnnnn* is the encrypted password, always in hexadecimal. This is NOT the actual password. To obtain the encrypted password value, you must use SLOAD5 in interactive mode where the text of the password can be entered, and press the 'Copy Command Line To Clipboard' button to see the generated /PASSWORD= switch. The encryption is not the same as that used for the password in the '.5hw' file, the passwords are not compatible. 0=no password.
Example:
```
/PASSWORD=FAB5762C
```

/SERIALNO=*dddddddd*

The decimal serial number of the target PCD (a hex number can also be used if it begins with $0x$, e.g. $0xABCD$). This must match the serial number programmed into the PCD. This is currently only valid for the PCS1.C8, but may be introduced to other new PCD types soon. If the serial number in the PCD does not match, the operation is aborted and status PCD_WRONGCPU is returned. If the connected PCD does not have a serial number, the "NAK response" error occurs (returns PCD_NAK). 0=no serial number.
This switch cannot be configured from interactive mode.
Examples:
```
/SERIALNO=1234
/SERIALNO=0xABCD
```

/DNLD[=ALL | CODE,TEXT,EXT,INIT]

Downloads program *filename*.pcd. If /DNLD alone is used, then all segments are downloaded, including the 'first time initialisation data'. This is the same as /DNLD=ALL. To download individual segments, use one or more of the **CODE,TEXT,EXT,INIT** parameters, separated by commas.
CODE : code segment
TEXT : text/DB segment
EXT : extension memory segment (see also /EMI switch)
INIT : first time initialisation data
Examples:
To download the entire program these are all equivalent (but /DNLD on its own is easier to type) :
```
/DNLD
/DNLD=ALL
/DNLD=CODE,TEXT,EXT,INIT
```
To download the entire program without the 'first time initialisation data' use this:

```
/DNLD=CODE,TEXT,EXT
```
To download only the 'first time initialisation data':
```
/DNLD=INIT
```
To download only the extension memory segment, which is in RAM:
```
/DNLD=EXT
```

/DNHW[=ALL | MEM,SBUS,PWRD]

Downloads the hardware settings, or selected hardware settings from file *filename*.5hw. If /DNHW alone is used, or /DNHW=ALL, then all hardware settings are downloaded. The other options allow settings to be downloaded separately:

`MEM` : Memory allocation - the user program is deleted.

`SBUS` : All S-Bus communications settings: S-Bus, Serial, Modem, Profi-S-Bus, TCP/IP, and Gateway.

`PWRD` : The password setting. This will remove the password if password protection is not defined.

Examples:

To download all hardware settings from file MyFile.5hw, the user program is deleted:
```
SLOAD5 "MyFile.5hw" /DNHW
```
To download only a new password, defined in hardware settings file MyFile.5hw:
```
SLOAD5 "MyFile.5hw" /DNHW=PWRD
```
To download the hardware settings over a PGU connection to CPU 0, without deleting the user program:
```
SLOAD5 "MyFile.5hw" /ONLINE="PGU" /DNHW=SBUS,PWRD
```
NOTES

Downloading the memory allocation will delete all the programs in the PCD. For a multi-CPU system, *all* user programs in all CPUs will be deleted.

Changing the S-Bus or TCP/IP settings over an S-Bus or TCP/IP connection could put the connected PCD offline. You can re-connect using the new channel settings.

/EMI=NONE|COMPACT|FULL

Defines the 'extension memory initialisation segment' type. This switch can only be used if /DNLD or /DNLD=TEXT is used, because the EMI segment is in the PCD's Text memory. If there is no /EMI switch then the default is FULL. The EMI segment is used to re-initialise the Extension Memory Segment if it is erased because the RAM backup battery has failed.

WARNING

Normally this switch should *not* be used (defaults to FULL), unless there is not enough user memory to hold the EMI segment, or if the EMI segment is very large and you want to do a faster download.

`FULL`   : The default. Re-initialises Extension Memory using the initialisation values from the source files. All RAM Texts and RAM DBs are correctly initialised with the same data that is written when the program is first downloaded. This is the default setting.

`COMPACT` : Re-initialises Extension Memory filling all Texts with spaces, and all Data Blocks with zeros (0).

`NONE`   : No EMI segment is created, Extension Memory cannot be re-initialised. The Extension Memory Segment must be downloaded again before the program will run. This should only be used if there is not enough Text memory to hold the EMI segment.

Example:

No EMI segment, this could be used during debugging to speed up the download if there are many large texts and DBs in extension memory :
```
SLOAD5 "MyProgram" /DNLD /EMI=NONE
```

/UPLD

Uploads the user program (all segments) into a '.upl' file using the PGU channel. This is compatible with a '.pcd' file, except that it does not contain any symbol information. The '.upl' file can be disassembled by the PG5, or downloaded using /DNLD.

Example:
```
SLOAD5 "MyProg.upl" /UPLD /ONLINE="PGU"
```

NOTES

The '.upl' file does not contain any hardware settings. These must be uploaded separately using the /UPHW switch.

/UPHW

Uploads the hardware settings into a '.5hw' file. All settings are uploaded. It has the same function as the PG5's 'Upload Hardware Settings' command.

Example:

Upload the user program to MyProg.upl and the hardware settings to MyProg.5hw (it creates the '.5hw' filename), over the channel used by the PG5.

```
SLOAD5 "MyProg.upl" /UPLD /UPHW /ONLINE=PG5
```

NOTES

The hardware settings file may already exist if it is also being used to hold the online settings and channel configuration. The online settings in the '.5hw' file are not changed by saving the hardware settings in this file, because they are stored in a separate section of the INI file.

The '.5hw' file also holds the 'Software Settings' for the CPU if it's used with the PG5. The software settings are also not changed if the hardware settings are uploaded and stored in the file.

/UPLOADALL
/DOWNLOADALL

Uploads or downloads the PCD's memory image from/to a binary image file (.im5). It uploads/downloads the user program AND hardware settings, and also the values of all the media (Registers, Counters, Flags etc). On a multi-CPU system, the user programs of all CPUs are transferred.

NOTES

- The /RESTART switch is not needed for a Download All because a restart will always be done before the download starts.
- Because SLOAD5 only allows one file name on the command line, this name must be that of the image file (.im5). If a hardware settings file is needed to configure a channel, thus must be done by a previous invocation of SLOAD5.

/DCO

'Don't Clear Outputs'. When the PCD restarts (resets), it normally turns off all its outputs. Use this switch if you want the output states to be unchanged while the program or hardware settings are downloaded or a restart is done.

/COPYTOFLASH or /COPYFROMFLASH

Copies the user program to or from Flash memory. If Flash memory is not fitted, the operation will fail with a 'NAK response'. These switches cannot be used together. /COPYTOFLASH cannot be used if other switches cause the user program to be deleted.

/COPYTOFLASH copies the program and hardware settings to flash memory after downloading.

/COPYFROMFLASH will copy the program and hardware settings from flash before uploading. It is not possible to use /COPYFROMFLASH and do a download.

Example:

Download program "MyProg.pcd" to the CPU, station and channel in "MyProg.5hw", copy the user program to Flash, then put the CPU into Run :

```
SLOAD5 "MyProg.pcd" /DNLD /COPYTOFLASH /RUN
```

/RUN or /RUNALL

Puts the connected CPU or all CPUs in the connected PCD into Run. These switches can also be used on their own so the only action is to put the CPU(s) into Run (e.g. SLOAD5 /ONLINE="PGU" /RUN), or they can be used after a download to start the new program.

NOTE

/RUNALL does *not* put all CPUs on a *network* into Run, only the CPUs of the connected PCD. To put all CPUs on a network into Run, you must do a separate /RUN or /RUNALL for each station.

Examples:

To download program MyProg and put the CPU into Run via the PGU channel:
```
SLOAD5 "MyProg" /ONLINE="PGU" /DNLD /RUN
```
To only put CPU 0 in station 10 into Run using the S-BUS channel :
```
SLOAD5 /ONLINE="S-BUS",0,10 /RUN
```
To only put the CPU defined in file MyProg.5hw, using the channel defined in MyProg.5hw into Run :
```
SLOAD5 "MyProg.5hw" /RUN
```

/RESTART or /RESTARTALL

Restarts the connected CPU or all CPUs. If connected to CPU 0 then all CPUs will be restarted anyway. If using /DNLD or /DNHW you do not need to use this switch because a restart will always be done anyway. These switches are really designed to be used on their own, possibly with the /RUN or /RUNALL switches. If /RUN is not used, them the CPU(s) will remain in Stop.
NOTE

`/RESTARTALL` does *not* restart all CPUs on a network. For this you must do a separate `/RESTARTALL` for each station.
Example:
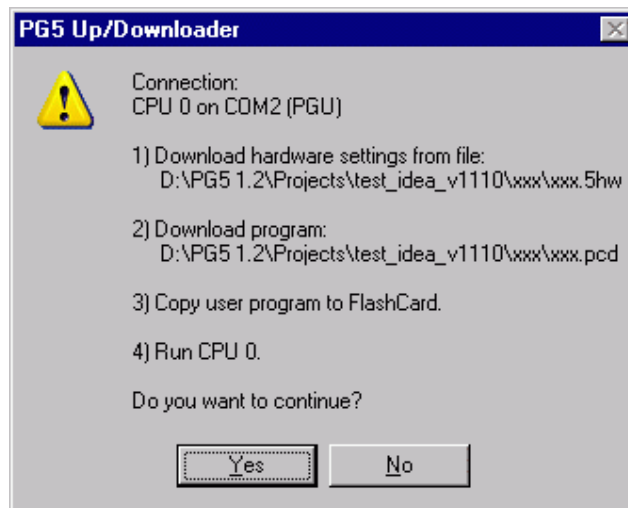To restart CPU 0 on station 10, and put it into Run, using channel "S-BUS":
```
SLOAD5 /ONLINE="S-BUS",0,10 /RESTART /RUN
```

/WARN

Warns the user if a running program will be stopped. A message box is displayed asking the user if it's OK to stop the CPU(s). This is the same as the PG5's 'General' option "Warn if program will be stopped". On multi-CPU systems, PCD4 or PCD6, all CPUs are checked, and the warning will be issued if any CPU which is running and will be stopped.

/ASK

The user will be asked if it's OK to continue. A dialog box showing the online settings and what will be done is displayed, and it asks "Do you want to continue ?" (Yes/No). Pressing "No" aborts the operation.

/SILENT

Runs SLOAD5 without displaying any message boxes even if an error occurs. The return value will show the result. Progress dialog boxes are still shown. This switch cannot be used with `/GUI` or with `/PG5DIALOGS`.

/GUI

Forces SLOAD5 to run in interactive mode. Settings from any other command line switches are displayed in the dialog box. This switch cannot be used with `/SILENT`.

/SETPG5

Configures the PG5 online settings in the Registry, so that other PG5 stand-alone tools such as S-Bug and S-Conf will use the same channel. The online settings are determined by the `/ONLINE=` switch. `/SETPG5` is not allowed if `/ONLINE=PG5` is used.

NOTE

This has no effect if S-Bug or S-Conf are already running.

/PG5DIALOGS

Forces the upload/download dialog boxes (and settings) of the PG5 to be used. These are the dialog boxes used by the PG5 Project Manager, and are an alternative user interface to the intercative mode interface. Only the CPU filename '.5pc' should be supplied with this switch. If `/PG5DIALOGS` is used then the CPU filename is required, and no other switches are allowed because all configuration of the operation is done on the PG5 dialog boxes, not by the switches. The online settings from the PG5 CPU's '.5hw' file are used. The PG5's 'Download Options' are also used.

NOTE

If the `/PG5DIALOGS` switch us used, then the other switches are not required - only the name of the CPU file (.5pc) is required.

/SETCLOCK

Sets the real-time clock in the PCD from the clock in the PC. This is always done first, before any upload or download operation.

NOTES

If several operations are done, the order is always the same regardless of the order of the command line switches.

For downloads:

a) download hardware settings (always does a restart first)
b) download program (always does a restart first)
c) copy to flash
d) run

For uploads:

a) restart (CPU stays in Stop)
b) copy from Flash
c) upload hardware settings
d) upload program
e) run

For restart and run:

a) restart
b) run

4.3 Return Values

SLOAD5 returns 0 (PCD_OK) if the operation was successful, or the one of the communication driver return values if it fails. The most common return values will be PCD_NORESP (6) if the PCD cannot be connected, or PCD_CANCEL if the user presses the 'Cancel' button. Any non-zero return value means that one or more of the requested operations has failed. The state of the PCD and it's user program should be checked.

The return value can be accessed through the ERRORLEVEL variable in a batch file. "IF ERRORLEVEL *n*" is true if ERRORLEVEL is equal or greater than the value '*n*'. See the example batch file below.

Value	Description	ScommDLL Name
0	Operation successful (0)	PCD_OK
1	NAK response, command not accepted (1)	PCD_NAK
3	Invalid BCC or CRC, bad or unreliable connection (3)	PCD_BCCERR
4	Invalid response (4)	PCD_INVALID
5	Bad connection between P800 and PCD6 (5)	PCD_P8CONN
6	No response, cannot connect to the PCD (6)	PCD_NORESP
8	No Data Carrier Detect (8)	PCD_NODCD
9	Port in use in another mode or baud rate (9)	PCD_INUSE
10	Bad parameter (10)	PCD_BADPARM
11	PCD memory write verify error (11)	PCD_VERIFERR
12	IBM PC out of memory (12)	PCD_OUTOFMEM
13	Physically connected to wrong CPU on PCD6, or connected CPU has wrong Serial Number (13)	PCD_WRONGCPU
14	CPU not present (14)	PCD_NOCPU
15	PCD to flash failed on M170 (15)	PCD_TOFLASH
17	Can't open file (17)	PCD_CANTOPEN
18	Error writing to file (18)	PCD_WRERROR
19	Error reading file (19)	PCD_RDERROR
20	Invalid PCD file (20)	PCD_BADFILE
21	PCD file checksum error (21)	PCD_CSERROR
22	Invalid header in PCD (22)	PCD_BADHDR
23	Not enough space in code segment (23)	PCD_CODESIZE
24	Not enough space in text segment (24)	PCD_TEXTSIZE
25	Extension memory segment too small (25)	PCD_EXTSIZE
26	Header not initialised (26)	PCD_NOTINIT
27	Can't write EPROM memory (27)	PCD_EPROM
28	Operation cancelled by user (28)	PCD_CANCEL
30	CPU must be in Stop or Halt (30)	PCD_RUNNING
31	CPU not programmed (31)	PCD_NOTPROG
34	Can't change size of extension memory (34)	PCD_NOCHGEXT
35	Could not open the channel (35)	PCD_NOTOPEN
36	Write to PCD failed (36)	PCD_TXERROR
37	Port request timeout (37)	PCD_COMBUSY
40	Port is in use by another application (40)	PCD_LOCKED
44	Fatal internal error (44)	PCD_BUG
45	Operation not supported by PCD F/W version (45)	PCD_NOTSUP
46	Station number already defined (46)	PCD_ALRDYDEF
47	Not enough space for extended header (47)	PCD_EXTHDR
48	Invalid password (48)	PCD_BADPWRD
49	Extended header checksum error (49)	PCD_EXTHDRCS
50	Download to wrong S-BUS station ($STN) (50)	PCD_WRONGSTN
51	Download to PCD with wrong firmware ($PCDVER) (51)	PCD_WRONGFW
52	S-BUS Parity mode not supported by this COM port (52)	PCD_NOPARITY
54	RTS/CTS mode is not supported for this COM port (54)	PCD_NORTSCTS

Other values can be returned by DOS, these are the most common :

128	DLL not found	-
9009	EXE file not found, the path for SLOAD5.EXE is incorrect	-

NOTE

All other non-zero return values should be treated as an error.

4.4   Example Batch File

This example batch file will download three programs into three stations on a small S-Bus network. It creates a log file which contains the error codes if any download fails. It cancels the operation if the user presses 'Cancel' on one of the progress dialog boxes. The batch file must be in the project directory, with all CPU files in subdirectories, e.g. the project directory contains subdirectories "STN 0", "STN 1" and "STN 2", which contain the PCD files to be downloaded.

To save repeating the same download code, the FILENAME value and the return label RETURNTO are assigned before jumping to the DOWNLOAD label. It returns to the label assigned to RETURNTO, unless the user presses 'Cancel'. Because "IF ERRORLEVEL *n*" is true for ERRORLEVEL values of *n* and above (not only for *n*) then it must check for the value above PCD_CANCEL (29), before checking for the PCD_CANCEL value itself (28).

Tip: You can download from or upload a ZIP file (compressed file) by using WinZip or other suitable compression utility, and placing the zip/unzip commands in the batch file which runs SLOAD5.

```
----
@ECHO OFF

REM EMPTY THE LOG FILE
ECHO DOWNLOAD LOG FILE > LOGFILE.TXT

SET FILENAME=".\STN 0\STN 0.PCD"
SET RETURNTO=1
GOTO DOWNLOAD

:1
SET FILENAME=".\STN 1\STN 1.PCD"
SET RETURNTO=2
GOTO DOWNLOAD

:2
SET FILENAME=".\STN 2\STN 2.PCD"
SET RETURNTO=END

:DOWNLOAD
REM DO THE DOWNLOAD, RETURNS TO LABEL IN VARIABLE 'RETURNTO'
"C:\PROGRAM FILES\SAIA-BURGESS\PG5 1_2\SLOAD5.EXE" %FILENAME% /DNLD /ONLINE=5HW
REM GREATER THAN PCD_CANCEL?
IF ERRORLEVEL 29 GOTO FAILED
REM PCD_CANCEL?
IF ERRORLEVEL 28 GOTO CANCELLED
REM ALL OTHER ERRORS >= 1
IF ERRORLEVEL 1 GOTO FAILED
GOTO %RETURNTO%

:FAILED
ECHO FAILED TO DOWNLOAD %FILENAME%, ERRORLEVEL=%ERRORLEVEL% >> LOGFILE.TXT
GOTO END

:CANCELLED
ECHO OPERATION CANCELLED >> LOGFILE.TXT

:END
TYPE LOGFILE.TXT | MORE
----
```

4.5   Interactive Mode

Interactive mode is only for creating and testing command lines for Sload5.

NOTE

The interactive mode dialog box is shown if only if the `/GUI` switch is used. The dialog box fields are filled in from the file name and any other switches on the command line or in the command file. All fields and checkboxes on this dialog box have equivalent command line switches. For more information, please refer to the switch descriptions

The up/download procedure can be configured and started interactively using this dialog box, or this dialog box can be used just to create a command line text and copy it to the clipboard so it can be pasted into a batch file.

Files group

File Name (.pcd .upl .5hw .5pc .im5)

The file name depends on the selected operation. For a program download, this can be the name of the PCD file to be downloaded (.pcd), or the name of the CPU file whose program is to be downloaded (.5pc). For a hardware settings download it can be the name of the hardware settings file (.5hw) or the name of the CPU file (.5pc).

For uploads it is more strict. For a program upload, it must be the name of the destination file (.upl). For a hardware settings upload, it must be the name of the destination hardware settings file (.5hw). For 'Upload/Downlad All' it should be the name of a memory image file (.im5).

In some cases, two files are needed. The '.pcd' program file and the '.5hw' hardware settings file (the online and channel settings can be read from the '.5hw' file). You can enter either file name, or the name of the CPU file (.5pc). SLOAD5 will always create the required file names by changing the extension.

For 'Upload/Download All', the filename must be the name of the image file (.im5).

Browse… button

Displays the 'Brwose for File' dialog box so an existing file can be located. This is similar to the standard Windows 'File Open' dialog box.

Hardware Settings… button

If a file name has been entered which is the name of a '.5hw' hardware settings file, or a '.pcd' or '.5pc' file which has a '.5hw' file in the same directory, then pressing this button will open the PG5's 'Hardware Settings' dialog box, which allows the hardware settings file to be viewed and/or modified.

Edit .5hw File button

This opens the '.5hw' hardware settings file using Notepad, so it can be viewed or edited as a text file. The '.5hw' file is actually a standard Windows INI file.

NOTE

This is for advanced users only, who know the format of the '.5hw' file, which is not documented. Normally you should edit the hardware settings file by pressing the 'Hardware Settings' button.

If you edit the file from Notepad and change the [GoOnline] section or Password= setting, and SLOAD5's 'From' setting is 'Use Settings in .5hw file' (see below), then the displayed Online Settings will NOT be updated because SLOAD5 does not know that the '.5hw' file has been changed. To update the displayed Online Settings, you must press the 'Hardware Settings' button, then 'OK'.

Online Settings group

This section defines the online settings to be used for communications. The settings can be supplied in one of four ways, depending on the 'Get Online Settings From' setting:

- on the command line
- in a CPU's Hardware Settings file (.5pc)
- from the PG5's last active CPU's online settings
- from a [GoOnline] section in an 'ini' file

Get Online Settings From:

This defines where the online settings will be obtained. It has three options:

Hardware Settings File (.5hw)

This is the default setting. The online settings are taken from the `[GoOnline]` section of the Hardware Settings file named in the 'File Name' field. This enables the 'Write Channel Settings to File' button, which you can use to transfer the channel settings to the '.5hw' file.

Switch: `/ONLINE=5HW`

Definitions Below

The settings are defined on this dialog box in the 'Channel Name', 'S-Bus station', 'CPU' and 'Password' fields below.

NOTE

This cannot be used to define 'S-Bus Modem' and 'SOCKET' channels because these need a telephone number or an IP address, so you must use the 'Hardware Settings File (.5hw)' to define these channels.

Switch: `/ONLINE="channel_name",cpu,stn`

PG5 Online Settings (Active CPU)

The online settings of the PG5 Project Manager's active CPU are used. If the PCD is password protected, you must also enter the password. If the PG5 Project Manager is not running, then the settings of the last active CPU are used. This can be useful if running SLOAD5 as a Project Manager 'Add-on Tool', or from Project Manager's customized Tools menu.

Switch: `/ONLINE=PG5`

File with [GoOnline] section

The online settings are read from the `[GoOnline]` section of the file given in the 'File with [GoOnline] section' field. Press the '**>**' browse button to choose an existing file. Press the 'Online Settings…' button to view the settings or create a new file containing the settings. The 'Write Channel Settings to File' button can be used to write the channel settings to the file.

Switch: `/GOONLINE="filename"`

Online Settings… button

This displays the 'Online Settings' dialog box, showing the configuration of the selected channel. If the file does not exist, it can be created by answering 'Yes' to the 'File does not exist, do you want to create it?' message box.

NOTE

If you modify the channel settings, then you may need to press the 'Write Channel Settings to File' button again to update the channel configuration in the hardware settings or GoOnline section file.

File with [GoOnline] section

If 'File with [GoOnline] section' was selected in the 'Get Online Settings From:' field, then enter the name of the file which contains the [GoOnline] section. The [GoOnline] section is the same as that in a standard hardware settings file (.5hw).

The following three fields are enabled when the 'Get Online Settings From: Definitions Below' is selected.

Switch: `/ONLINE="channel_name",cpu,stn`

Channel Name

The name of channel, which must be defined on the target PC.

CPU

The CPU number, normally 0. You can download to another CPU on a PCD4 or PCD6 containing more than one CPU.

NOTES

On the PCD6 you do not have to be connected to the correct CPU.

Hardware Settings can only be downloaded to CPU 0.

S-Bus Station

The station number, or "None" if it's not an S-Bus station. The station number is only used if S-Bus communications protocol is used. SLOAD5 verifies that the correct S-Bus station is connected. For PGU protocols, the station number is set to "None".

Password

If the PCD is password protected, enter the password here. It is encrypted and re-displayed as "******". If a `/PASSWORD` switch is generated, the encrypted password is used, not the actual password, so the user never sees the actual password. Password protection is restored after the up/download is complete, or if it's aborted.

The encryption is not the same as that used for the password in the '.5hw' file, the passwords are not compatible.

Switch: `/PASSWORD`

Write Channel Settings to File button

This is enabled if 'Get Online Settings From:' 'Hardware Settings File' or 'File with [GoOnline] section' is selected. Normally the file will not contain the channel configuration, because channel settings are stored in the Registry on the PC, and the file contains only the channel name. If the target PC does not have the channel settings defined, press this button to write the channel configuration to a section in the file. When SLOAD5 runs, it will use this data to configure the channel in the Registry of the target PC if the channel is not already defined.

Channels… button

Displays the 'Channels' dialog box, showing the channels configured on the host PC. Channel settings can be edited, channels deleted or new channels created. You can use this to create and configure a new channel before pressing the 'Write Channel Settings to File' button - but don't forget to first select the new channel in the 'Channel Name' combobox.

Download radio button and group

Only one upload or download operation can be selected. It's also possible to have none of these operations selected if you only want to do a Restart, Run, 'Copy To/From Flash' or 'Set Clock' operation.

Switch: `/DNLD[=ALL | CODE,TEXT,EXT]`

Program checkbox

The program will be downloaded from the '.pcd' (or '.upl') file. By default all segments are downloaded (the entire program). Individual segments can be selected if required.

Code Segment

The segment containing the program (all the COBs, FBs, PBs etc).

Text Segment

Texts, DBs and DBXs. Also contains the Extension Memory Initialisation (EMI) segment. To download the EMI segment you must have 'Text Segment' checked.

Extension Memory

The segment containing the RAM texts and DBs. This is often downloaded separately if the RAM battery failed an extension memory was corrupted, and the CPU does not contain an EMI segment, see the 'EMI Segment Type' switch below.

First Time Init Data

First time initialisation data values. Registers, Flags, Timers and Counters can have initialisation values which are written when the program is downloaded. They are defined using the '**:=**' assignment in the source module where the symbol is defined. Select this option if you want these values set to their startup values. This should normally be checked, but you may want to un-check it if you do not want to values reset. For Fupla programs this should always be checked.

Example of first time initialisation value definition in IL:

`MySymbol EQU R 123 := 0   ;first time init value is 0`

NOTE

These values are initialised only once, when the program is downloaded, and NOT every time the program starts.

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EMI Segment Type

Extension Memory Initialisation segment type. The EMI segment contains data which is used to re-initialise the Extension Memory (RAM) if the backup battery has failed or if the RAM memory chip was changed.

Switch: `/EMI`

Full

The default setting. All Text and DB data is restored. Normally this should be selected.

Compact

Texts and DBs are restored, but Texts will contain spaces and DBs with contain zeros. Use this only if Texts and DBs will be initialised by the user program.

None

Extension memory is not re-initialised by the PCD. If the RAM becomes corrupted the user program will not run until extension memory is restored by downloading the Extension Memory segment.

NOTE

Normally this should always be set to **Full**. Only use Compact or None if user memory is too small to hold the full EMI segment, or if the EMI segment is very large and you want to do a faster download. If possible, use a larger memory chip in the PCD to hold the full EMI segment.

Hardware Settings checkbox

Check this to download the hardware settings before the program is downloaded. The hardware settings are defined in the associated '.5hw' file. Which settings are downloaded can be defined with the checkboxes below.

Switch: `/DNHW [=ALL | MEM,SBUS,PWRD]`

Memory Allocation

Downloads the memory map. This will delete *all* the user programs in the PCD. If it is a multi-CPU system (PCD4 or PCD6), then the user programs of each CPU must be downloaded afterwards.

Switch: `/DNHW=MEM`

S-Bus

Downloads the communications settings, S-Bus station no., Serial, Modem, Profi-S-Bus and Gateway.

Switch: `/DNHW=SBUS`

Password

Downloads the password. Note that this will *remove* password protection if the 'Password Protection' checkbox on the Hardware Settings dialog box is unchecked.

Switch: `/DNHW=PWRD`

WARNING

If connected via an S-Bus, Modem, TCP/IP or Gateway connection, then changing the S-Bus, Modem, TCP/IP and/or Gateway configurations will probably put the PCD off line. You can reconnect by modifying the Online Settings. The hardware settings will have been correctly downloaded because the new settings are only used after the restart is done once the settings have been downloaded, but the user program will NOT have been downloaded, because this is done after downloading the hardware settings.

Upload radio button and group

Selects what will be uploaded.

Program

The user program (all segments) is uploaded into a '.upl' file. This file can be disassembled using the PG5's 'Tools/Disassembler' command, or can be downloaded back into the PCD. Enter the name of the '.upl' file in the 'File Name' field.

Switch: `/UPLD`

Hardware Settings

The hardware settings are uploaded into a '.5hw' file. Enter the name of the '.5hw' file in the 'File Name' field. This file can be view/edited by pressing the 'Hardware Settings' button. It is the same format as the PG5's hardware settings file.

Switch: `/UPHW`

Upload All and **Download All** radio buttons

These commands upload or download an image of the entire PCD memory. It includes the user program(s), hardware settings and all media values (Registers, Counters etc). 'Upload All' is often done before changing a battery or memory chip, followed by a 'Download All' to restore the memory. On a multi-CPU system, the user programs of all CPUs are transferred.

Switches: `/UPLOADALL` and `/DOWNLOADALL`

Options group

These options provide some control over the up/download operation, or provide additional operations other than upload and download.

Don't Clear Outputs

Normally the PCD turns off all its Outputs when it is reset (when a restart is done). Check this if you want the Outputs to stay in their current states. This is often done for HEAVAC or building management systems, to prevent lights and heating being turned off. PCDs with very old firmware may not support this feature. A warning will be issued if this is checked and the connected PCD does not support it.

If the PCD has an RO jumper fitted (Rest Outputs), then this setting will override the jumper.

Switch: `/DCO`

Set PG5 Online Settings

The PG5 stores the online settings of Project Manager's active CPU in the Registry. When these applications are started they will use these online settings by default: S-Bug (Online Debugger), S-Dat (Data Transfer) or S-Conf (Online Configurator). Check this option to allow the batch file to select the online settings defined in a hardware settings file. If the channel does not exist it will be configured.

Switch: `/SETPG5`

WARNING

Do NOT use this option for a tool which is run from the PG5's Project Manager (e.g. as 'Add-on Tool' or from the customised Tools menu), because it may change the active CPU's online settings, which are only set by Project Manager when the CPU is first activated.

Warn if CPU Running

If this is checked, and the operation will cause a running CPU to be stopped, then a message box will be displayed to warn the user and ask if it's OK to continue. Pressing 'No' aborts the operation. This is the same as the PG5's 'General' option "Warn if program will be stopped". On multi-CPU systems, PCD4 or PCD6, all CPUs are checked, and the warning will be issued if any CPU is running and will be stopped.

Switch: `/WARN`

Ask User Before Starting

If checked, then a message box describing the target PCD and operation to be done is displayed, with a 'Cancel' button. It is a good idea to show this because the user can verify that the up/download will be done with the correct PCD. It is especially useful on a network, where is it easy to connect to the wrong station or CPU.

Switch: `/ASK`

Copy To Flash Memory

Copy From Flash Memory

In a PCD with Flash memory fitted, these commands cause the entire user program memory (code, text and extension) to be copied to or from the Flash memory.

Switches: `/COPYTOFLASH` or `/COPYFROMFLASH`

Restart

Restart All CPUs

Restarts the connected CPU or all CPUs. If connected to CPU 0 then all CPUs will always be restarted - 'Restart CPU 0' is the same as 'Restart All CPUs' on a multi-CPU system (PCD4 or PCD6 only).

NOTES

If doing a download or program or hardware settings then you may not need to use these options because a restart will always be done anyway. 'Restart All CPUs' does *not* restart all CPUs on a network. For this you must do a separate 'Restart All CPUs' for each station.

Switches: `/RESTART` or `/RESTARTALL`

Run

Run All CPUs

Puts the connected CPU or all CPUs in the connected PCD into Run. These can also be used on their own so the only action is to put the CPU(s) into Run, or they can be used after a download to start the new program.

Switches: `/RUN` or `/RUNALL`

NOTE

'Run All CPUs' does *not* put all CPUs on a network into Run. For this you must do a separate `/RUNALL` for each station.

Use PG5 Dialog Boxes

Forces the upload/download dialog boxes of the PG5 to be displayed. These are the dialog boxes used by the PG5 Project Manager, and are an alternative user interface to the interactive mode interface. If checked, then the CPU filename is required, and no other download operations can be done at the same time.

Switch: `/PG5DIALOGS`

Set Clock From PC

Sets the PCD's real-time clock from the clock in the PC. This is always done first, before any upload or download operation.

Switch: `/SETCLOCK`

Copy Command Line to Clipboard button

SLOAD5's command lines can be long and contain many switches. The easiest way to create a command line is to configure the desired operation using SLOAD5 in interactive mode, and then press the 'Copy Command Line to Clipboard' button to copy the full command line to the clipboard. The command line can then be pasted into the batch file or other text file by pressing **Ctrl+V** or using the application's 'Paste' command.

NOTES

File names in the generated command line will not have paths. If you need relative paths, then you must edit the command line. It is assumed that the files will be in the current directory when the command or batch file is run. Paths on the target PC may not be the same as those on the PC which is generating the command line, so using full path names would not work.

SLOAD5 does not check that the required files exist before generating the command line because the command may be designed to run on another PC where the file does exist.
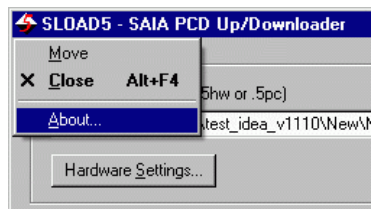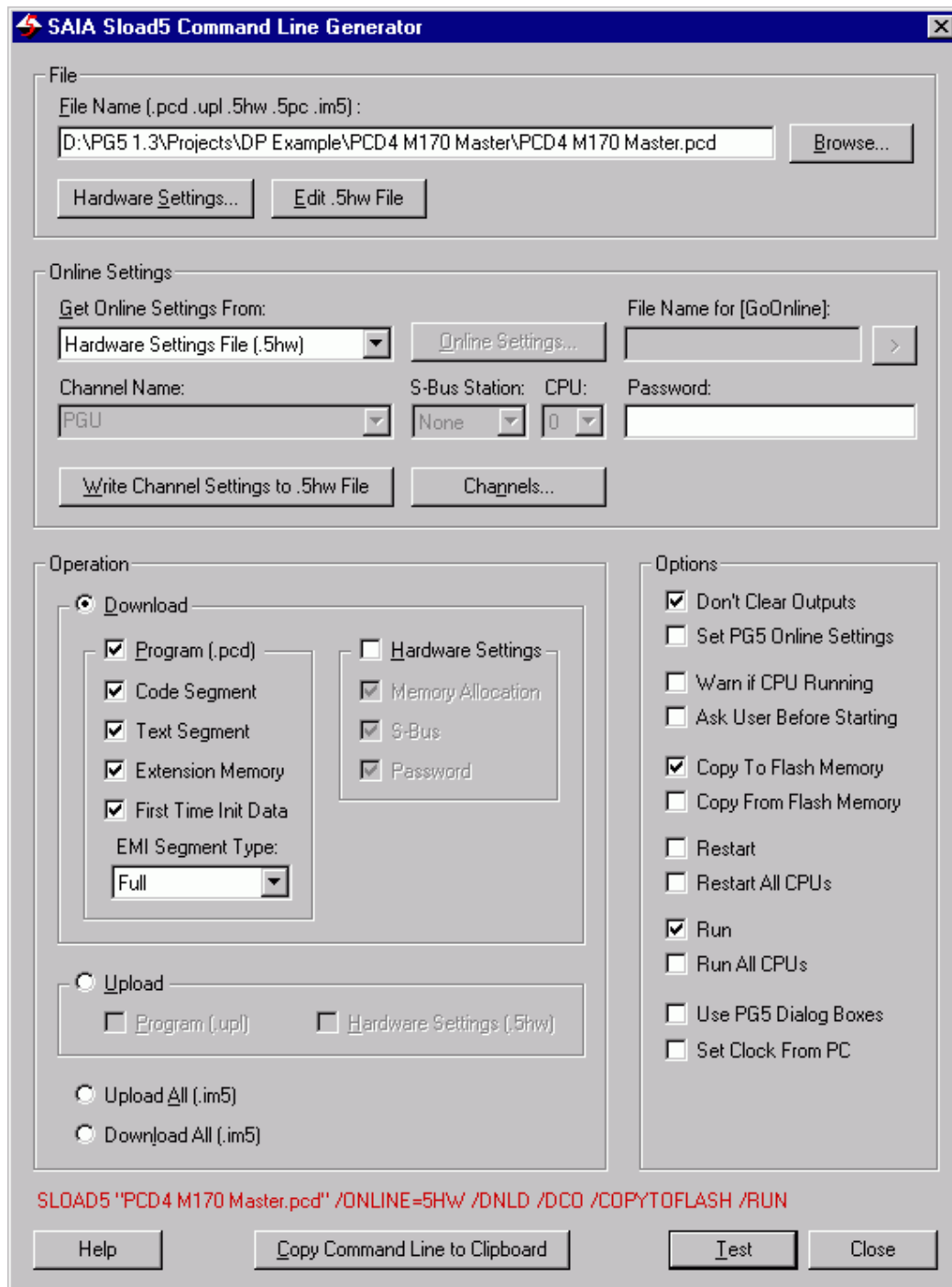
Test button

Use this to test your configuration. It starts the operation defined in the Download or Upload and/or the General Options sections. If 'Ask User Before Starting' (`/ASK`) is checked, then a dialog box describing what will be done is displayed, which must be confirmed by pressing **OK** before the operation begins.

Close button

Closes SLOAD5.

The **About** dialog box is displayed from the System menu, click on the icon to the left of the title bar:

Interactive mode

4.6 Progress dialog box

The progress dialog box is displayed during a download or upload operation. It is displayed in both interactive and batch mode.
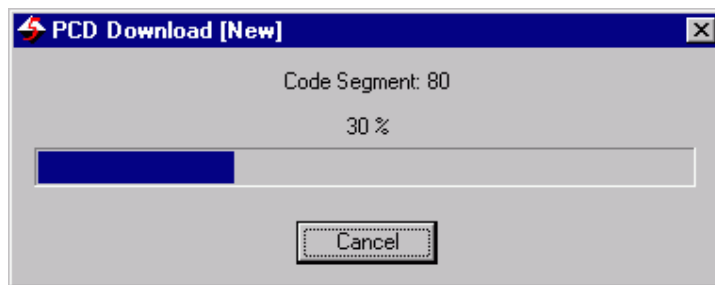
It shows the action and percentage complete, and has a 'Cancel' button which can be used to abort the operation.

The name of the hardware settings/PCD file/UPL file/CPU file is shown in square brackets on the title bar, e.g. **[New]** in the picture below.

In batch mode, only the progress dialog box is shown.

NOTES
- If the communications driver is busy, then pressing 'Cancel' may not have an immediate effect. For example, during a Restart operation the 'Cancel' button will not work immediately - but the operation *will* be cancelled as soon as the restart is complete.
- The 'Copy to Flash' and 'Copy from Flash' operations *cannot be cancelled*. Once started, these are controlled by the PCD firmware, and SLOAD5 only polls for the completion status.
- 'Copy to Flash' may take a long time. SLOAD5 does not know how long it will take, and for very large programs it may reach 100% some time before the copy is actually finished.
- The % complete indication is for the displayed operation only, it is not a summary indication of all the operations, so you may see it go from 0% to 100% several times during a sequence of operations. For example, once for 'Downloading Hardware Settings…', once for 'Downloading Program…', and once for 'Copying to Flash…'.

4.7 Browse For File dialog box

This dialog box is displayed by pressing the '**>**' browse button next to the 'File Name' field. It is not just for finding files, it can also be used to do many other things depending on your operating system and installed applications, for example you can:

    - create directories
    - delete files
    - cut/paste/copy files
    - rename files
    - rename directories
    - send files to Floppy A:
    - compress files
    - open files with another application, e.g. Notepad
    - scan for viruses (if you have a suitable scanner installed)
    - drag-and-drop files

Because this dialog box is supplied by the operating system, it varies between different versions of Windows, the actual style and layout may not be the same as in the picture below, but the functionality will be similar.

The dialog box can be resized by dragging the gripper in the lower right-hand corner, or by dragging the border.

Look in

    Selects the directory whose files are shown in the window below. The first two tool buttons can be used to move to the previous directory or up the directory tree.

Tool buttons

    {bmc FileOpenButton1.bmp} Moves back to the previously selected directory.

    {bmc FileOpenButton2.bmp} Moves up to the parent directory.

    {bmc FileOpenButton3.bmp} Creates a new directory.

    {bmc FileOpenButton4.bmp} Selects the files window display format.

    The most common display formats are:

    Icons - shows large icons for each entry with filename underneath).

    List - shows a small icon for each entry with the name on the right).

    Details - shows the size and date of each file and other information in sortable columns. The 'Details' view is often the most useful. Columns can be sorted by clicking on the window header, e.g. click on 'Type' to sort by file type. Which columns are displayed can be selected by right-clicking on the header to show a context menu.

Files window

    This shows all the files in the directory selected in the **Look in** field which match the filter defined by the **File name** or **Files of type** fields. It also shows all the subdirectories. Click on a file to select it. To open a subdirectory, select it an press the 'Open' button, or just double-click on it. Right-click on an entry to display the context menu which allows various operations on the file or directory.

    Click on a name to open it for editing – this is not such a nice feature, it would be better to use the context menu command for this.

    Press 'Del' to delete the file (move to Recycle Bin), or Shift+Del to permanently delete the file.

File name

    This field has two uses.

    a) It shows the name of the file which you wish to open. Enter the file name, or click on the desired file in the files window. Press 'Open' to open the file.

    b) It can be a filter for the file names displayed in the files window. Enter a partial file name containing the wildcard characters * and ?. This will act as a filter, showing only the files which match the file name entered here. E.g. `*.pcd` will show all files with type '.pcd'.

Files of type

    A drop-down listbox which contains filters for certain file types. The contents of this listbox will depend on what type of file you are supposed to be opening. If you select anything other than 'All Files (*.*)' then only files of that type will be shown in the files window.
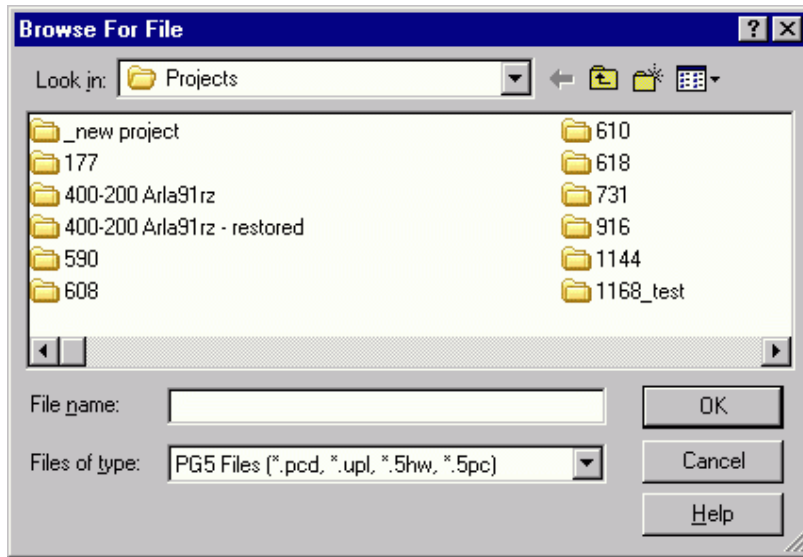
Context menu

    This is displayed by right-clicking in the files window. It shows all the commands which are available to act on the selected file or directory. The actual contents of this menu will vary according to your operating system and which applications you have installed.

Open button

    This button has two uses.

    a) If the File name field contains a valid file name, it will open the file.

    b) If a subdirectory is selected in the files window then it will open the subdirectory and show its files.

Browse For File

Look in: Projects

_new project
177
400-200 Arla91rz
400-200 Arla91rz - restored
590
608
610
618
731
916
1144
1168_test

File name:

Files of type: PG5 Files (*.pcd, *.upl, *.5hw, *.5pc)

OK

Cancel

Help

5. S-Dat : Data Transfer Utility

5.1   Introduction

S-Dat is a program for saving and loading a PCD's Register, Flag, Timer, Counter, Input/Output and/or Data Block values to/from text files.

It has two modes, interactive mode and command line mode. In interactive mode, it has a built in text editor for viewing, modifying or creating the address and data files which define the addresses and data to be up or downloaded. Command line mode up/downloads files using a command line and shows only the 'progress' dialog boxes.

Warning

It can be dangerous to download data into a running PCD because changes to the data are not synchronized with the execution of the program, and the program may react in unexpected ways as the data is changing. To be safe, you should ensure that the program is stopped while downloading the data. This can be done using the new $STOP/$RESTART directives, or the PCD's Run/Stop switch if the PCD has one. The PG5's Online Configurator also has Run/Stop/Restart buttons. Alternatively, use a control flag to indicate to the user program that the data is changing or has been changed, see How to use Recipes for details.

New features

The latest version of S-Dat has many improvements over the previous version:

- Improved command line :
  - Now has many switches for defining the online settings, such as /ONLINE="*channel*" and /STN=123.
  - Can upload more then one range of the same data type, e.g. R0-9 R100-199 R 4000-4099H (the old version allowed only one range for each type).
  - /STN=n and /SERIALNO=n switches to identify the target PCD and prevent data files being downloaded into the wrong PCD.
- $RUN, $STOP and $RESTART directives. These can be put into the file to control the PCD's program execution during the data download.
- $SKIP..$ENDSKIP directives. These can be used to delimit text which is to be ignored.
- $STN=n and $SERIALNO=n directives to identify the target PCD and prevent data files being downloaded into the wrong PCD.
- Improved parser :
  Now accepts any delimiters between address and data values. Much faster for large files.
- Uploads and downloads are faster, especially for Data Blocks.
- Can now upload using addresses in a data format file, data and address formats are compatible.
- /APPEND switch, allows data to be uploaded and appended to an existing file. Useful for data logging to a single log file.
- New 'Syntax Check' toolbar buttons.
- Much better error messages for syntax errors.
- The caret is now moved to the location of the syntax error.
- Syntax error messages are now displayed on Status bar in red.
- The caret's line and column are now shown on the Status bar, e.g. "Ln 123 Col 45".
- Shows INS/OVR on status bar to indicate Insert or Overwrite mode.
- Upload and download dialog boxes now show the channel settings and have a '>' button which allows the channel settings to be modified.
- New 'Find' and 'Replace' commands.
- New 'Tools' menu for 'Syntax Check', 'Channels' and 'Options' commands. (Syntax Check and Options were on the Edit menu, which was not the logical place for them.)
- New 'Window / Close All' command.
- Now has a context menu, displayed by right-clicking on a document.

- Supports drag and drop of '.dt5' files into its main window.
- Saves/restores printer settings.
- Print Preview.

Data transfer files ('.dt5')

Data to be read or written is defined in text files, with extension '**.dt5**'. See Data Transfer File Formats for more details. This file has two formats:

A *data format* file contains the data to be written to the PCD or data which has been read from the PCD. S-Dat creates a data format file when data is uploaded, and processes a data format file when data is downloaded.

An *address format* file contains the definition of which data is to be uploaded from the PCD, and optionally which units are to be used. S-Dat processes an address format file to provide the types and addresses of data to be uploaded.

A data format file can also be used to provide addresses for uploading, so it's possible to download a data format file, then upload the data using the same file.

Defining addresses of data to be uploaded

There are three ways to define data to be uploaded:

1) create an address format file and run the 'Online / Upload Data From PCD' command to upload and store the data in a 'data format' file.

2) Use the 'Quick Data Upload' dialog box to select data types and defined the address ranges.

3) Supply the addresses on the command line.

Interactive and command line mode

S-Dat can be run in two modes, interactive mode and command line mode. If opened from the PG5's Project Manager, it will run in intercative mode. If run from the command prompt with command line parameters it will show only the Upload or Download dialog boxes, without the main window.

Integration with the PG5 Project Manager

Data transfer files can be added to the Project Manager's 'Project Tree'. Double-clicking on the file will open the file in S-Dat.

Communications Channel

By default, S-Dat uses the communications channel of the active CPU in Project Manager. If you run S-Dat from the command prompt, the channel can be defined on the command line.

NOTE

If you change the channel from S-Dat's 'Online Settings' menu command it will *not* change the active CPU's channel settings. This only affects S-Dat for the current session, if you close S-Dat and re-open, S-Dat's channel will revert to the active CPU's channel setting.

Recipes

A 'recipe' is a set of data which can configure the program in the PCD. Downloading a 'recipe' will change data values and change the way the program runs. This is a powerful concept, and can be used in many different ways, depending on the application. For example, different PID control data can be downloaded to change control characteristics, or different Register or DB values could control the amounts of materials used in a process. The recipe would be defined in an S-Dat 'data format' file which can be downloaded into the PCD to change the process.

See How To Use Recipes for more details.

Data Blocks (DBs)

The size of a DB cannot be changed during Run. If the size of a DB to be downloaded is not the same as the DB already in the PCD, then a new DB will be created. This cannot be done if the PCD is in Run.

Data Blocks 0..3999 may be in EPROM or Flash memory, depending on the PCD's hardware. DB data cannot be downloaded into EPROM or Flash memory. DBs 4000..8191 are in RAM memory, and can be downloaded unless they are new DBs or their size has changed..

NOTE

In earlier versions of S-Dat, it was possible to supply fewer values than the DB size, and the remaining values were set to zeros. This is no longer possible. The exact number of values must be supplied, or supply no values to set the DB to all zeros.
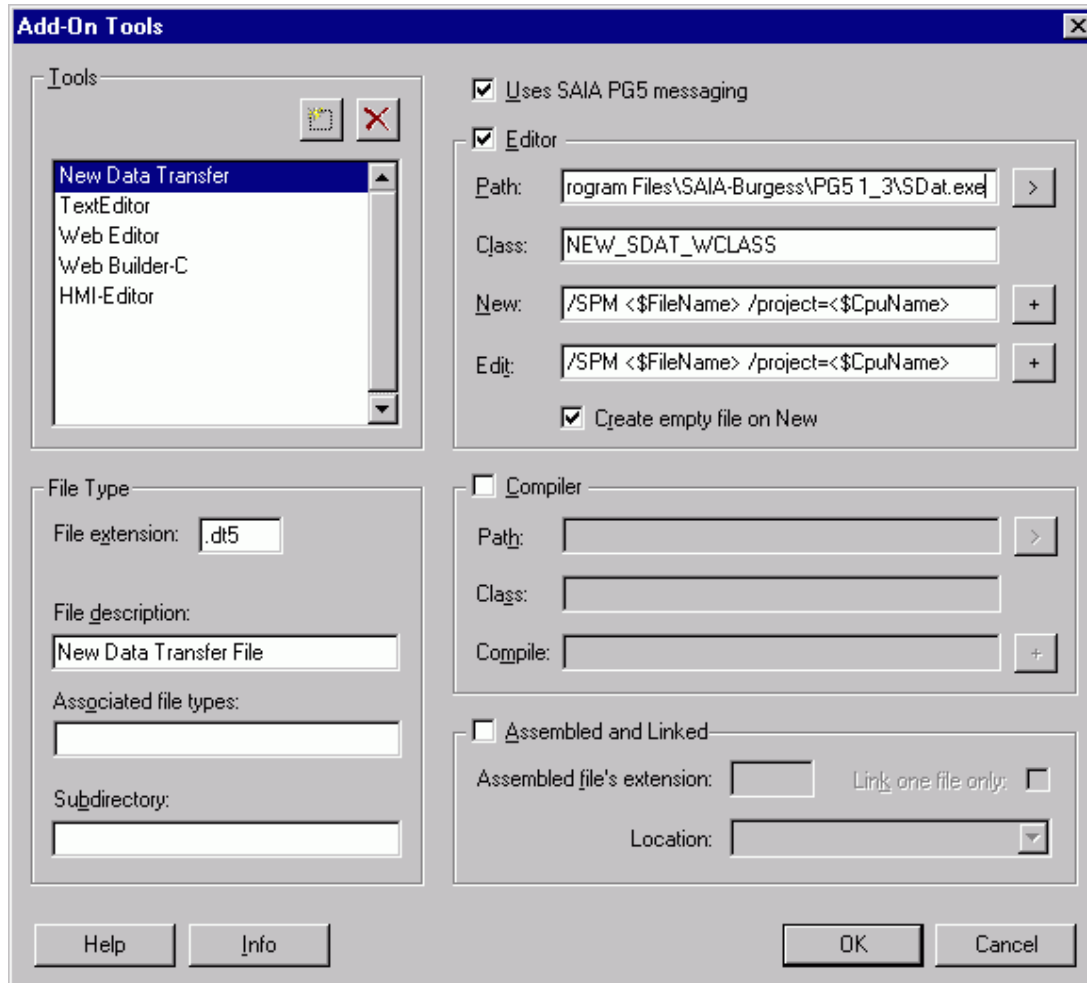
```
DB 10 [5] 1,2,3      ;error, 5 values are required
DB 10 [5]            ;ok, all values are set to zeros
DB 10 [5] 0,0,0,0,0  ;same as above
```

Configuring the PG5 project manager to use the new S-Dat

The PG5 can be configured to use the new version of S-Dat using the 'Tools / Add-On Tools' menu command. Add a new toll called 'New Data Transfer' and configure it to open '.dt5' files, as shown:

5.2   Main Window

The main window is not displayed if S-Dat has been invoked with a command line. S-Dat has a 'multiple document interface' (MDI) which is shown when S-Dat is run from the Project Manager or is launched without command line parameters. Each data transfer file is opened in a new window, where it can be viewed, edited, printed or downloaded after a syntax check.

The main window is resizable. It is always displayed with the same size and position as it had when it was last used. To change the window size, click and drag the border of the window using the mouse. It can be maximized, minimized and normalized using the buttons on the top right of the title bar. You can also double-click on the title bar to maximize or normalize the window.

Title bar

The title bar at the top shows the application name. If the document window is maximized, it also shows the name of the active document in square brackets, e.g. [Untitled1]. An asterisk indicates that the document has been modified but not saved, e.g. [Untitled1 *]. On the right are three buttons: Minimize, Maximize and Close.

Menus

See Menus.

Toolbar

The toolbar has buttons for the most commonly used commands. These commands are also available from the menus. To see what the toolbar button does, move the mouse pointer over the button and a 'tooltip' text will popup. The action of the toolbar button is also described on the status bar at the bottom left.
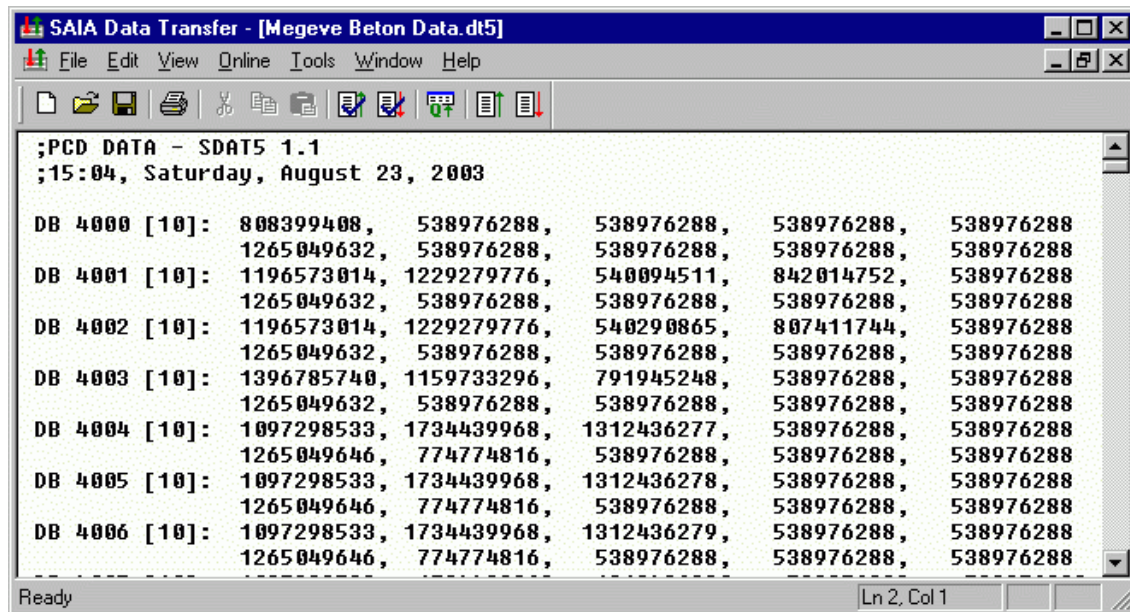
Edit Windows

A new edit window is opened for each data transfer file. These windows are managed by the Windows menu.

Status Bar

On the left, the status bar shows a brief description of the selected menu command or toolbar button, or describes what S-Dat is currently doing, e.g. "Checking syntax…". It also shows syntax error messages in red.

On the right are shown the line and column "Ln 100 Col 1", the insert/overwrite mode "INS" or "OVR", and the states of the Caps Lock "CAP" and Num Lock "NUM" keys.

5.3   Menus

The main menu contains the following submenus.

5.3.1 File Menu

New...   Ctrl+N

Creates a new empty document, "Untitledx". Another name can be assigned when the document is saved with Save or Save As

Open...   **Ctrl+O**

Opens an existing DT5 file.

Close

Closes the active file. Prompts to save a modified file.

Save   **Ctrl+S**

Saves the contents of the editor window into the DT5 file.

Save As...

Saves the contents of the editor window into a new DT5 file.

Print   **Ctrl+P**

Prints the DT5 file.

Print Preview

Displays the Print Preview window, showing how the document would appear if it was printed.

Print Setup...

Selects the printer and paper orientation (portrait or landscape).

1,2,3...

A list of the last opened files. Select a file from the list to re-open it.

Exit

Closes the application.

5.3.2 Edit Menu

Undo   **Ctrl+Z**

Undoes or redoes the last edit operation.

Cut   **Ctrl+X**

Copies the current selection to the clipboard then deletes it.

Copy   **Ctrl+C**

Copies the current selection to the clipboard.

Paste   **Ctrl+V**

Inserts the contents of the clipboard.

Delete   **Del**

Deletes the current selection from the editor window.

Select All   **Ctrl+A**

Selects the entire contents of the editor window.

Find   **Ctrl+F**

Finds particular text.

Find Next   **F3**

Finds the next occurrence of the text declared by the previous Find command.

Replace   **Ctrl+H**

Finds and replaces a particular text.

5.3.3 View Menu

Toolbar

Shows or hides the toolbar.

Status Bar

Shows or hides the status bar.

5.3.4 Online Menu

Online Settings...

Select a communication channel for connection to the PCD.

NOTE

The default channel is the channel used by the last active CPU in PG5 Project Manager.

Quick Data Upload...

Reads the contents of the connected PCD controlled by the 'Quick Data Upload' dialog box.

Upload Data From PCD...

Reads the contents of the connected PCD according to the open 'address format' file.

Download Data To PCD...

Writes the contents of the open 'data format' file into the PCD. The syntax of the file is first checked..

5.3.5 Tools Menu

Check Syntax For Upload   Ctrl+U

Checks the syntax of the text for an upload operation, checks it's a valid address format file.

Check Syntax For Download Ctrl+D

Checks the syntax of the text for a download operation, checks it's a valid data format file.

Channels

Displays the 'Channels' dialog box, allowing channels to be configured, added or removed.

Options

Displays the 'Options' dialog box.

5.3.6 Window Menu

Cascade

Arranges document windows so that all title bars are visible.

Tile Horizontally

Arranges document windows horizontally.

Tile Vertically

Arranges document windows vertically.

Arrange Icons

Arranges minimized windows along the bottom.

Close

Closes the active window. Asks to save an unsaved file.

Close All

Closes all windows. Asks to save each unsaved file.

1,2,3...

Brings the selected window to the front.

5.3.7 Help Menu

Help Topics   F1

Displays the contents of the help file.

About S-Dat

Displays the 'About' dialog box containing version information.

5.4   Toolbar

The toolbar contains buttons for the most commonly used commands. It is a dockable window which can be moved by dragging it with the mouse, but usually it is displayed at the top under the menu.

To find out what the button does, move the mouse cursor over the button and a pop-up 'tooltip' window will be shown which briefly describes the button's action. The action of the toolbar button is also described on the status bar at the bottom left of the window.

All toolbar buttons also have equivalent menu commands.

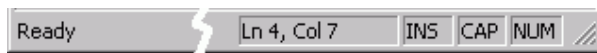The toolbar can be shown or hidden with the 'View / Toolbar' menu command.

5.5   Status Bar

The status bar is shown at the bottom of the main window. It can be shown or hidden using the 'View /Status Bar' menu command.

The left of the status shows a brief description of the selected menu command or toolbar button, or describes what S-Dat is currently doing, e.g. "Checking syntax…". It also shows syntax error messages in red.

On the right are shown the line and column "Ln 100 Col 1", the insert/overwrite mode "INS" or "OVR", and the states of the Caps Lock "CAP" and Num Lock "NUM" keys.

The far right of the status bar is the 'gripper', which is used to resize the main window. The window can also be resized by dragging the borders.

5.6   Command Line Invocation

S-Dat can be run from the command prompt window or from a shortcut icon with command line options. It can also be invoked by another application, for example by calling WinExec() or CreateProcess() from a Microsoft 'C' application.

Items in square brackets [..] are optional. File names should be enclosed in double quotes "...".

There are several command line formats, depending on the desired operation.

To open S-Dat in interactive mode, don't supply a file name:
```
>SDAT
```

To download data from data file:
```
>SDAT "datafile" switches
```

To upload addresses in *addsfile* to *datafile*:
```
>SDAT "datafile" "addsfile" switches
```

To upload addresses on command line to *datafile*:
```
>SDAT "datafile" addresses switches
```

The command line can also be supplied in an indirect command file by preceding the command file name with @:
```
>SDAT @"commandfile[.cmd]"
```

"*datafile*"
"*addsfile*"
File names should be enclosed in double quotes, especially if they contain spaces.
The first file name is always the data file, containing data to be downloaded, or is the destination file when data is being uploaded. If there is only one file name, it is assumed to be the name of the data file to be downloaded.
The second file name is an address file. If there are two file names it is assumed to be an upload operation, where the first file name is the name of the destination data file and the second file is the address file containing the addresses to be uploaded.
The default file type is '.dt5' (Data Transfer 5).

@"*commandfile[.cmd]*"

This is the name of an indirect command file which contains the command line, preceded by an @ sign. The contents of this file is read and processed as if it was part of the command line. You can also supply additional switches on the command line too. The default filename extension is '.cmd', but any extension can be used. If the filename contains spaces it must be enclosed in double quotes, e.g. @"Command File Name.cmd". The command file should contain the "*filename*" and *switches* exactly as they would be on the command line, except they can be on one or more lines in the file.

Example:

To run S-Dat using command line parameters in file command.cmd, and force the use of the PGU channel via COM2:

>SDAT @command.cmd /ONLINE="PGU" /COM2

addresses

For uploading data, you can give a list of addresses and address ranges for the data to be uploaded. The destination file name must also be given. The new version of S-Dat supports many ranges for the same data type.

The format for each address is: *type start [- end] units*

type   is R T C I O F DB

start [*- end*] is start address, and optional end address preceded by a dash '-'

units   D=decimal (the default), H=hex, F=floating point Q=binary A=Ascii
(not for I O F which are always binary)

Examples:

To upload all registers to file "myfile.dt5" in hex:

>SDAT "myfile" R0-4095H

To upload different ranges of registers, in floating point, decimal and hex:

>SDAT "myfile" R0-5F r10-15d r93h

switches

Switches are one or more words beginning with a forward slash '/', see the list below. The switches define the online connection, CPU and station number, and the operation(s) which will be done. Switches can be in upper or lower case, e.g. /COM1 is the same as /com1.

The following switches override the settings defined on the 'Options' dialog box.

/VPL32=*n* or **/R=*n***

Values per line for R T C and DB (32-bit values). The /R=*n* switch is supported for backward compatibility with the old SDat5.

Example, to set 10 values per line for 32-bit values:

/VPL21=10

/VPL1=*n* or **/I=*n***

Values per line for I O F (1-bit values). The /I=*n* switch is supported for backward compatibility with the old SDat5.

Example, to set 1 value per line for 1-bit values:

/VPL1=1

/ADDSSEP=*sep* or **/A=*sep***

Defines the address separator, where *sep* can be one of these values:

SPACE TAB COMMA COLON COMMA+SPACE COLON+SPACE COMMA+TAB COLON+TAB

/A=*sep* is supported for backward compatibility with the old SDat5.

Example, to use a tab character as the separator between the address and the data:

/ADDSSEP=TAB

/DATASEP=*sep* or **/D=*sep***

Defines the data separator, where *sep* can be one of these values:

SPACE TAB COMMA COLON COMMA+SPACE COLON+SPACE COMMA+TAB COLON+TAB

/D=*sep* is supported for backward compatibility with the old SDat5.

Example, to use a comma and a tab as the separator between data values:
```
/DATASEP=COMMA+TAB
```

/OPTIONS=*abcd*

Allows these options to be configured from the command line. See the Options dialog box for more details. *abcd* must be four 0 or 1 digits. 0 = no, 1 = yes.

a Type and address at beginning of line.

b Empty line between data types.

c Data separator at end of line.

d Information comment.

Example: Default settings
```
/OPTIONS=1101
```

The following switches are used to define the online settings. If no /ONLINE or /GOONLINE switch is supplied, then the online settings from the last active PG5 CPU are used. Other switches (/STN=*n* etc) can be used to override the online settings.

/ONLINE="*channel_name*"[,*cpu*[,*stn*]]
/ONLINE=PG5

This switch defines the 'online settings' - which channel, CPU and S-Bus station number will be used. If `/ONLINE=` or `/GOONLINE=` (see below) are not used, then the online settings of the last active PG5 CPU are used. The `/ONLINE=` switch cannot be used with the `/GOONLINE=` switch.

"*channel_name*" : The name of a channel which is already defined on the PC. The channel name must be enclosed in double quotes, e.g. "`PGU`".

cpu and *stn* : The optional CPU and S-Bus station numbers. If the `PG5` or `5HW` options are used, then the CPU and station numbers are read from the Registry or '.5hw' file, but can be overridden with these options. If "*channel_name*" is used, *cpu* and *stn* will default to CPU 0 and station 0. The station number *stn* is ignored if it's not an S-Bus protocol channel. The `/STN=n` can also be used to set the S-Bus station number.

PG5 : Use the online settings of the currently active or last active CPU in the PG5's Project Manager. The `PG5` keyword must *not* be in double quotes.

Examples:

To use channel S-Bus, CPU 0, station 12:
```
/ONLINE="S-Bus",0,12
```
To use channel MyChannel, CPU 0, station 0 :
```
/ONLINE="MyChannel"
```
To use the Project Manager's active CPU's channel, CPU number and station (useful for add-on tools) :
```
/ONLINE=PG5
```

NOTES

On a PCD4 or PCD6, it is not necessary to be physically connected to the target CPU, programs can be downloaded through any CPU, but note that hardware settings can only be downloaded to CPU 0.

/GOONLINE="*filename*[.ini]"

The online settings are read from the `[GoOnline]` section in file *filename*, which has the default file type '.ini' . This is similar to the `/ONLINE=5HW` setting described above, but a different file is used. The `/COMn`, `/IPADDS`, `/PHONE`, `/STN` and `/FDLADDS` override switches can still be used. This switch cannot be used with the `/ONLINE=` switch.

/COM1 .. /COM255

Serial COM port override switch. To save defining a new channel for each serial COM port, this switch can be used to override the COM port in the online settings. It is used only for serial RS-232 channels. Only one /COMn switch is allowed.

/IPADDS=*n.n.n.n*

IP address override switch. Used only with TCP/IP channels. This overrides the IP address in the online settings. It is ignored for non-TCP/IP channels.
Example:
```
/IPADDS=192.168.12.125
```

/PHONE="*nnnnn*"

Telephone number override. Overrides the telephone number defined in the online settings, if used. Used only for a dial-up modem channel. It must be enclosed in double quotes. It can contain any characters allowed by the modem, e.g. ',' = 500ms delay.
```
/PHONE="0041,,,26 666 12 34"
```

/STN=n

S-Bus station number override. Range is 0..253. This must match the S-Bus station number of the target PCD even if not using S-Bus protocol.

/FDLADDS=n

FDL address override switch. For Profi-S-Bus (PG5 1.3 and later) only.

/SERIALNO=*dddddddd*

The decimal serial number of the target PCD (a hex number can also be used if it begins with `0x`, e.g. `0xABCD`). This must match the serial number programmed into the PCD. This is currently only valid for the PCS1.C8, but may be introduced to other new PCD types soon. If the serial number in the PCD does not match, the operation is aborted and status PCD_WRONGCPU is returned. If the connected PCD does not have a serial number, the "NAK response" error occurs (returns PCD_NAK). 0=no serial number.
Examples:
```
/SERIALNO=1234
/SERIALNO=0xABCD
```

Miscellaneous switches:

/SILENT

Runs S-Dat without displaying any message boxes even if an error occurs. The return value will show the result. Progress dialog boxes are still shown.

/APPEND

Allows data to be uploaded and appended to an existing data file. Useful for data logging to a single log file. If the data file does not exist yet, it is created.

5.7 Return Values

In command line mode, S-Dat returns a value which can be checked by the calling application, or by using the ERRORLEVEL variable in a batch file.

S-Dat returns 0 (PCD_OK) if the operation was successful, or the one of the communication driver return values if it fails. The most common return values will be PCD_NORESP (6) if the PCD cannot be connected, or PCD_CANCEL if the user presses the 'Cancel' button. Any non-zero return value means that one or more of the requested operations has failed. The state of the PCD and it's user program should be checked.

The return value can be accessed through the ERRORLEVEL variable in a batch file. "IF ERRORLEVEL *n*" is true if ERRORLEVEL is equal or greater than the value '*n*'.

Value	Description	ScommDLL Name
0	Operation successful (0)	PCD_OK
1	NAK response, command not accepted (1)	PCD_NAK

3	Invalid BCC or CRC, bad or unreliable connection (3)	PCD_BCCERR
4	Invalid response (4)	PCD_INVALID
5	Bad connection between P800 and PCD6 (5)	PCD_P8CONN
6	No response, cannot connect to the PCD (6)	PCD_NORESP
8	No Data Carrier Detect (8)	PCD_NODCD
9	Port in use in another mode or baud rate (9)	PCD_INUSE
10	Bad parameter (10)	PCD_BADPARM
11	PCD memory write verify error (11)	PCD_VERIFERR
12	IBM PC out of memory (12)	PCD_OUTOFMEM
13	Physically connected to wrong CPU on PCD6, or connected CPU has wrong Serial Number (13)	PCD_WRONGCPU
14	CPU not present (14)	PCD_NOCPU
15	PCD to flash failed on M170 (15)	PCD_TOFLASH
17	Can't open file (17)	PCD_CANTOPEN
18	Error writing to file (18)	PCD_WRERROR
19	Error reading file (19)	PCD_RDERROR
20	Invalid PCD file (20)	PCD_BADFILE
21	PCD file checksum error (21)	PCD_CSERROR
22	Invalid header in PCD (22)	PCD_BADHDR
23	Not enough space in code segment (23)	PCD_CODESIZE
24	Not enough space in text segment (24)	PCD_TEXTSIZE
25	Extension memory segment too small (25)	PCD_EXTSIZE
26	Header not initialised (26)	PCD_NOTINIT
27	Can't write EPROM memory (27)	PCD_EPROM
28	Operation cancelled by user (28)	PCD_CANCEL
30	CPU must be in Stop or Halt (30)	PCD_RUNNING
31	CPU not programmed (31)	PCD_NOTPROG
34	Can't change size of extension memory (34)	PCD_NOCHGEXT
35	Could not open the channel (35)	PCD_NOTOPEN
36	Write to PCD failed (36)	PCD_TXERROR
37	Port request timeout (37)	PCD_COMBUSY
40	Port is in use by another application (40)	PCD_LOCKED
44	Fatal internal error (44)	PCD_BUG
45	Operation not supported by PCD F/W version (45)	PCD_NOTSUP
46	Station number already defined (46)	PCD_ALRDYDEF
47	Not enough space for extended header (47)	PCD_EXTHDR
48	Invalid password (48)	PCD_BADPWRD
49	Extended header checksum error (49)	PCD_EXTHDRCS
50	Download to wrong S-BUS station ($STN) (50)	PCD_WRONGSTN
51	Download to PCD with wrong firmware ($PCDVER) (51)	PCD_WRONGFW
52	S-BUS Parity mode not supported by this COM port (52)	PCD_NOPARITY
54	RTS/CTS mode is not supported for this COM port (54)	PCD_NORTSCTS

Other values can be returned by the operating system, these two are the most common :

128	DLL not found	-
9009	EXE file not found, the path for SDAT.EXE is incorrect	-

NOTE
All other non-zero return values should be treated as an error.

5.8   Data Transfer File Formats (.dt5)

The data file (default file type '.dt5' - meaning Data Transfer for PG5) is an ASCII file which contains the data type, addresses and data values to be up or downloaded.

Values can be in any units - decimal (the default), hexadecimal, binary or ASCII. Floating point is also supported for registers and data blocks. Individual elements can be loaded with different values, or a set of elements can be loaded with a same single value. The data file can also contain comments and blank lines.

The data is downloaded in the order it is defined in the file.

There are two formats of '.dt5' file:

5.8.1 Data Format file

Holds addresses and actual data as read from the PCD or to be written to the PCD. This format of file is created by S-Dat's 'Upload' operation. For example, this is a *data format* file containing data which can be downloaded into the PCD:

```
;This is my comment for the 'data format' file
R 0-99 : 0        ;registers 0..99 set to 0
R 12 : 32h        ;register 12 set to 32 hex
R 55 : 64.3       ;register 55 set to 64.3 floating point
F 0-999 : 0       ;flags 0..99 set to 0
F 1000: 1         ;flag 1000 set to 1
DB 100 [5] : 1,2,3,4,5 ;downloads all values to DB 100
```

Tip: The download runs faster if multiple values appear on each line of the data file.

5.8.2 Address Format file

Defines the addresses and units of the data to be uploaded. It does not contain any data. This file must be created manually by editing it using S-Dat or another text editor. This is an *address format* file which defines data to be uploaded into a 'data format' file. Note that the address separator (**:**) is required, even if there is no units specification.

```
;This is my comment for the 'address format' file
R 0-99 :          ;upload registers 0..99 in decimal
R 12 : %h         ;upload register 12 in hex
R 55 : %f         ;upload register 55 in floating point
F 0-999 :         ;upload flags 0..99
F 1000 :          ;upload flag 1000
DB 45 [] :        ;uploads all of DB 45 (size is unknown)
DB 1000-1009: %h  ;uploads DBs 1000 to 1009 in hex
```

Register, Timer, Counter, Input, Output and Flag values
The format for R | T | C | I | O | F values in the '.dt5' file is like this:

type start [**-** *end*] *address_sep value* [*value*...] [*;comment*]

Where:

type	The type of the element:
	R = Register, C = Counter, T = Timer, F = Flag, O = Output (or Input)
start	The address of the first element.
[**-** *end*]	For downloadable address format only. Optional end address for a range of elements, must be preceded by a dash '-'. A range of elements can be loaded with a single value.

address_sep	An *address separator* is required to separate the address from the data. This separator is defined in the Options dialog box. Then default is **':'** (COLON).
value	The value (data format file) or format (address format file) of the element. Values for registers, timers and counters can be represented in decimal, hexadecimal, binary or ASCII units. Register values can also be represented in floating point. Timers and counters cannot be loaded with negative or floating point values. For Outputs and Flags, the binary value must be 0 or 1.
[*value*...]	Appears in the uploaded data format only. Additional values for consecutive elements, separated by *data_sep*. Additional values cannot be supplied if an address range was given.
[;*comment*]	Optional comments can appear on any line, and must be preceded by a semicolon **';'**. Everything after **';'** to the end of the line is ignored.

Data Blocks

The format of Data Blocks in the data file is slightly different from the other elements:

DB *number* '['*len*']' [*address_sep* *value*... [*value_sep value*...] [;*comment*]]
[[*value_sep value*...] [;*comment*]]...

Where:

DB	The data type indicating a data block
number	The number of the data block (0..5999/7999/8191)
'['*len*']'	The length of the data block - the number of 32-bit values it holds. The square brackets must be present, for example '[100]'. When downloading, *len* must be present. **NOTE:** *len* is ignored when uploading because it uses the actual DB length.
address_sep	Delimits the length from the data values.
value...	An optional list of data values (data format file) separated by *value_sep*. Values can be in decimal (default), hexadecimal, ASCII or floating-point. More than one line can be used to hold the data values. There cannot be more values than the data block length, but there can be fewer. Undefined values are set to zero. If no values are present, all values are set to zeros. If there are more values than will fit into the data block in the memory of the PCD, an error message is displayed, and the additional values are ignored. Values are ignored if uploading, and an optional 'units' specifier can be used (%d %h %q %a %f, see units below).

Download examples:
```
DB 100 [5] : 1,2,3,4,5  ;downloads DB 100, size 5
DB 100 [] :  1,2,3,4,5  ;same as above, the size is calculated
```

Upload examples:
```
DB 100 [] : %h    ;uploads DB 100 in hex units
DB 100-109 :      ;uploads DBs 100-109 in the default decimal units
```

Notes

- The size of a DB cannot be changed during Run. If the size of a DB to be downloaded is not the same as the DB already in the PCD, then a new DB will be created. This cannot be done if the PCD is in Run.
- Data Blocks 0..3999 may be in EPROM or Flash memory, depending on the PCD's hardware. DB data cannot be downloaded into EPROM or Flash memory. DBs 4000..8191 are in RAM memory, and can be downloaded unless they are new DBs or their size has changed..

- DBs 0..3999 can contain up to 383 items (0..382). DBs >= 4000 can contain up to 16384 items (0..16383).
- In earlier versions of S-Dat, it was possible to supply fewer values than the DB size, and the remaining values were set to zeros. This is no longer possible. The exact number of values must be supplied, or no values at all to set the DB to all zeros.

```
DB 10 [5] 1,2,3     ;error, 5 values are required
DB 10 [5]           ;ok, all values are set to zeros
DB 10 [5] 0,0,0,0,0 ;same as above
```

Upload Units

Binary input, output and flag values are always saved as 0 or 1.

Data blocks, registers, counters and timers can be saved in binary, decimal, hexadecimal or ASCII. Values for registers and data blocks can also be saved in floating point.

Values for loading registers, timers, counters or data blocks can be represented in the data file as decimal, hexadecimal, binary or ASCII units. Registers and data block values can also be represented in floating point units.

Timers and counters cannot be loaded with negative or floating point values.

In a data format file, the units of a value are determined by its representation.

In an address format file, the following format controls define the units to be used for storing the data:

Decimal	%d	Just a decimal number with optional sign. E.g. `1, -1, +1, -1234`
Hexadecimal	%h	End the hexadecimal number with an 'h' or an 'H', the first digit must be 0..9, not A..F. E.g. `1BH, 0abcdh, 0DeadBeefH, 0000000AH, 0FFH`
Binary	%q	End the binary number (1's & 0's) with 'q' or 'Q'. E.g. `1001Q, 00001111Q, 11001010Q`
ASCII	%a	4 ASCII digits enclosed in single quotes, IBM extended ASCII codes are supported. Non printable characters are displayed in hexadecimal format after a '\' (backslash). E.g. `'abcd', '\00bcd', '   $', '1234', '\FF\01\02\03'`
Floating point	%f	Must contain a decimal point or an 'E' followed by an exponent. If a register does not contain a valid floating point value, it will be shown in decimal. E.g. `1.2345, 1E7, -1E3, .1, 0.5`

Directives

Directives are special commands which begin with the $ character. Directives must be on an empty line.

$RUN	Puts the CPU into Run. Use this directive at the end of the download, so it begins processing with the new data.
$STOP	Stops the CPU. The CPU will stop wherever it happens to be at the moment it receives the command.
$RESTART	Resets and restarts the CPU. The user program begins executing from start-up XOB 16.
$SKIP..$ENDSKIP	All text between these directives is ignored. These directives can be used to delimit comment texts, or to temporarily patch out data or addresses.
$STN=n	Target PCD's S-Bus station number. This must match the PCD's station number even if not using S-Bus protocol. Cannot be used with the /STN=n switch, unless the station numbers are the same.

$SERIALNO=n   Target PCD's serial number. This must match the PCD's serial number. Cannot be used with the /SERIALNO=n switch, unless the serial numbers are the same.

5.9   How to use Recipes

A 'recipe' is a set of data which can influence the user program in the PCD. Downloading a 'recipe' will change data values and cane change the way the program runs. This is a powerful concept, and can be used in many different ways, depending on the application. For example: different values could be downloaded to control ratios of ingredients in a mixture; or PID control data could be downloaded to change control characteristics for different machine uses. The recipe would be defined in an S-Dat 'data format' file which can be downloaded into the PCD to change the process.

It can be dangerous to download data into a running PCD because changes to the data are not synchronized with the execution of the program. There are two ways to manage this: restart the PCD (to stop it), download the data, then put it into Run; or code the user program to detect when data is changing.

Data is downloaded into the PCD in the same order that it is defined in the data file. The download of new data is not synchronized with the execution of the program. You can define elements in a certain order so that the program in the PCD will run correctly if the data is downloaded while the program is running.

For example, a Flag could be set which is read by the user program and indicates that new data has been downloaded. When this Flag is set, the program can copy the data into working Registers or Flags, reset the Flag, and continue processing using the new data. Here is an example of a data file and program which illustrates this.

The '.dt5' data file:
```
;New data to be downloaded
F 100-199 : 0
R 200-249 : 999.0
...
;set the 'data ready' flag so the user program
;will process the new data
F 100 : 1
```

The user program:
```
...
STH     F 100     ;if new data is available, 'data ready' flag set
CFB     H 100     ;call an FB to copy the data in the workspace
RES     F 100     ;clear the 'data ready' flag
...
```

Data Blocks can also be used. When a new Data Block is loaded, a Flag can be set to notify the program, which can then copy the data block into Registers using the GET instruction. For example:
```
...
STH     F DataReady    ;if a new Data Block is available
JR      L NoData
GET     DB 100         ;read it into the working registers
        R Work
RES     F DataReady    ;and reset the 'data ready' flag
NoData:
...
```
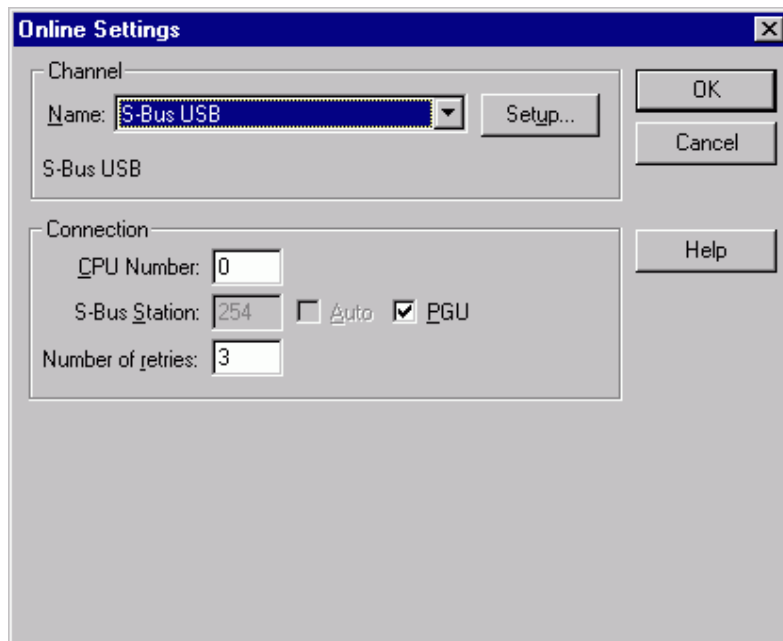
Alternatively, the new $STOP, $RESTART and $RUN directives can be used to stop program execution while downloading the new data, restart the program from XOB 16, and start the program running.

```
;Stop the program
$STOP
;Download the new data
F 100-199 : 0
R 200 :     999.0
R 201 :     1.3
...
;Reset and run the program from XOB 16
$RESTART
$RUN
```

5.10 Online Settings

Selects and configures the channel to be used for communicating with the PCD.
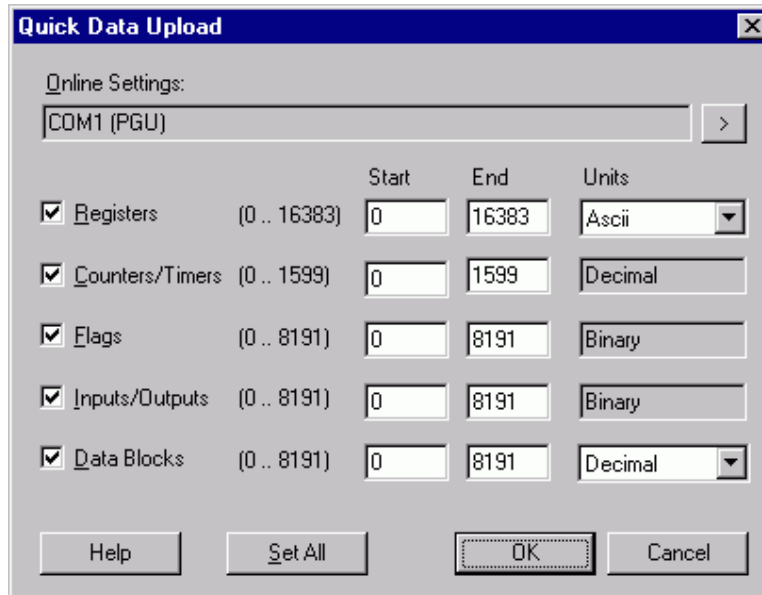

5.11 Quick Data Upload dialog box

This allows data to be uploaded by defining a range of addresses and units for selected data types. Select the data types using the checkboxes on the left, and the range of addresses to be uploaded (start/end). Representation units can be selected for Registers and Data Blocks: Decimal, Hex, Binary, Floating Point and Ascii.

End addresses can be set beyond the maximum allowed for the PCD type. S-Dat will automatically limit the addresses to those supported by the PCD when it connects and determines the PCD type.

NOTES
- Only the new PCD2.M480 and PCD3 types support Registers 4096..16383.

- Not all Data Blocks in a range may be defined in the PCD's memory. S-Dat must ask the PCD if the each DB is present before uploading it. This means that all 8000 DBs must be examined if the range is 0..7999. This can be slow, so define a smaller range if you can, which contains only the DBs that you need.
- The maximum number of DBs depends on the PCD type, refer to your hardware documentation. The PCD3 and PCD2.M480 types support Data Blocks up to 8191.
- The maximum number of I/Os depends on the PCD type, refer to your hardware documentation.

5.12 Upload Data From PCD dialog box

This dialog box is displayed by the 'Online / Upload Data From PCD...' menu command, or by pressing the 'Upload Data' toolbar button. The same dialog box is also displayed in command line mode.

In interactive mode, the active document provides the types and addresses of the data to be uploaded. It should be an address format file. The data is uploaded into a new document called 'Untitledx' (x=next untitled document number). The new document is not saved until 'Close', 'Save' or 'Save As', is done. In command line mode, the file is saved automatically to the supplied file name.

Before starting the upload, check that the correct Online Settings are selected. If not, press the **>** button and choose the correct settings.

Press the **Upload** button to start the upload. The dialog box is expanded to show the message line and progress bar. The syntax of the address format file is checked first, then the upload starts.
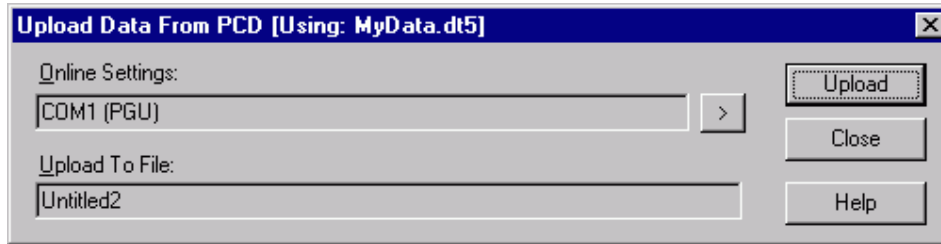
Press **Cancel** to abort the upload. Data already uploaded will remain in the new document.
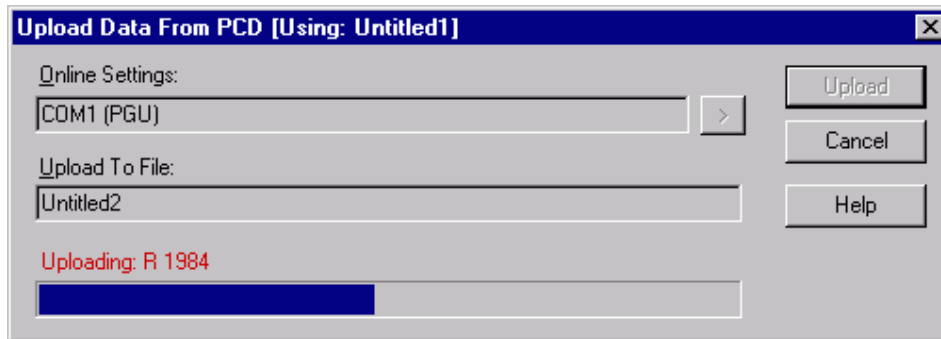
Online Settings
The channel, S-Bus station, TCP/IP address, etc. of the online connection to be used for the upload. Ensure this will connect to the correct PCD, especially on a network. Press the **>** button to change the online settings. By default, these will be the Online Settings of the PG5's last active or currently active CPU.
Upload To File

The name of the file to which the data will be uploaded. In interactive mode, this will be 'Untitledx'. In command line mode it will show the name of the destination file.

Before upload starts.

During upload, dialog box expands to show the message line and progress bar.

5.13 Download Data To PCD dialog box

IMPORTANT!
- Before starting the download, check that the correct Online Settings are selected, especially on a network - make sure that data is not downloaded into the wrong PCD! If wrong, press the '**>**' button and choose the correct settings.
- Also check you are downloading the correct file!
- **Downloadng in Run**
  It can be dangerous to download data into a running PCD because changes to the data are not synchronized with the execution of the program, and the program may react in unexpected ways as the data is changing. To be safe, you should ensure that the program is stopped while downloading the data. This can be done using the new $STOP/$RESTART directives, or the PCD's Run/Stop switch if the PCD has one. The Online Configurator also has Run/Stop/Restart buttons. Alternatively, use a control flag to indicate to the user program that the data is changing or has been changed, see How to use Recipes for details.

This dialog box is displayed by the 'Online / Download Data From PCD...' menu command, or by pressing the 'Download Data' toolbar button. The same dialog box is also displayed in command line mode.

In interactive mode, the active document provides the types, addresses and the data to be downloaded. It should be a data format file.

Press the **Download** button to start the download. The dialog box is expanded to show the message line and progress bar. The syntax of the data format file is checked first, then the download starts.

Press **Cancel** to abort the download.

Online Settings

The channel, S-Bus station, TCP/IP address, etc. of the online connection and destination PCD to be used for the download. Ensure this will connect to the correct PCD, especially on a network. Press the **>** button to change the online settings. By default, these will be the Online Settings of the PG5's last active or currently active CPU.

Download From File

The name of the data format file from which the data will be downloaded.

{bmc DownloadDataDialog.bmp}
Before download starts.

{bmc DownloadingDialog.bmp}
During download, dialog box expands to show the message line and progress bar.

5.14 Options dialog box

These settings define the format of the uploaded data file. When used in command line mode, these settings are the defaults if the associated command line options are not supplied.

Address separator

The character after the media address before the data. Switch: /ADDSSEP=sep.

Data separator

The character used between each data value. Switch: /DATASEP=sep.

Values per line for R/T/C/DB

The number of data values per line for 32-bit data values. Switch: /VPL32=n.

Values per line for I/O/F

The number of data values per line for 1-bit (0 or 1) data values. Switch: /VPL1=n.

NOTE

If you are using tab separators, then using more than 32 values per line will be beyond the tab setting of the document, and values beyond the 32nd tab will not be in nice columns.

The following settings can be configured with the `/OPTIONS=abcd` command line switch:

Type and address at beginning of line

Start each line with a data type and address. If unchecked then only the first line has the data type and first address.

Empty line between different data types

List an empty line whenever the data type changes.

Data separator at end of line

Add a separator after the last data item on each line, except for the very last line.
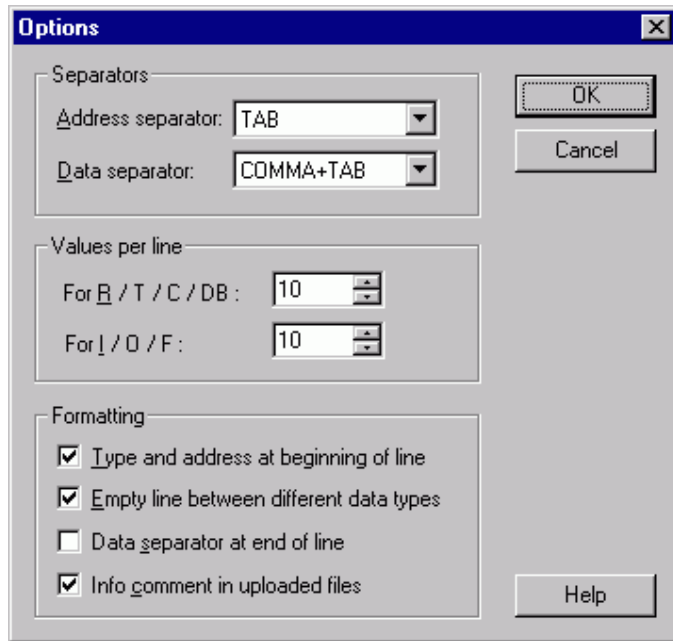
Information comment

The file will contain two comment lines at the start, which indicate the S-Dat version and date/time of the upload. The S-Bus station and serial number of the source PCD are also shown if the PCD has them.

```
;PCD DATA TRANSFER: S-Dat V1.3.100
;Uploaded: 20/08/04 13:42:29, S-Bus Station: 123, Serial No: 00453216
```

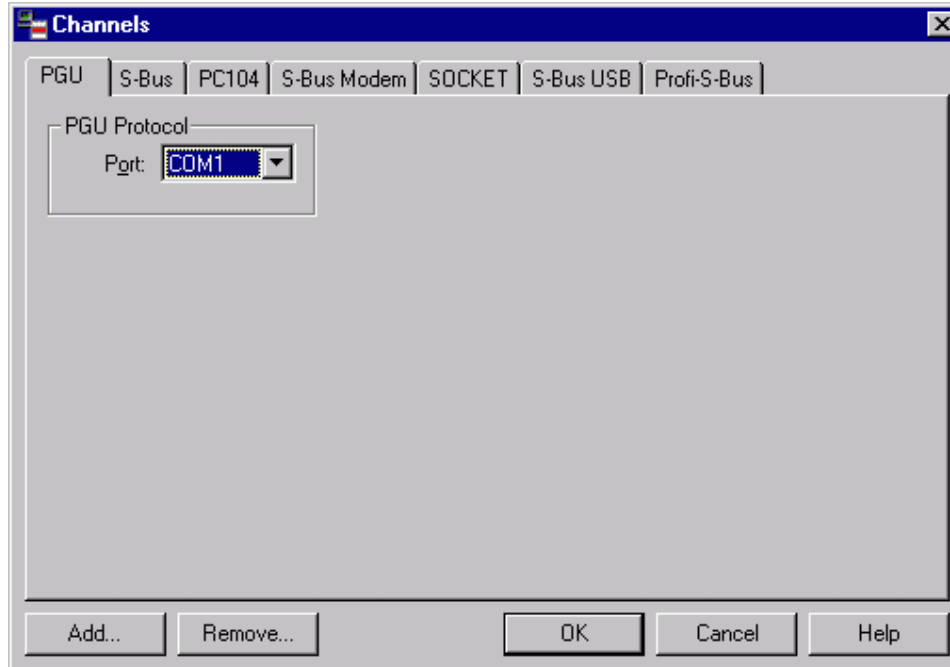**Set Defaults** button

Initializes all settings to the default values.

5.15 Channels dialog box

Communications channels can be viewed, edited, added or deleted.

5.16 About dialog box

Displayed by the 'Help / About S-Dat' menu command.

Shows the application's version number, the expiry date if it's a demonstration version, the 'Registered User Name', and has a 'More Info' button for displaying information about all other installed PG5 programs and libraries.

It also has an Internet link to the SAIA-Burgess Controls support website where more information can be obtained.

If it is a time-limited demo version, you will need to install a key file which you can obtain from your SAIA representative before the expiry date is reached. If not, you will not be able to use the package after this date.

5.17 Error Messages

5.17.1   Command line errors

Cannot use /GOONLINE= switch with /ONLINE=
/GONOLINE= gives the name of a file which contains the online settings. /ONLINE= defines the online settings. They cannot be used together.

Can't open indirect command file: <*filename*>
File *filename* was not found. Is the path correct?

Invalid </switch> switch, <*description*>
The /*switch* is invalid, see Command Line Invocation.

Missing closing quote
A closing quote " at the end of a file name is missing. File names containing spaces must be enclosed in double quotes, e.g. "My File Name.dt5".

More than one /ONLINE= switch

More than one /GONLINE="filename" switch

More than one /COMn switch
These switches can be only once.

Unexpected data
Invalid command line text, it could not be evaluated.

Unknown switch </*switch*>

The /*switch* is invalid, see Coomand Line Invocation.

5.17.2   Syntax check errors

Syntax errors are shown with the line number. If in interactive mode, the caret is placed at the location of the error.

DB address range not allowed for download
    A range of DB addresses, e.g. DB 100..199 is not allowed in a file to be downloaded. It does not contain any data.

DB must have [size] for download, e.g. DB 1 [10]
    A DB size if required when downloading DBs. The size if used if the DB needs to be created, or is compared if the DB already exists.

DB size not allowed after DB address range
    A DB address range, e.g. DB 100..199 cannot have a size in square brackets.

Document contains no data
    The file is empty, there is nothing to upload or download.

End address less than start address
    The end address must always be after the start address. Addresses are always up/downloading in ascending order.

$ENDSKIP without $SKIP
    Missing $SKIP directive.

Expected a data type: R T C I O F DB
    The first item on a line should be a data type (unless it's a DB data line, comment or directive).

Expected decimal address
    An address is needed after a data type.

Invalid address
    The address is missing or contains invalid characters.

Invalid binary value, should be 0 or 1
    Binary values consist of 0's and 1's only.

Invalid data type, expected R T C I O F DB
    It's not a recognized data type, or not a data type supported by S-Dat.

Invalid data value
    The data value is missing or contains invalid characters.

Invalid DB size, range is 1..<n>
    The DB size cannot be 0. For DBs 0..3999, the last element is 382 (0..382 = 383 elements). For DBs >= 4000, the last element is 16383 (0..16383 = 16384 elements).

Invalid path
    The path or file name is invalid.

Line too long, max is 1024 characters
    S-Dat files cannot contain lines longer than 1024 characters. Break the line into shorter lengths.

Missing closing bracket

Missing closing quote

Missing data value

Missing DB size

Missing end address

Missing $ENDSKIP

Missing file name

Missing start address
    Syntax error, something's missing.

No values allowed after units
    In an address format file, not values can occur after the <u>units</u>.

Number of values not same as DB size
    The number of DB data values is not the same as the DB length in square brackets.
    e.g. `DB [10] 1,2,3 ;values 4..9 are missing.`

Only DBs can have a size, e.g. DB 1 [10]
    Only DBs can have different sizes.

Rest of line should be empty

Unexpected text on the line.

Syntax error

S-Dat could not process the text.

Timers and counters cannot contain -ve values

Timers and Counters can only contain positive values, 0..2147483647 (0..7FFFFFFFh).

Value too big/too small

The value is out of range, it cannot be represented as a 32-bit number.

Write error on file: <*filename*>

The file is probably read-only.

Unknown directive

The $directive is not recognized.

Wrong number of values for address range

A range of addresses can be used to assign the same value to more than one address, but there can be only one value, e.g.

```
R 100..199 : 0   ;sets Registers 1..199 to the same value 0
```

5.17.3   Up/Download Errors

Can't create file: <*filename*>

The file could not be created. Maybe it already exists and is read-only. Or perhaps the directory does not exist (S-Dat will not create directories).

Can't open file: <*filename*>

The file does not exists or the file name or path is invalid.

CPU is in Run, cannot change size of DB <n>.

CPU is in Run, cannot create DB <n>.

Data Blocks cannot be created while a user program is running. Stop the CPU before doing the download, or put a $STOP directive in the file to be downloaded.

Invalid media address: <type address>, max. is <n>.

The address is not supported by the connected PCD type. The maximum address is shown. This error cannot be issued during the Syntax Check because the PCD type is not know until it is online.

PCD contains EPROM or Flash memory, cannot change size of DB <n>.

PCD contains EPROM or Flash memory, cannot create DB <n>.

PCD contains EPROM or Flash memory, cannot write to DB <n> in Text memory.

DBs 0..3999 can only be created written to by S-Dat of the PCD contains RAM memory. EPROM memory cannot be written to at all. DBs can only be downloaded into Flash memory using Project Manager's or the Online Configurator's 'Online / Download Program' command.

PCD has no serial number.

PCD has wrong serial number.

The /SERIALNO=nnn command line switch was used, and the serial number of the connected PCD does not exist or does not match. This prevents the data being downloaded into the wrong PCD.

Read error on file: <*filename*>

A hardware read error has occurred.

Unknown error

The new Large Hadron Collider in Geneva split a Boson and caused a chain reaction which will destroy the universe in approximately 30 minutes.

*   *   *   *   *