Software Description

- HSGPL 1.31
- HSGPLDSR 2.10

system-99 user-group

Last Manual Edit: 2014-04-22
Reason: Typo detected
Translation by Bob Carmany
Actual versions at system-99 user-group

HSGPL Control Program

Overview

The program for the HSGPL is very complex in function. We ask that you read through these instructions at least once even if you think that you have a good concept of the programs for the TI 99/4A.

Usage:

With this program, it is possible to have up to 16 Solid-State-Modules for the TI 99/4A GROM-Port installed in the HSGPL Card.

Operation:

The operation of this program is based on various key combinations the use of which will be individually explained later.

Selecting a screen from the Main Screen:

To choose a sub-directory, you must press the first letter of the named function. The program will accept either upper or lowercase entry.

Selecting a screen from a Sub Screen:

If you are at one of the sub screens, you can simultaneously press the CTRL key and the appropriate key for the function you require (without going to the Main Screen).

This method does not work in RESET or BASIC mode.

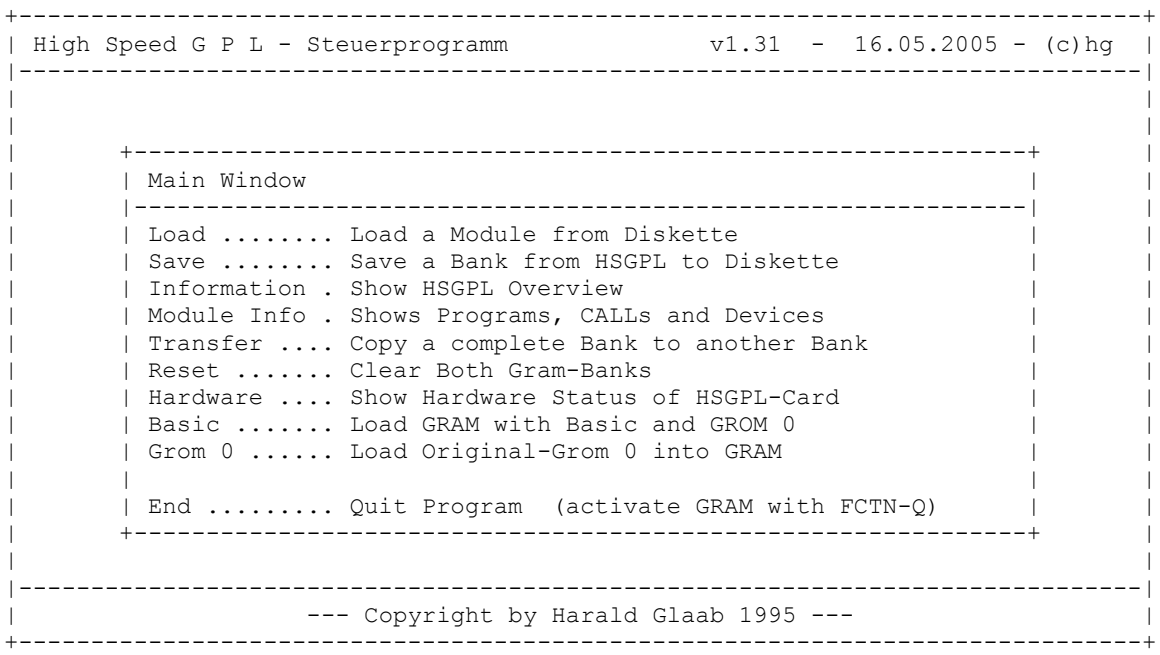
Restrictions:

To fully use the functions of the HSGPL, you must:

- No module or module simulation (MultiMod, Supercart, etc.) can be in the GROM port. Editor's Note: The error message "No HSGPL found" can be bypassed by pressing <ENTER>.
- The appropriate GROM 0 (G>0000 to G>1FFF) in the HSGPL is activated (there is no original GROM 0 in the console.

If either of these restrictions exists, different program functions will not work.

A Glimpse of the Functions:



LOAD:

Load one or more module files with the modified 4-byte header into the HSGPL card. It is possible to store them in the FEEPROM permanently or temporarily in RAM.

SAVE:

You can save the modules found in the in the HSGPL card either to disk or RAMdisk. It is also possible to read and save a module inserted in the GROM port for later use and loading into the HSGPL card.

INFORMATION:

A summary presentation of the modules found in the HSGPL card.

MODULE INFORMATION:

Information about the programs, DSR and SBR subprograms in the modules loaded in the HSGPL.

TRANSFER:

Banks can be copied within the HSGPL card from one to another.

RESET:

Empties both RAM Banks of the HSGPL card. This function does not have a sub Screen and can be chosen from the Main Screen.

HARDWARE:

Provides information about the construction and layout of the card. Eventually identifying defective chips on the card.

BASIC:

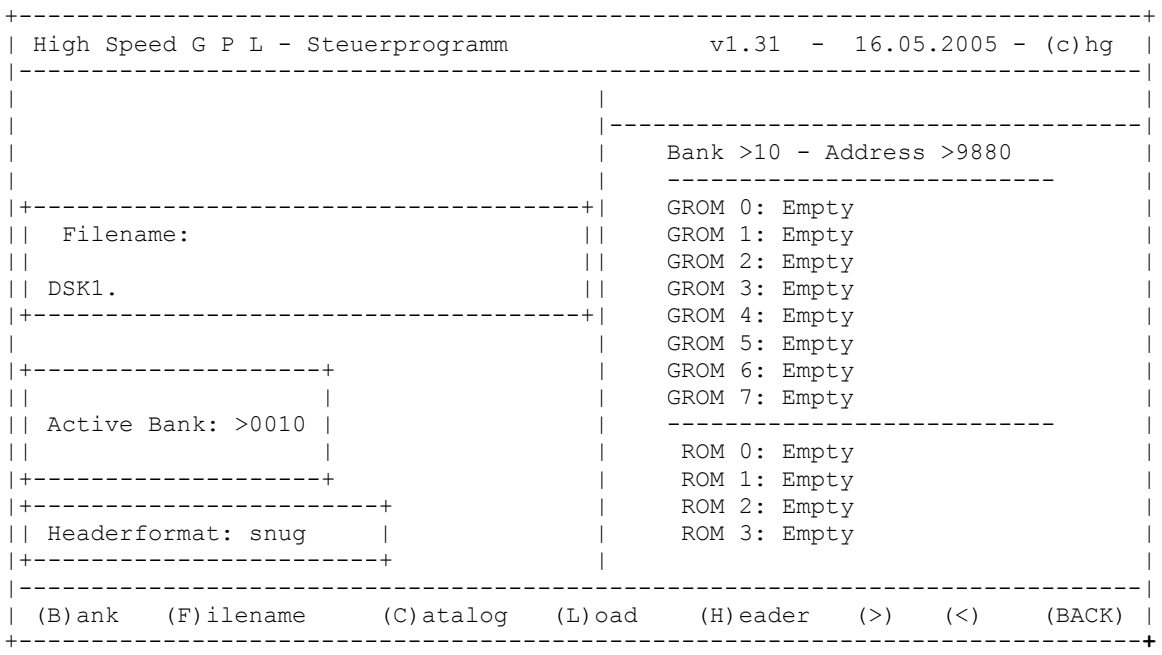
Copies GROM 0 to 2 from the DSR and Bank 5 to 7 into both GRAM banks.

END:

Ends the HSGPL control program.

If the FCTN key is pressed simultaneously, both GRAM banks will be enabled before ending.

Functions of the LOAD Screen:



(B) Bank

With Bank you can choose the bank address into which you want to load the module. The number of banks is determined by the configuration of your card.

(+) or (>) Bank Up

With the + or > key you can select the next highest bank.

(-) or (<) Bank Down

With the – or < key you can select the next lowest bank

(F) Filename

You can enter the filename of the files you wish to load from Diskette or SCSI drive.

(H) Header Format Input

You can adjust the data to be loaded in either SNUG (4 Byte Header) or GRAMKRACKER format (6 Byte Header). An improper entry can cause unforeseen problems. Pay close attention to this setting. SAVE is only possible in SNUG format.

(L) Load

This key press starts the Load process. All of the data that comes after the header will be loaded and the header is ignored. The program display on the right side of the screen will update and show the bank contents as each file is loaded.

Safety Question during Loading!

During loading, the question "Load GROM 0?" is seen, you must answer with “Yes“ to satisfy yourself that a real GROM 0 in place. Otherwise, the TI operating system will be destroyed.

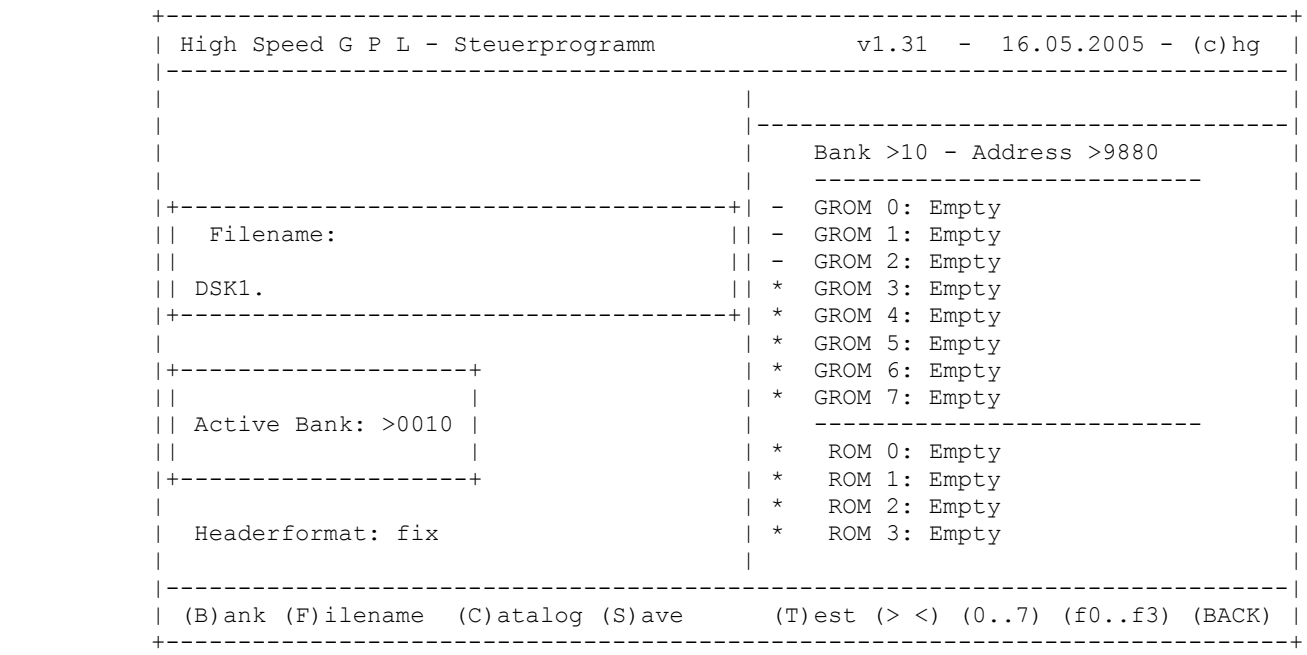
When you are asked "Is this a GROM 0 ???", pay very close attention to what you are doing, since with no GROM 0 header (>AA) installed, you will be left with faulty data files..

The question "Copy ROM 1 to 3?" or "Copy ROM 0+1?" means that, the missing contents for the those banks remaining or Bank 0 or 0&1 must be filled.

(C) & (FCTN-C) Catalog

This function allows the listing of the files on your chosen Diskette and RAMDISK (C) or SCSI drive (FCTN-C).

Functions of the SAVE Screen:



(B) Bank

With BANK you can choose the bank address into which you want to load with a module. The number of banks varies with the configuration of your card. You can go up or down with either + or – or < or >.

(+), (>) Bank Up and (-), (<) Bank Down

You can choose the Bank with these keys.

(F) Filename

You can input the filename for Diskette or SCSI drive.

(S) Save

This key starts the Save process. All of the portions of the modules will be saved to Diskette or Ramdisk that show * in front of them.

The Save function is also used to read and save modules from the GROM port

(C) & (FCTN-C) Catalog

This function allows the listing of the files on your chosen Diskette and RAMDISK (C) or SCSI drive (FCTN-C).

(T) Test

This will intensively test the individual banks. Through these and more complete tests, the results on the “Program / Header / Empty / Used“ will be displayed at the fastest speed.

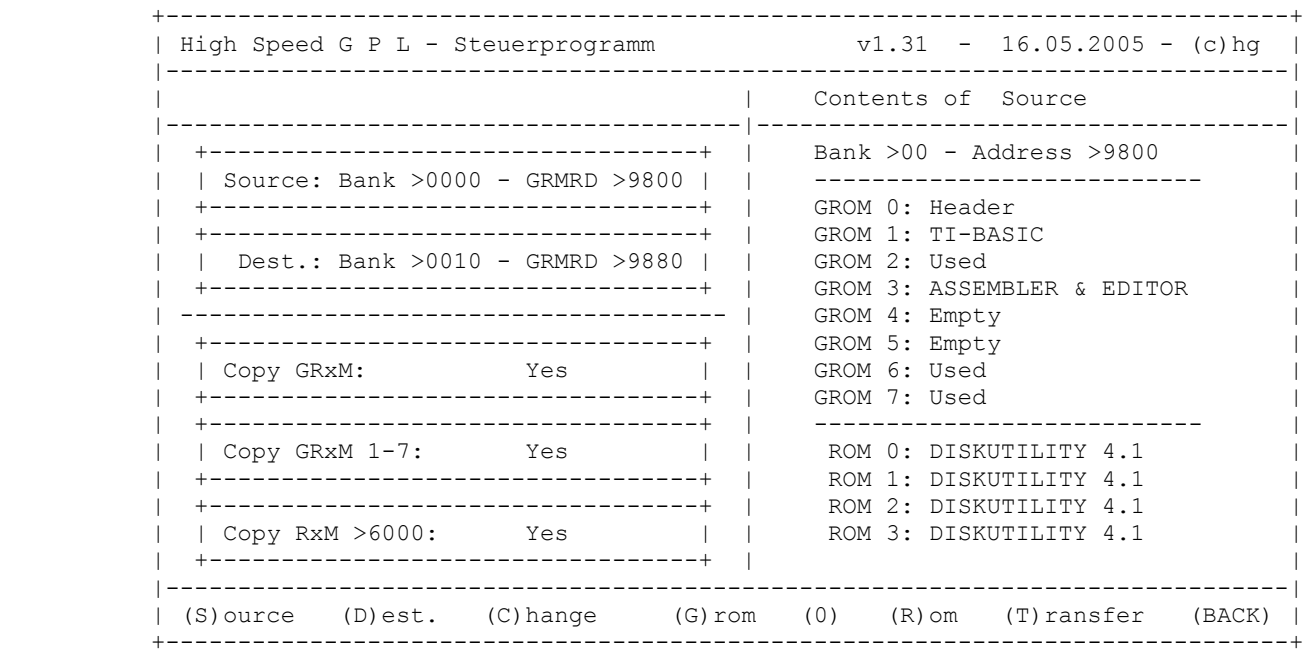
(0) to (7) and (FCTN 0) to (FCTN 3)

You can toggle the inclusion of saved GROM (without FCTN) and ROM Banks (with FCTN).

FCTN-L

You can automatically inquire about the file length to be saved.

Functions of the TRANSFER Screen



(S) Source Bank Designation

Designates the Bank, **from** which the data will be copied.

(D) Destination Bank Designation

Designates the Bank, **to** which the data will be copied.

(C) Change Bank

Switches the display of the contents between Source and Destination

(0) Grom 0

The contents of GROM 0 (G>0000 to G>1FFF) will be copied.

(G) Grom 1-7

The contents of GROM 1 to GROM 7 (G>2000 to G>FFFF) will be copied

(R) ROM >6000

All 4 Banks at ROM >6000 from the Source will be copied to the same place in the destination.

(T) Transfer

Start the copy process. The display of the Bank contents will be automatically updated on the destination Bank.

Functions of the INFORMATION Screen

(+) or (>) Bank Up

(-) or (<) Bank Down

```
+-------------------------------------------------------------------------------+
| High Speed G P L - Steuerprogramm              v1.31  -  16.05.2005 - (c)hg   |
|-------------------------------------------------------------------------------|
|                                                                               |
|-------------------------------------------------------------------------------|
|  |0|1|2|3|4|5|6|7|8|9|A|B|C|D|E|F 10|11 |   Bank >10 - Address >9880          |
|-------------------------------------------------------------------------------|
|G0|H|H|H|H|H|H|H|H|H|H|H|H|H|H|H|H  -|-  |   GROM 0: Empty                     |
|G1|H|H|H|H|H|H|H|H|H|H|H|H|H|H|H|H  -|-  |   GROM 1: Empty                     |
|G2|*|*|*|*|*|*|*|*|*|*|*|*|*|*|*|*  -|-  |   GROM 2: Empty                     |
|G3|H|H|H|H|H|H|H|H|H|H|H|H|H|H|H|H  -|-  |   GROM 3: Empty                     |
|G4|-|*|H|-|*|*|*|*|-|*|*|*|*|-|-|*  -|-  |   GROM 4: Empty                     |
|G5|-|*|-|-|-|*|*|*|-|*|-|*|*|-|-|*  -|-  |   GROM 5: Empty                     |
|G6|*|H|*|-|*|-|*|H|*|H|*|*|*|-|-|-  -|-  |   GROM 6: Empty                     |
|G7|*|-|*|-|-|-|*|*|*|-|-|*|*|-|-|-  -|-  |   GROM 7: Empty                     |
|-------------------------------------------------------------------------------|
|R0|H|*|H|H|*|*|*|*|-|*|-|H|H|*|H|*  -|-  |    ROM 0: Empty                     |
|R1|H|*|H|H|*|*|*|*|-|*|-|H|H|-|H|*  -|-  |    ROM 1: Empty                     |
|R2|H|*|H|H|*|*|*|*|*|*|-|H|H|-|H|*  -|-  |    ROM 2: Empty                     |
|R3|H|*|H|H|*|-|*|*|-|*|-|H|H|-|H|*  -|-  |    ROM 3: Empty                     |
|                                                                               |
|-------------------------------------------------------------------------------|
| (>) Bank up     (<) Bank down                                        (BACK)   |
+-------------------------------------------------------------------------------+
```

Left Side Screen:

With the choice of the Information Screen the GROM and GRAM Banks will automatically be read and displayed on the left part of the screen.

Display Explanation:

(-) Free

No data is found in this area.

(*) Used

Unspecified data has been found in this area.

(H) Header

A valid Header (>AA) at the beginning of the data was found.

(A) Autostart

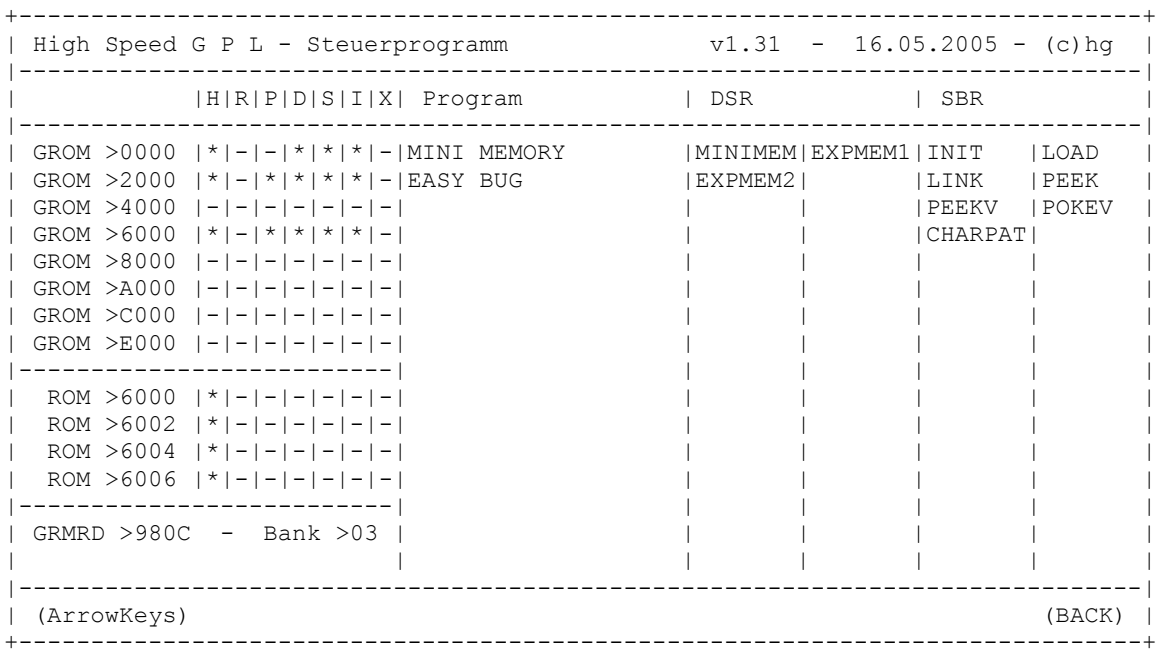
A valid (>AA) at the beginning of the data was found that enables the automatic start of the program.

Right Side Screen:

By using the < and > the red cursor will go to the right or the left. A more detailed specification of the individual Banks will be displayed.

The detailed layout information will be given, and if a valid known Header is found in the program name, it will be displayed. In the event that more program names are found, they will be displayed by pressing the (+) key.

Functions of the MODULE-INFO Screen



This screen will show the information about the module organization and individual Grom Addresses.

Overview:

Displayed on the left side of the screen will always be a quick look of all of the actual Banks with an * for those that are filled and a – for those that are not.

Character Definition of the Individual Elements:

H: Headerbyte

At the address >x000 is found the HEADER recognition byte >AA.

R: RESET-Vector

The address >x004 is a vector unlike >0000, where the Reset Routine resides. It is the basis for initialization of the calculations after shutdown or a warm or cold start.

P: Program-Cache

At the address >x006 is the vector unlike >0000, where the different program names are referenced that are built after the choice is made from the title screen.

D: DSR-Sub program(s).

At the address >x008 is the vector unlike >0000, where the individual DSR names are referenced and available to the module. These DSR names may be accessed in TI-BASIC™ with OPEN, CLOSE, INPUT, PRINT etc. or in TMS9900-Assembler with DSRLNK, DATA >8.

S: SBR-Sub program(s)

At the address >x00A is a vector unlike >0000, where the individual DSR names are referenced and are available to the module. These DSR names may be accessed in TI-BASIC™ with CALL or in TMS9900-Assembler with DSRLNK, DATA >A.

I: ISR-Sub program

At the address >x00C is found the vector for the Interrupt-Service-Routine, and the “External Interrupt“.

X: Vector for “„Future Expansion“

This vector at the address >x00E is without function. In the publications from Texas Instruments it is “Future Expansion“ – Vector, and reserved for later unspecified routines. There are no known routines at this vector.

Name List:

The right screen all program, DSR names and SBR-Subprograms with their full names are displayed. In the column for program names is a maximum of 16 names and in the column for DSR and for SBR a maximum of 32 names can be displayed.

Any names with a length 19 characters (for programs) or 7 characters (for DSR and SBR), will have the names truncated.

Up and Down Arrow Keys

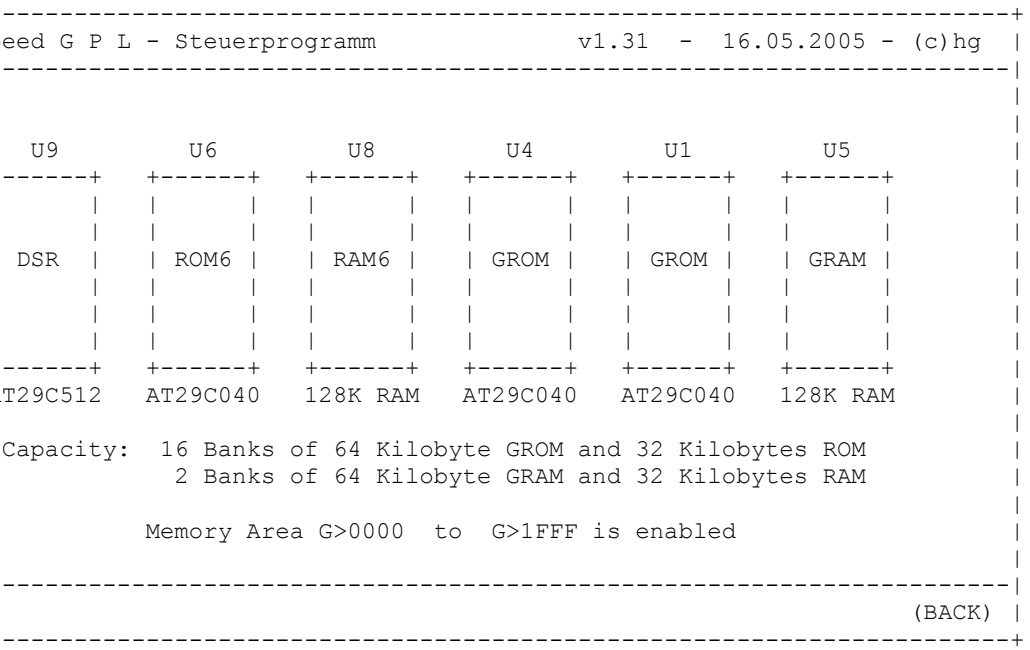
Use these keys to go to the desired address. Starting at the first GROM address at >2000 and stepping up and from G>0000 to G>E000 and then the range of ROM>6000 and the sub-addresses of >6000, >6002, >6004 and >6006.

Left and Right Arrow Keys

Use these to look over the filled GROM. The construction of the HSGPL card is such that all of the Banks from >00 to >11 can be so displayed by use of GRMRD.

Functions of the HARDWARE Screen

No further command keys are integrated into this screen.



This is not a test program. It will show the information about the organization of the HSGPL card but will not test any of the functions.

It is designed to list or display the components but not to display if they are operating correctly.

Functions of the (Diskette-) CATALOG Screen

Disk Number

After choosing the Catalog function from the LOAD or SAVE screen, you will be asked for the number of the disk drive. You can choose from between 1 and 9, followed by the ENTER key.

```
+--------------------------------------------------------------------------------+
| High Speed G P L - Steuerprogramm              v1.31  -  16.05.2005 - (c)hg    |
|--------------------------------------------------------------------------------|
|                                        |                                       |
|                                        |---------------------------------------|
|                                        |    Bank >10 - Address >9880           |
|                                        |    ---------------------------        |
|                                        |    GROM 0: Empty                      |
|                                        |    GROM 1: Empty                      |
|             +-------------+            |    GROM 2: Empty                      |
|             | Catalog     |            |    GROM 3: Empty                      |
|             |             |            |    GROM 4: Empty                      |
|             |    Drive: 1 |            |    GROM 5: Empty                      |
|             +-------------+            |    GROM 6: Empty                      |
|                                        |    GROM 7: Empty                      |
|                                        |    ---------------------------        |
|                                        |     ROM 0: Empty                      |
|                                        |     ROM 1: Empty                      |
|                                        |     ROM 2: Empty                      |
|                                        |     ROM 3: Empty                      |
|                                        |                                       |
|--------------------------------------------------------------------------------|
|                                                                                |
+--------------------------------------------------------------------------------+
```

After entering the disk drive number, the specific filenames will be displayed.

```
+--------------------------------------------------------------------------------+
| High Speed G P L - Steuerprogramm              v1.31  -  16.05.2005 - (c)hg    |
|--------------------------------------------------------------------------------|
| DSK6=RAMDISK 6    Used=1586 Free=  14  |                                       |
|----------------------------------------|---------------------------------------|
|ARC          41 D 80  DM2L        33 Prog|    Bank >10 - Address >9880           |
|ARC303G      33 Prog  DM2M        22 Prog|    ---------------------------       |
|ARC40A       33 Prog  DM2N        10 Prog|    GROM 0: Empty                      |
|ARC40B        4 Prog  DN          27 Prog|    GROM 1: Empty                      |
|BITRESET      8 Prog  DSRLDR2     33 Prog|    GROM 2: Empty                      |
|BOOT         25 Prog  DSRLDR3     33 Prog|    GROM 3: Empty                      |
|BOOU         25 Prog  DSRSCAN     30 Prog|    GROM 4: Empty                      |
|CC           33 Prog  EXP         33 Prog|    GROM 5: Empty                      |
|CC-PAR        2 Prog  EXQ         33 Prog|    GROM 6: Empty                      |
|CD           20 Prog  EXR         10 Prog|    GROM 7: Empty                      |
|CFG          27 Prog  HRD16SAV    30 Prog|    ---------------------------       |
|CHAR@3        9 Prog  HSGPL       33 Prog|     ROM 0: Empty                      |
|DISKASS      33 Prog  HSGPM       33 Prog|     ROM 1: Empty                      |
|DISKAST      17 Prog  HSGPN       10 Prog|     ROM 2: Empty                      |
|DM           33 Prog  MDCH1       33 Prog|     ROM 3: Empty                      |
|DM2K         33 Prog  MDCH2       33 Prog|                                       |
|--------------------------------------------------------------------------------|
| (BACK)  (Arrowkeys)    (ENTER)                                                 |
+--------------------------------------------------------------------------------+
```

(Arrow keys (FCTN-E, FCTN-S, FCTN-D and FCTN-X)

You can select the filename with the arrow keys and then ENTER to begin whichever task you have chosen.

(PROCEED) (FCTN-6)

When the screen has been filled with filenames (and the Status line indicates more names to be displayed) use PROCEED to go to the next page.

(REDO) (FCTN-8)

Use REDO for another diskette catalog after giving the disk drive number once again.

(BACK) (FCTN-9)

Use BACK to exit from the Catalog mode.

Functions of the SCSI Drive CATALOG Screen

Use this function to also get a disk catalog and submenu listing from a SCSI drive. Navigate with the help of the arrow keys. You can mark the filename or submenu with ENTER. The option ".." (Period-Period) will allow you to go back to the previous submenu. The function keys PROCEED, REDO and BACK have the same function as in the disk catalog.

In the head line of the catalog at the default name of the SCSI device is displayed. You can navigate with the arrow keys there to enter the actual path.

```
+--------------------------------------------------------------------------------+
| High Speed G P L - Steuerprogramm              v1.31  -  16.05.2005 - (c)hg    |
|--------------------------------------------------------------------------------|
| SCS6.GRAM.ANWEND.E.                    |                                       |
|----------------------------------------|---------------------------------------|
|..         DIR 0009                     |    Bank >10 - Address >9880           |
|AUF-LOS     42*Prog                     |    ---------------------------       |
|BIORHYT     22*Prog                     |    GROM 0: Empty                      |
|BUNDESLIGA  27*Prog                     |    GROM 1: Empty                      |
|HYPOPLAN    23*Prog                     |    GROM 2: Empty                      |
|IQ-TEST     42*Prog                     |    GROM 3: Empty                      |
|KALENDER     7*Prog                     |    GROM 4: Empty                      |
|LOAD         4 Prog                     |    GROM 5: Empty                      |
|PFERDE      26*Prog                     |    GROM 6: Empty                      |
|RUSSISCH    29*Prog                     |    GROM 7: Empty                      |
|TILGPLAN    35*Prog                     |    ---------------------------       |
|VOKABEL     26*Prog                     |     ROM 0: Empty                      |
|WECKER      26*Prog                     |     ROM 1: Empty                      |
|WERTMINDER  35*Prog                     |     ROM 2: Empty                      |
|                                        |     ROM 3: Empty                      |
|                                        |                                       |
|--------------------------------------------------------------------------------|
|             (REDO)    (BACK)    (Arrowkeys)                                    |
+--------------------------------------------------------------------------------+
```

Header Format of the GRxM-Module

Overview

The HSGPL employs a header that is a modified 4-Byte-Header from the SNUG Users Group (System 99 user-group), built as a header type, and was used in the first GROM simulation for the GROM port.

It is loadable into only one GRxM Bank.

The construction of the Header

Byte >0	Byte >1	Byte >2 and >3	Byte >4 ..... >2003
Target address 256 Byte-increments	Load information & additional load bit	Length of the File	Used data

Header-Byte >0

The target address of the modules is in bytes >0 and >1 of the Header. There is further information in byte >1, in which no address sharing in byte >1 and like >00 is considered. It is here that the target address must and is always placed in multiples of 256 (>100).

Header-Byte >1

In this byte is the information is stored about which in memory area the file will be copied and where additional data will be loaded.

Bit 0	Bit 1	Bit 2	Bit3	Bit 4	Bit 5	Bit 6	Bit 7
Not used at this time				Target Bank +1 in ROM >6000			Additional Load bit

The additional load bit determines where the next file will be loaded or if the file is the last file in the series. If the additional load bit is set as 1, the next filename will be loaded and the filename must end in the next alphabetical letter.

The target Bank in the range of ROM >6000 is where the file will be loaded. The values are set by default to 1 to 4. If they are set to zero, the file is written to GRxM.

Header-Bytes >2 and >3

The file size is shown here. The HSGPL Control Program ignores these bytes. It will always copy >2000 bytes (8 KB) to the target Bank.

Header-Bytes >4 to >2003

This is the actual file data. All of the values between >00 and >FF are transparently written.

Example for a Header:

Byte >0 and >1	Byte >2 and >3	Explanation
>6001	>2000	Memory GROM 3, load next file
>6004	>2000	Memory ROM >6000, Bank 2, last file
>0000	>2000	Memory GROM 0, last file
>6003	>2000	Memory ROM >6000, Bank 1, additional files to load

Functions of the HSGPL-DSR

Power-Up

The Power-Up Routine after turn on whether a reset or warm boot checks all of the relevant memory areas if there is a conflict detected by means of QUIT.

If a module has been inserted or a module simulation is found, the HSGPL card is not activated and only the module that has been inserted is accessed.

The area G>0000 to G>1FFF is only activated if the middle jumper is installed.

Subprograms accessed in TI-BASIC via CALL

CALL GRAM

This shows the GRAM Banks 0 and 1 instead of GROM-Bank 0 and 1 at the addresses G>9800 and G>9804 (basic pages). It does NOT check if there are any useful data there. You must first use CALL TIBASIC.

CALL GROM

Switches off GRAM Banks 0 and 1.

CALL RAM6000

Enables the RAM instead of the ROM of the basic pages. NO bank switching is possible but writing to these addresses is allowed. It is possible, for example, through the Assembler from J.P. Hoddie by employing the program options.

CALL ROM6000

Cancels CALL RAM6000. This is the standard condition at Power-Up.

CALL SCON

Turns on the Super-Cart emulation. In comparison with the normal Super-Cart, it has twice the memory at ROM >6000. All of the even and odd GROM Banks appear as the same ROM area. Modules in other Banks can´t use the area in ROM >6000 as long as the Super-Cart is turned on.

CALL SCOFF

Turns off the Super-Cart emulation. This is standard at reset or after turn on.

CALL MBXON

Turns on the Rom banking for MBX-Module.

CALL MBXOFF

Turns off MBX banking.

CALL GWRON

Turns off the write protection for the GRAM area.

CALL GWROFF

Turns off the write protection for the GRAM area. This is the automatic standard at turn on or after hardware reset.

CALL TIBASIC

Loads both GRAM banks with GROM 0 modified for 80-column cards. TI-BASIC™ with the data from the DSR (Bank 5 to 7) is loaded. The GRAM areas 0, 1, and 2 are overwritten. The contents of memory from >A000 to >FFFF are destroyed.

CALL GROM0

Both GRAM banks will be loaded with the original GROM 0 (as in the console).

CALL HSGPL

The Control Program for the HSGPL card will be copied from the DSR area (Bank 2 to 4) and started. The memory space >A000 to >FFFF will be overwritten and the BASIC program will be destroyed.

CALL BANK(n)

The contents of the bank with the number (n) will be copied into both GRAM areas. It is necessary that the source bank has GROM 0 and TI-BASIC™ installed. One must have a proper operating system in place to avoid a crash!

The accepted range is 0 to 15 (depending on card capacity). It is possible to use only decimal entries - 10 for Bank >A, 11 for Bank >B … to 15 for Bank F.

CALL MINIMEM

The MINIMEMORY™ module (without EASYBUG) and GROM 0 to 2 will be copied from the DSR in *both* banks of the GRAM area and the card so configured that ROM6000 can be written to. To be sure, this is the very same area from >6000 to >7FFF that will be altered if unprotected.

All of these settings that are installed with CALL **SCON**, **GRAM, RAM6000** and **GWRON** are active as long as the reset key is has not been pressed. A warm start with **FCTN=** (QUIT) doesn't change the settings.

Attention: The subprograms **BANK(n), TIBASIC** and **MINIMEM** will load the same data in both banks. The choice ***REVIEW MODULE LIBRARY*** is not displayed.

Technical Appendix

CRU-Distribution bits

Names with „/“ marks negative Logic

	R12	MM30	Name	Equates	Significance
>0	>1B00	>0001	DEN	DSRENA	DSR Enable
>1	>1B02	>0002	GRMENA	GRMENA	GRAM instead oft GROM in Banks 0 and 1
>2	>1B04	>0004	/BNKINH	BNKENA	Banking disable
>3	>1B06	>0008	PG0	PG0	Paging-Bits for DSR (see below)
>4	>1B08	>0010	PG1	PG1	
>5	>1B0A	>0020	PG2	PG2	
>6	>1B0C	>0040	PG3	PG3	
>7	>1B0E	>0080	PG4	PG4	
>8	>1B10	>0100	PG5	PG5	
>9	>1B12	>0200	CRDENA	CRDENA	Memory area for the HSGPL activation
>A	>1B14	>0400	WRIENA	WRIENA	Write enable for RAM and GRAM
>B	>1B16	>0800	SCENA	SCARTE	Super Cart Banking activation
>C	>1B18	>1000	LEDENA	LEDENA	LED switch on
>D	>1B1A	>2000	-	-	Free
>E	>1B1C	>4000	MBXENA	MBXENA	MBX Banking activation
>F	>1B1E	>8000	RAMENA	RAMENA	RAM6000 instead of ROM6000 in Banks 0 and 1

Using of DSR-ROM

Most cards only have the first 64Kbyte of the DSR installed in an AT29F512

Bank	PG543210	MM 3.0	Address in EPROM	Usage
0	000000		>0000 to >07FF >0800 to >1FFF	DSR Original-Grom 0
1	000001		>2000 to >2FFF >3000 to >3FFF	GROM Mini-Mem ROM Mini-Mem
2	000010		>4000 to >5FFF	Reserved for HSGPL Control Program
3	000011		>6000 to >7FFF	Reserved for HSGPL-Control Program
4	000100		>8000 to >9FFF	Reserved for HSGPL-Control Program
5	000101		>A000 to >BFFF	Reserved for GROM 0 (Version Winfried Winkler)
6	000110		>C000 to >DFFF	Reserved for GROM 1 (existing TI-Basic)
7	000111		>E000 to >FFFF	Reserved for GROM 2 (existing TI-Basic)
8-15	001xxx		>0000 to >FFFF	Not used
16-23	010xxx		>0000 to >FFFF	Not used
24-31	011xxx		>0000 to >FFFF	Not used
32-39	100xxx		>0000 to >FFFF	Not used
40-47	101xxx		>0000 to >FFFF	Not used
48-55	110xxx		>0000 to >FFFF	Not used
56-63	111xxx		>0000 to >FFFF	Not used

Access to ROM6000

In the Rom6000 (>6000 to >7FFF) range there are up to 18 Banks available. However, for GROM access each has its own access address. Through a circuit trick, the GROM range is masked and by means of GRMRA GROM3 is read last. That is done by a normal module scan. In order to access a ROM bank, you must first read them before accessing GROM3.

Direct Access Channel for all Memory Ranges

Modulebank	Read GROM	Write GROM	Read ROM6000	Write ROM6000
0	>9800	>9C00	>9880 Offset >0000	>9C80 Offset >0000
1	>9804	>9C04	>9880 Offset >8000	>9C80 Offset >8000
2	>9808	>9C08	>9884 Offset >0000	>9C84 Offset >0000
3	>980C	>9C0C	>9884 Offset >8000	>9C84 Offset >8000
4	>9810	>9C10	>9888 Offset >0000	>9C88 Offset >0000
5	>9814	>9C14	>9888 Offset >8000	>9C88 Offset >8000
6	>9818	>9C18	>988C Offset >0000	>9C8C Offset >0000
7	>981C	>9C1C	>988C Offset >8000	>9C8C Offset >8000
8	>9820	>9C20	>9890 Offset >0000	>9C90 Offset >0000
9	>9824	>9C24	>9890 Offset >8000	>9C90 Offset >8000
10	>9828	>9C28	>9894 Offset >0000	>9C94 Offset >0000
11	>982C	>9C2C	>9894 Offset >8000	>9C94 Offset >8000
12	>9830	>9C30	>9898 Offset >0000	>9C98 Offset >0000
13	>9834	>9C34	>9898 Offset >8000	>9C98 Offset >8000
14	>9838	>9C38	>989C Offset >0000	>9C9C Offset >0000
15	>983C	>9C3C	>989C Offset >8000	>9C9C Offset >8000

Modulebank	Read GRAM	Write GRAM	Read RAM6000	Write RAM6000
16 (Ram)	>9880	>9C80	>98C0 Offset >0000	>9CC0 Offset >0000
17 (Ram)	>9884	>9C84	>98C0 Offset >8000	>9CC0 Offset >8000

The access channel pair >98C4 and >9CC4 is used to write and clear a 64k block of RAM

DSR-Bank	Read	Write
0 to 7	>9840	>9C40
8 to 15	>9844	>9C44
16 to 23	>9848	>9C48
24 to 31	>984C	>9C4C
32 to 39	>9850	>9C50
40 to 47	>9854	>9C54
48 to 55	>9858	>9C58
56 to 63	>985C	>9C5C

Attention: The write function only works within these ranges and with the simultaneous setting of the read-only flag (CRU >1B14). For a description of the FEEPROM Algorithms each manufacturer must be consulted.