Manual

128 K-BYTE GRAM-CARD

MECHATRONIC

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128K-Byte GRAM-Card Manual

1. Introduction

The Mechatronic 128K-Byte GRAM-Card enables owners of the TI 99/4A to dump, store, and run Modules without the frequent switching of cartridges. You can store the contents of your module on disk and with a press of a few keys call it back into memory, using it exactly like you would normally. In one 128K-Byte GRAM-Card you can store and select up to two modules. The modules are selected from the Title screen of the TI 99/4A.

The following instructions describes the handling of the 128K-Byte GRAM-Card and the built-in software. The software is installed in the hardware so that awkward loading of support utilities is avoided. Through this built-in software you can alter stored module programs. For example, you can alter the screen colors of any given module, the printer output device parameters(RS232, PIO). Furthermore, the 128K GRAM-Card offers 13K-Bytes more storage for TI-BASIC programs.

Together with a GPL-Assembler, the 128K GRAM-Card offers a development system for the Graphics Programming Language utilized by the TI 99/4A operating system. With some slight modifications GPL programs can be stored on disk for EPROMS, allowing you to design your own modules for the TI 99/4A.

The GRAM-Card can be installed in any slot of the Peripheral Expansion Box. All the usual precautions are advised for the handling of such cards. Insert the card only after all power is shut off, avoid touching any contacts (to eliminate static discharge). Seat the card firmly, rocking it into place if needed.

If one card isn't enough, you can always add more GRAM-Cards. Up to eight(8) 128K-Byte GRAM-Cards can be installed in the PE-Box. (depending on the number of availaible slots) Or, you can upgrade to a 512K-Byte GRAM-Card, seating only 2 cards in the PE-Box allows to store up to 8 Modules online with 1M-Byte of RAM available. Consult with your local dealer for further information.

2. DSR-Software V 1.0

2.1 General Information

The built-in EPROM software makes it very easy to use the GRAM-Card. However the correct functioning of the 128K-Byte GRAM-Card requires an initial setup. When only one GRAM-Card is in use, the GROM bias address of >9800 must be selected by setting the DIP switches upon installation. With multiple GRAM-Cards, it is important that the card with the smallest CRU-address, is also set at the smallest GROM bias address.

Examples: >1800 (CRU)   >9800 (GROM)
(mandatory setting for first card)
            >1900 (CRU)   >9804 (GROM)
                           (or higher)

Should your card not function correctly when using multiple GRAM-Cards, consult the Hardware Section of this manual.

To fully utilize the inherent software possibilities of the GRAM-Card, you must have a 32K-Byte Memory Expansion Card attached. The resident GRAM-Card software uses the storage area from >2700 ¬ >BE00. Any previously resident machine language programs will be over-written.

The built-in software supports up to (8)eight GRAM-Cards in the TI-PBOX, however the Loader from BASIC can only access up to (3)three of these cards(See below).

If, during power up, a module is inserted, it has the effect of making the GRAM-Card(s) "invisible" to the operating system(i.e they automatically switch off). When no module is present on power-up, the GRAM-Card(s) will auto-initialize. For each card this will roughly take 4.5 seconds(a 512K card will take about 18 seconds). Because of this, an amount of time will pass before the actual Title screen will appear. This is normal, and unfortunately necessary to prevent any system failures. During this process the entire GRAM is cleared. At any time, you can initialize or clear the GRAM, by way of pressing Function 4 (CLEAR), during a reset of the TI 99/4A(e.g. immediately after typing BYE in BASIC).

2.2) Selecting the GRAM-Card

1. TI-BASIC
2. GRAM-Card >9800
3. REVIEW MODULE LIBRARY

If no module is inserted, the TI 99/4A will show the above Menu after the Title Screen (with Disk controllers that have their own screen, pressing the space bar will access this list.

Choosing option 3 shows any other available GRAM-Cards. Please be aware that every GRAM-Card will report itself at two different GROM-Addresses (example >9800 and >9820). See the Hardware section.

Press option 2, to select the GRAM-Card. A new menu list appears headed with the title "GRAMCARD >98XX" (where "XX" indicates the GROM Address, again see Hardware section). Similar to the TI 99/4A Menu.

Option 1 of this Menu selects the Loader (which we will address later). The other options are Load-Files, that will also be explained later.

3. GRAM-Card Loader Menu

1. LOAD (G)RAM WITH PROGRAM
2. LOAD   GRAM WITH ASM-FILE
3. LOAD   RAM WITH ASM-FILE
4. LOAD   GROM 0-2
5. SAVE   GROM
6. SAVE   ROM
7. LOAD   FILE

3.1   The Loader

Pressing option 1 selects a multi-function utility program with its own selection menu.

1.   LOAD (G)RAM WITH PROGRAM

With this option. any file previously saved with options SAVE GROM/SAVE ROM can be reloaded.

After selecting 1. on the lower screen will appear the CRU Address and the GROM Base-address. Generally you should confirm these addresses by hitting Enter. The GRAM-Card Base-address is then accepted as the correct Load Address.

Even with multiple GRAM-Cards. one should not alter GROM Addresses. as they may cease to function properly. After that you must enter the file name you wish to load into the GRAM-Card (e.g "DSK1.TEST")

Note:This option will not work with a cassette recorder.

In addition to normal error messages, there is an additional message "No (G)RAM-File!". This indicates that a file name was entered which was not saved with any of the Loader Save options or that a RAM file with a different GRAM Base-Address then >9800. RAM in >6000->7FFF is only available when GROM >9800 is selected.

This is unavoidable especially if several GRAM-Cards are in use. to prevent several RAM-Banks being switched on at one time.

If with this option a program is loaded into GRAMS 1 and 2 (>2000->5FFF). then the program is present but cannot be selected since GRAMS 0-2 don't get switched on. This will only occur if you load GRAM 0 (>0000 - >1FFF). This program will be loaded in all areas of GRAM to prevent a possible lock-up during "reset" on the TI 99/4A.

2.   LOAD GRAM WITH ASS-FILE

This section serves to load GFL programs. that were assembled with a GFL Assembler. The program must be in Tagged Object Code (D/F 80) without REF/DEF's (absolute Addressing only). One such GFL Assembler is the one written by Michael Weiand. This option will also request the CRU Address and the GROM Base-Address.' Again respond to each prompt with "Enter". Then the prompt "Filename:" will appear. If you are using the above mentioned Assembler. don't give an OFFSET. else the Object-Code will load into an incorrest area of the GRAM-Card.

3. LOAD RAM WITH ASS FILE

This option allows the loading of TMS 9900 Tagged Object-Code into the RAM area of the GRAM-Card. This can only be selected with a GRAM Address >9800.

In contrast to the usual loaders. this Loader will only accept code with Absolute Addressing (no REF/DEF's). The usual utilities in RAM (VMBR.VMBW. DSRLNK. KSCAN. etc) are not available. You must write your own replacement routines.

After the selection of this option you will be prompted for first the CRU Address and then the Bank of memory to load your program into. Pressing "Enter". defaults to Bank >6000, then you will be prompted for the filename ("DSK1.TEST).

4. LOAD GROM 0-2

Again, after setting the appropriate CRU and GROM adresses, there will be an additional message: "ARE YOU SURE (Y/N)". If you have choosen this option by mistake reply "N" ,and press enter. You will be taken back to the previous menu.

If you select "Y", the operating system in GROM's 0-2 (>0000 - >5FFF will be copied into the GRAM-Card, and GRAM's 0-2 will be switched on. To secure a problem-free operation of the system, the operating system will be loaded into both regions of the GRAM. The RAM regions will no longer be available, since GRAM 0 would be overwritten by the RAM region.

IMPORTANT NOTICE: The GRAM-Card works "against" the built-in console GROM's. Dependent on the driver in the PE-Box, the TI 99/4A will only recognize the GRAM's 0-2. There is no guarantee that this operation couldn't lead to possible damage to the console GROM's. This option should not normally have any use to anyone except experienced programmers.

5. SAVE GROM

Choosing this option allows the memory contents of selected GROM's to be stored on an output device. The maximum size saved is >2000 or 8K-Bytes. You will have to enter the GROM bias address, and the file name you wish to store it on("DSKX.GROM1").

6. SAVE ROM

This works largely in the same way as Option 5, except that it stores the ROM-areas of modules. After requesting for the CRU-Address, you will additionaly be prompted for the BANK-Address. At this point if you just press ENTER >6000->7FFF will be saved. Otherwise is you enter >6002, then >7000 - >7FFF will be saved. Finally, you will be asked for the output file-name.

The 128K Byte GRAM-Card is fully compatible with all developments of Texas Instruments on the TI 99/4A. This card may not work correctly with third party ROM-Modules which may contain some Bank switching of their own.

7. LOAD FILE

A module may consist of up to 5 GROMS and 16 RAM Banks. This can make it tedious to have to load each one individually with this option. However with this option and an approriate Load File (D/V 80 Format. TI-Writer or E/A modules. or a BASIC program). containing the names of the programs and an EOF blank line.

When using TI-Writer. do a Control O. so that no Control Codes will be embedded in your file. Enclosed below is a BASIC program example to create a Load File:

```
100 OPEN #1:"DSK1.TE.DISPLAY.VARIABLE 80.OUTPUT
110 PRINT #1:"DSK1.TEST1"
120 PRINT #1:"DSK1.TEST2"
130 PRINT #1
140 CLOSE #1
150 END
```

Loader Comments: After the Load File has completed executing. Function "BACK" (9) will return you to the Title screen which will now include your reloaded module as a valid selection. (But only if no real module is inserted).

With a lot of Loader entries Function '9' will only return you to the previous Menu.

Note: All Address entries must be in Hexadecimal.

3.2   LOAD FILES

Upon entry of the 128K Byte GRAM-Card a whole series of Load Files can become available on a simple key press. Pressing Function '7' "AID" allows switching between Menu screens.

Pushing the number of your choice results in the loading of a file as described in option 7.

Note: Load File selections through the GRAM-Card menu does not display any error messages. Any error messages will be ignored. If you load a program into GRAM 3 (>6000 - >7FFF). with this option the routine will return to the Title screen of the TI 99/4A. otherwise the GRAM-Card Menu will be restored. From the GRAM-Card Menu Function Back will take you to the Title screen.

Comment: Additionally the Loader does not verify if any files loaded into GRAM/RAM with a CRU Address of >0020 or higher over-write each other.

4. Use of Loader from BASIC

The Loader can be accessed from TI-BASIC (especially when you wish to dump a module to Disk). Enter TI-BASIC, and in Immediate Mode enter CALL GRAM (GRAM1, GRAM2, GRAM3). Under BASIC, the limit is 3 GRAM-Cards, no matter how many you actually have installed.

CALL GRAM will load the usual GRAM-Card Menu and regular operations can proceed from there. A single restriction in BASIC is that you MUST enter the correct GRAM-Card Address.

During installation of the GRAM-Card(s) it is recommended to write down all the addresses for handy reference, otherwise the Loader functions as previously described.

5. TI-BASIC Programs as Modules

You can also "transform" TI-BASIC programs into Modules.

Procedure: Select TI-BASIC, load your program, enter the following: "CALL MODULE("MYNAME"). When the cursor returns, go back to the Title screen and "MYNAME" will have been added to the Menu List.

Note: This only works with TI-BASIC, not EXTENDED BASIC.

Additionally, such programs may not contain the command "RESTORE". All other commands did not cause any failures although not fully tested.

These programs can also be saved from GRAM into a GROM format. Thus it is possible to store your programs in a format which would enable you to burn them in on an EPROM, thus designing your own modules. (All BASIC programs regardless of size occupy GRAM >6000 - >9FFF). This frees-up VDP-RAM for use of variables and string space, a 13K Byte gain in storage, effectively increasing program size to roughly 26K Bytes.

BASIC programs in module format cannot be edited. BASIC programs only function correctly from GRAM Base-Address >9800. Despite being in module format, your program executes normally except that during Prescan the screen remains blank. This can be, as in TI-BASIC, a lengthy process.

When the program finishes or an error occurs the following message will be displayed (after the error message): "Press any Key to RESET"; which will then return you to the Title screen.

6. The Hex-Monitor

The software of the 128K Byte GRAM-Card also contains a simple Hex-Monitor, that enables a direct alteration of memory contents. The monitor is accessed from TI-BASIC with the direct command "CALL EDITMEM". The screen will be cleared and "TYPE OF MEMORY" will be displayed.

V=VDP-RAM, G=GRAM, C=CPU-RAM. After that you must enter the starting address of the memory location you wish to examine. Example G >9800

8 Lines will appear on the lower half of your screen displaying the contents of memory in Hexadecimal form. The cursor is controlled with the arrow keys. The monitor will scroll if you overstep the 8 line range. function 7 "AID" allows switching from Hex to ASCII. All keys will repeat if continually pressed. Function 9 returns you to the original screen. function 5 returns you to BASIC.

Please NOTE: In VDP-RAM (>0000 - >3FFF) there are no provisions to prevent the overstepping of the boundaries of begining and ending addresses. Making alterations or overstepping the bounds may crash your system. Furthermore the alteration of the GRAM-Card RAM must occur over address >7000 with a GRAM Addres of >9820 and a start address of >E000. (see hardware section). The RAM in >6000 - >6FFF can only be altered because it resides in GRAM and is invisible to the operating system. The operating system can only access this area if you have a program loaded into bank >6000.

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7. Practicing with the GRAM-Card

7.1   Saving and Loading of Modules

Insert the module normally. select TI-BASIC and access the 128K Byte GRAM-Card via "CALL GRAM1". Select option 5. or 6. to save GROM or ROM. With GROM's you must save each one individually.

```
Addresses:   >6000 - >7800
             >8000 - >9800
             >A000 - >B800
             >C000 - >DF00
             >E000 - >F800
```

The original TI-GROM's were 6K Bytes each. Example: The Disk Manager module contains two GROM's. These are saved with option 5 using start >6000 - >7800, >8000 - >9800 with the filenames DSK1.Manager1, DSK1.Manager2. On the same diskette you can create a Load File ("DSK1.DM"). With the following BASIC program the Load File is created.

```
100 OPEN #1:"DSK1."DSK1.DM",DISPLAY,VARIABLE 80
110 PRINT #1:"DSK1.MANAGER1"
120 PRINT #1:"DSK1.MANAGER2"
130 PRINT #1:
140 CLOSE #1
```

This file can then be load using Option 7 of the Loader or directly from option 4 of the GRAM-Card Menu. (Where it will be placed by the Loader as a valid selection.). Second Example: (EXTENDED BASIC module). Extended Basic contains 4 GROM's and 2 ROM BANKS. Again select Option 5 of the Loader

```
>6000 - >7800          DSK1.XBASIC1
>8000 - >9800          DSK1.XBASIC2
>A000 - >B800          DSK1.XBASIC3
>C000 - >D800          DSK1.XBASIC4
Option 6:
>6000                  DSK1.XBROM1
>6002                  DSK1.XBROM2
BASIC LOAD PROGRAM:
100 OPEN #1:"DSK1.XB",DISPLAY.VARIABLE 80
110 PRINT #1:"DSK1.XBASIC1"
120 PRINT #1:"DSK1.XBASIC2"
130 PRINT #1:"DSK1.XBASIC3"
140 PRINT #1:"DSK1.XBASIC4"
150 PRINT #1:"DSK1.XBROM1"
160 PRINT #1:"DSK1.XBROM2"
170 PRINT #1
180 CLOSE #1
```

7.2 E/A Debugger

The Editor/Assembler Debugger can also be used to alter memory in the GRAM-Card. Instead of the usual M command , use M G600 (G for GRAM).

However. DEBUG is inaccurate. because it writes with a decrement to any address specified. one lower than the one entered. This is correctible however. simply by altering the source code and re-assembling. In the section "PUT TO SOURCE OR DESTINATION" you find a DEC STARTA with the comment "we must decrement for some simulators"

Remove this line and re-assemble. the memory addresses will be accurate.

7.3 Additional Information.

The GROM/ROM files saved by the Loader can be used with some restrictions for use with an EPROM burner. The Load files have a 6 byte header with some values that the Loader requires when loading. Taking this into consideration will allow you to utilize these programs on an EPROM-burner, anyway.

Remember. if your computer locks-up. your GRAM-Card contains read/write memory. and it is very likely that the contents of memory have been altered in such a manner as to make the resident programs unusable. This of course is a fond occurrance while developing new machine language programs. Thus it is usually wiser to re-initialize your GRAM-Card and reload your resident programs.(Using Function 4 after a "reset").

Some TI Modules will only work correctly from >9800 (Multiplan,TI-Writer. Personal Record Generator, BASIC program modules) the Editor Assembler will function correctly from >9800 or >9820. This does not claim to be comprehensive. when in doubt select >9800. With user-developed programs using G >6000 the operating system must be informed of this by putting a >AA at >6000 or on power-up the system will lock-up.

If loading a ROM/RAM module and using GRAM 0-3 (for example. to change the keyboard) do not pick option 3 "REVIEW MODULE LIBRARY" or the system will lock-up.

8. Hardware Section

8.1 The Ram Organization

In the GRAM-Card there are exactly a total of 128K-Byte RAM available. Of this 64K-Byte are configured as GRAM and 64K-Bytes are configured as normal RAM. The RAM is organized in 16 Blocks(BANKS).that can be accessed over the following addresses.

CPU ADDRESS TI 99/4A	SWITCH THRU WRITE TO ADDRESS	BANK	RAM ADDRESS 64K-BLOCK
>6000->6FFF	N/A	15	>0000
>7000->7FFF	>6000	1	>E000
>7000->7FFF	>6002	2	>F000
>7000->7FFF	>6004	3	>C000
>7000->7FFF	>6006	4	>D000
>7000->7FFF	>6008	5	>A000
>7000->7FFF	>600A	6	>B000
>7000->7FFF	>600C	7	>8000
>7000->7FFF	>600E	8	>9000
>7000->7FFF	>6010	9	>6000
>7000->7FFF	>6012	10	>7000
>7000->7FFF	>6014	11	>4000
>7000->7FFF	>6016	12	>5000
>7000->7FFF	>6018	13	>2000
>7000->7FFF	>601A	14	>3000
>7000->7FFF	>601C	15	>0000
>7000->7FFF	>601E	16	>1000

WARNING: A write to >601C turns on both >6000->6FFF as well as >7000->7FFF. Also the RAM area can be accessed as GRAM. The GRAM-Address becames the BASE-Address plus >0020. Care must be taken to pervent any double-occupation of GRAM and RAM by a loaded module. This can cause a failure when a cross reach occurs.

Example: Extended Basic. which uses RAM banks >6000 and >6002. If the module is loaded into >9820 it cannot occupy the GROM Addresses of >E000 - >FFFF. This is also important when GROM'S 0-2 are switched on(i.e if the operating svstem is loaded into the GRAM-Card.).since the areas of RAM >6000->6FFF are overwritten bve GROM 0(>0000->1FFF)

Through either Bank switching. or hard-wiring by selecting the appropriate DIP switches. the BANKS can be switched on and off.See the section below on setting the DIP switches. The other 64K-Byte area is configured as GRAM. They cover all the available GROM areas(from >0000 - >FFFF). The first three GRAM'S(GROM Address >0000 - >5FFF) can be switched off.

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8.2 The DIP switches

On each GRAM-Card there are three (3) DIP switches with 8 ea. switchs.

DIP 1: S1-S4 configure the CRU addresses see pg.17
S5-S6 not used
S7-S8 configure the Banks at address >7000->7FFF

S7	S8	Bank
off	off	2
on	off	1
off	on	4
on	on	3

DIP 2: SETS THE GRAM BASE ADDRESS. Only one switch at a time the other seven MUST be off

DIP ON	GRAM ADDRESS
S1	>9800/9820
S2	>9808/9828
S3	>9810/9830
S4	>9818/9838
S5	>9804/9824
S6	>980C/982C
S7	>9814/9834
S8	>981C/983C

The second Address exists for the possibility to address the RAM as GRAM.

This is useful when several GRAM-Cards are in the PE-Box.(up to 8 128K or 2 512K Cards, dependent on the number of open slots in the PE-Box.),as only one RAM can be active at one time.

In normal cases S1 sould always be "ON". If you are using one of the popular module expanders that allows access to inserted modules with the screen "REVIEW MODULE LIBRARY", then you must switch the required addresses on. while none of the modules are inserted.

WARNING: If RAM is to be used. such a module expander cannot contain a ROM module

DIP 3: Is designed to fit the Card to the appropriate wait-cycles of the Computer at every memory fetch. The switch is factory preset for the TI 99/4A.

8.3 The CRU Adresses

Setting the S1-S4 switches on DIF 1 enables the access to the
resident EFROM software of the GRAM-Card. An address must be
selected which does not conflict with any devices already
attached and configured to run off such an address. This
unresoled conflict between two devices trying to use the same
CRU-line will result in a system lock-up and potential harm
to your system if the conflict isn't resolved.
   On delivery of this Card >1700 is factory set as the one
address that hasn't been used by any other known piece of
hardware.

DIF 1

CRU-Adresses	S1	S2	S3	S4
>1000	ON	ON	ON	ON
>1100	ON	ON	ON	OFF
>1200	ON	ON	OFF	ON
>1300	ON	ON	OFF	OFF
>1400	ON	OFF	ON	ON
>1500	ON	OFF	ON	OFF
>1600	ON	OFF	OFF	ON
>1700	ON	OFF	OFF	OFF
>1800	OFF	ON	ON	ON
>1900	OFF	ON	ON	OFF
>1A00	OFF	ON	OFF	ON
>1B00	OFF	ON	OFF	OFF
>1C00	OFF	OFF	ON	ON
>1D00	OFF	OFF	ON	OFF
>1E00	OFF	OFF	OFF	ON
>1F00	OFF	OFF	OFF	OFF

   Generally, the above listing of switch settings for
CRU-Addresses will help you to set up your GRAM-Card
correctly. Since Texas Instruments no longer regulates what
devices are attached by which address, enclosed below is also
a listing of the peripheral devices.

>1100	All currently known Disk-Controllers.
>1300	RS232/PIO Cards, standalone ports.
>1400	CENTRONICS ports, Mechatronic 128K-Bytes Memory
>1500	SECOND RS232 CARD.
>1800	TI thermal printer
>1900	EFROM Programming device
>1E00	FOUNDATION 128K CARD, A/D-CARD
>1F00	P-CODE CARD

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Setting or clearing individual bits of the selected CRU-Adddress of the GRAM-Card turns diverse functions on or off. The X in the numeric fields designates the selected Adddres.

>1X00 (DSR enable) Set bit: DSR-(Ep)Rom turned on.
          Clear bit: DSR disabled.
>1X02 (RAM enable) Set bit: CPU-Ram >6000 - >7FFF read/write disabled.
          Clear bit: Access to all RAM-Banks.
>1X04 (GRAM enable 2) Set bit: Turn GRAM off (>1X00 and 1X06 must also be set.). Exception: When A10 (Address-line) goes High for example with GRAM >9820 set. Then >1X04 and >1X02 dont function with the GRAM: this bit should only really be altered when GRAM >9800 is selected and >9820 is to be turned off.
>1X06 (GRAM enable) Clear bit: GRAM turned on.
              Set bit: Access to GRAM is only possible when the conditions for >1X02 and >1X04 are met
>1X08 (RAM write enable): Set bit: Write enable on the RAM-Banks.
          Clear bit: Read only access.
>1X0a (GRAM 0-2 enable) Set bit: Entire GRAM-memory available. even >0000->5FFF
     If data is read from this area of GROM-Address. then the GRAM-Card will be working against the Console GROM's. Warning: This may result in damage to the console GROM's despite any lack of failures after repeated testing.
              Clear bit: Area of >6000->7FFF GRAM only available for work. On power-up of the Console this bit is automatically set to 0 to prevent ay harmful effects.
>1X0C (Bank-switching) Set bit: turns on the BANK of RAM hardware selected through the DIP switches. (>7000->7FFF). On a write to one of the previously described BANKS. the address is stored and the selected BANK will re-appear as selected even if the bit is cleared.
>1X0E (Bank enable) Set bit: BANK switch disable on write to address. If a BANK is to be selected on one off the previously described addresses then >1X08 and >1X0E must be set to write enable. Since the BANK switching is only partialy decoded you can have uncertain results if this step is not performed.

Please note: GRAM can always be written to. CRU-Addresses >1X06 and >1X04 only switch off the read to GRAM.

9. Addendum

9.1 Contents of some Modules

MODULE	Contents	MODULE	Contents
ADVENTURE	G3	CHESSMASTER	G3,G4,G5,G6,RO
ADVERTISER	G3(8K-Bytes)	SCHOLASTIC SPELLING	G3 G4,G5,G6,G7
ALIEN ADDITION	G3,G4	SPEECH EDITOR	G3
ALLIGATOR MIX	G3,G4	STATISTICS	G3,G4,G5,G6,G7
ALPINER	G3,G4,G5,G6,RO	TE II	G3,G4,G5,G6,RO
ATTACK	G3	TESTTRAINER	G3,G4
BEG. GRAMMAR	G3,G4,G5	TI-CALC	G3,RO,R2,R4,R6
BLACK JACK	G3	TI-INVADERS	G3,RO
BLASTO	G3	TI-WRITER	G3
BUCK-ROGERS	G3,G4,RO	TUNNELS OF DOOM	G3,G4,G5,G6,G7
BUDGET MGMT.	G3,G4	VIDEOGAMES	G3,G4
BURGER TIME	G3,G4,RO	VIDEOGRAPHIC	G3
CARWARS	G3	ZERO-ZAP	G7
CHISHOLM TRAIL	G3,RO		
COM. GRAPHIC	G3,G4		
CONGO-BONGO	G3,G4,RO		
CONNECT FOUR	G4		
DECIMALS	G3,G4,G5		
DEMOMODULE	G3,G4,G5,G6	G3: GROM >6000 - >7800
DEMOLITION DIV.	G3,G4	G4: GROM >8000 - >9800
DIAGNOSTICS	G3	G5: GROM >A000 - >B800
DM I	G3,G4	G6: GROM >C000 - >D800
DM II	G3,G4	G7: GROM >E000 - >F800
EDITOR/ASSEMBLR	G3		
EXTENDED BASIC	G3,G4,G5,G6,RO,R2	RO: ROM BANK >6000
FATHOM	G3,G4,G5,RO	R2: ROM BANK >6002
HANGMAN	G5	R4: ROM BANK >6004
HOSTLE	G3	R6: ROM BANK >6006
HUNT THE WUMPUS	G3		
INDOOR SOCCER	G3,G4		
LOGO II	G3,G4,G5,RO		
METEOR MULT.	G3,G4		
MICRO-SURGEON	G3,G4,G5,RO		
MINI-MEMORY	G3,RO		
MINUS-MISSION	G3,G4		
MOON-MINER	G3,G4,G5,G6,G7,RO		
MOON-SWEEPER	G3,G4,G5,RO		
MULTIPLAN	G3,G4,G5,G6,G7		
MULTIPLICATIONS	G3,G4,G5		
MUNCHMAN	G3		
MUSIC-MAKER	G3,G4,G5		
OTHELLO	G3,RO		
PARSEC	G3,G4,G5,RO		
PERS.REC.GEN.	G3,G4		
PERS.REC.KPING	G3,G4,G5,G6,G7		
POPEY	G6,G7,RO		
PRACTICAL MATH	G3,G5,G6		
PERCENTS	G3,G6		

9.2. Background Colors in X-Basic

There are a plethora of Interrupt-driven ML subroutines for color alterations in Extended-Basic. With the GRAM-Card it is a simple process. After the contents of the Module has been stored. Call EDITMEM, in version 110 of Extended-Basic address >693A contains the background color. Originally this should be >07 (Basic color value minus one.). Setting this to >01 for example would give you a Black background. Next of course one must alter the character -foreground color. >6948 should contain a >10. (change this to >F0 and your XBasic is set up for a BW monitor. After your changes you may if you wish to keep the color, save the program back to disk.

In this fashion, several modules can be customized for screen color and even output device. Remember, any alteration can be smaller or of equal size, however a larger specification my result in changes being overwritten in other areas of your program.

9.3. QUICK REFERENCE

CALL EDITMEM Call HEX-MONITOR from BASIC or EXTENDED BASIC to alter memory contents.

CALL GRAM Access of Loader from Basic to dump, store, or load modules.

CALL MODUL("MYMODULE") Call command from TI-BASIC Immediate Mode that allows the saving and storing of BASIC programs in a module format.

LOADER-Utility Multifunction utitlity program that primarily drives the GRAM-Card.

LOAD-FILES DV/80 format files that are used by the Loader to add modules to the memory.

In case of any difficulties, please verify that the GRAM-Card is not in an addres conflict with any other installed card. Then make sure that the card is firmly seated. It may also be possible because of a system crash that you may just need to reload your software. after switching your machine off for two minutes. If none of these remedies are successful, please contact our Service Department.

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DIP Switch locations

```
I----------------------------------------I
I                                        I
I       III                              I
I       III                              I            DIP SWITCHES 1,2,3
I       III                              I
I       III DIP 3                        I            I-------I
I                                        I            I       I
I                     III                I            I 1---- I
I                     III                I            I 2---- I
I                     III                I            I 3---- I
I              •      III DIP 1          I            I 4---- I
I     III                       I=======I            I 5---- I
I     III                       I==*====I            I 6---- I
I     III                       I       I            I 7---- I
I     III DIP 2                 I=======I            I 8---- I
I                               I=======I            I       I
III LED                                  I            I-------I
I                                        I
I----------------------------------------I
```
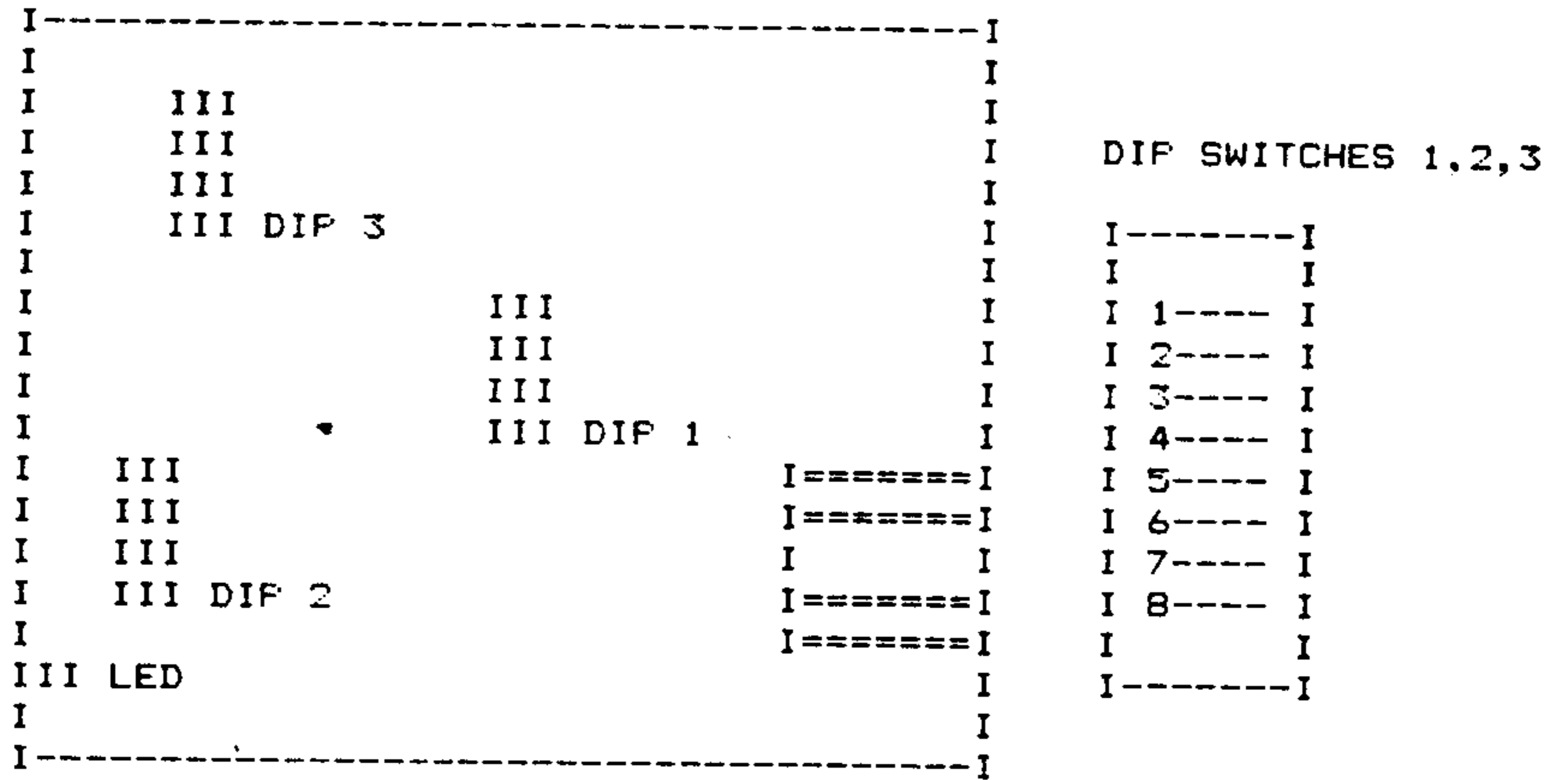
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```
I-------------------------I
I    Disk Drive Controller I
I    or TI-Title Screen    I
I-------------------------I
             I
             I
             I
I-----------------------------I
I                             I
I 1. TI-BASIC                 I
I                             I
I 2. GRAM-Card >9800          I
I                             I
I 3. REVIEW MODULE LIBRARY    I
I                             I
I-----------------------------I
             I
             I
             I
I-------------------------------------------------I
I                    I                            I
I                    I                            I
I----------I    I----------------I    I----------------------------------I
I TI-BASIC I    I GRAM >9800     I    I REVIEW MODULE LIBRARY            I
I          I    I 1. LOADER      I    I                                  I
I CALL     I    I                I    I SELECTS FURTHER GRAM CARDS I     I
I          I    I 2. LOAD-FILE I  I    I----------------------------------I
I GRAMX    I    I                I
I          I    I 3. LOAD-FILE I  I
I (X=1-3)  I    I                I
I          I    I----------------I
I CALL     I         I
I          I         I
I  EDITMEM I         I
I----------I         I
                     I
                     I
                     I
I-------------------------------------I
I THE LOADER                          I
I                                     I
I 1. LOAD (G)RAM WITH PROGRAM         I
I                                     I
I 2. LOAD   GRAM WITH ASS-FILE        I
I                                     I
I 3. LOAD    RAM WITH ASS-FILE        I
I                                     I
I 4. LOAD   GROM 0-2                  I
I                                     I
I 5. SAVE   GROM                      I
I                                     I
I 6. SAVE    ROM                      I
I                                     I
I 7. LOAD   FILE                      I
I-------------------------------------I
```

THREE-MONTH LIMITED WARRANTY

MECHATRONIC EXTENDS THIS WARRANTY TO THE ORIGINAL CONSUMER
PURCHASER OF THE GRAM-Card.

WARRANTY DURATION

This GRAM-Card is warranted for a period of three (3)months
from the date of original purchase by the consumer.

WARRANTY COVERAGE

This GRAM-Card is warranted against defective materials or
workmanship. THIS WARRANTY IS VOID IF THE ACCESSORY HAS BEEN
DAMAGED BY ACCIDENT, UNREASONABLE USE, NEGLECT, IMPROPER SERVICE
OR OTHER CAUSES NOT ARISING OF DEFECTS IN MATERIALS OR
WORKMANSHIP.

WARRANTY DISCLAIMERS

ANY IMPLIED WARRANTIES ARISING OUT OF THIS SALE, INCLUDING BUT
NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND
FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE
ABOVE THREE-MONTH PERIOD. MECHATRONIC SHALL NOT BE LIABLE FOR
LOSS USE OF THE SYSTEM OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS
EXPENSES, OR DAMAGES INCURRED BY THE CONSUMER OR ANY OTHER USER.

Some states do not allow the exclusions or limitation of implied
warranties or consequential damages, so the above limitations or
exclusions may not apply to you.

LEGAL REMEDIES

This warranty gives you specific legal rights, and you may also
have other rights that vary from state to state.

WARRANTY PERFORMANCE

During the above three-month warranty period, your GRAM-Card
will be repaired or replaced with a new or reconditioned
unit of the same or equivalent model (at option of MECHATRONIC)
when the unit is returned by prepaid shipment to MECHATRONIC.
The repaired or replacement unit will be warranted for three
months from date of repair or replacement. Other than the
postage requirement, no charge will be made for the repair or
replacement of in-warranty units.

MECHATRONIC strongly recommends that you insure the unit for
value, prior to shipment.