2012
(rel. 2.0)

This program is a spreadsheet for the Commodore Plus/4. It presents a lot of modern spreadsheet features and new ones too.

* If you're using an emulator, please set the speed at 200% *

Please note that this program needs 1/16000th the memory of Excel, and runs in a system 1500 times slower :-)
(Just to talk, an F16 fighter flies "only" 800 times faster than a walking man).

The below figure describes the screen of SVS-Calc and visible icons:
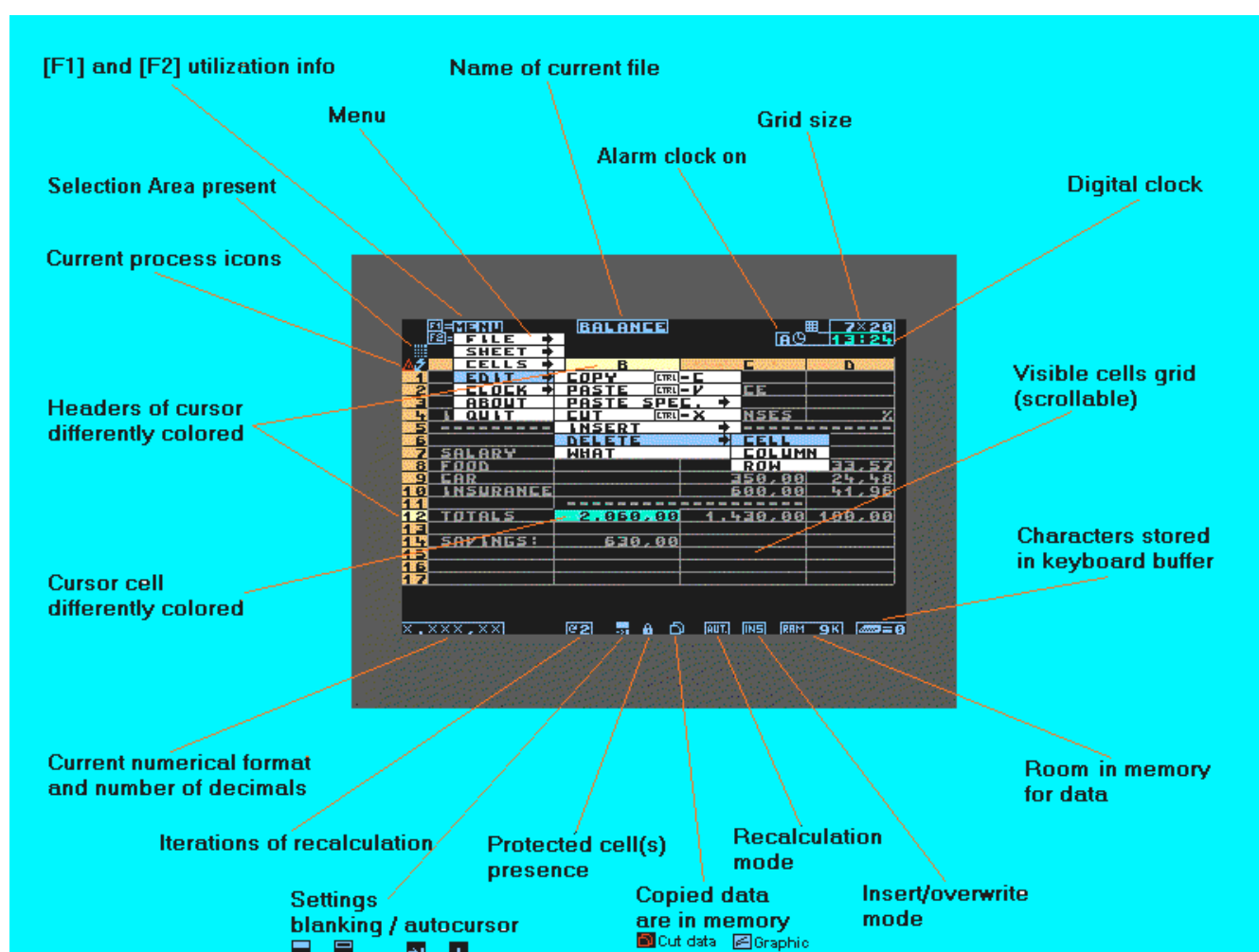
Overlaying:

SVS-Calc 2.0 uses the program overlay technique. This means that the system can temporary load a segment of the program in order to perform some operations. This allows a saving of memory for user data. Overlay loading is automatic: when it starts the user has only to be patient while loading (if the blanking feature is enabled, the overlay speed is faster).

SUMMARY *(click over links to jump in)*

0 – CONFIGURATOR on BOOT

When you boot SVS-Calc it prompts a Configuration page. Here you can define how resources are assigned to the sheet. In this way you can set a sheet appropriate to your needs, gaining the best results. Hit [F4]-key to accept the default values.
After setting the configuration, the system loads an overlay and draws the starting grid. If present on the current system disk, PREFERENCES.USR file is automatically loaded. To avoid this loading, hold [ESC] key.

0.1 – Grid values: Mind that you are setting how many rows/columns will be in the current grid, and also the **maximum** number of rows (maximum columns is always 26 that is "Z"). This means that once working on a sheet, you can enlarge the grid up to the max values.

0.2 Confirm and saving When done, a system message will inform you on how much free RAM is available for data and process. You can confirm or return to modify values.
Once confirmed, if you have modified any default value, you are offered the option to save them for future issues as the new default.

0.3 Screen blanking Last question is if you want to enable the blanking FX on screen. If you accept, then the system will load its files faster. (You can later disable it by CTRL-B).

0.4 View configuration To view all configuration values, just use MENU→INFO→CONFIG (see below chapt. 12.5)

1 - GENERAL FEATURES AND CUSTOMIZATION:
User can change all these settings any time.

1.1 - Grid: You can set grid size. Max is 65 rows x 26 columns (each named from "A" to "Z"; the 26th is Z). To modify the current grid, use MENU → SHEET → GRID SIZE then COLUMNS or ROWS.
The number of columns can always be enlarged. However, the number of rows depends on the max value set during Configurator. (see above chapt. 0.1)
Process speed is largely affected by grid dimension. Less rows and columns mean faster operations. Free memory is not affected by a grid resizing, because it is set during Configurator *choice of max values*.

1.2 - Visible rows on screen (min 5; max 17). You can set them as you like by MENU→CELLS→ VISIBLE_ROWS. With less visible rows you can obtain a speedier updating and scrolling of the screen.

1.3 - Formats to visualize numbers: User can choose the way numeric values are visualized.

- European (numbers: ##.###,00;   Date: DDMMYY; Weekday: 1=Monday 2=Tuesday, etc.)
- American (numbers: ##,###.00;   Date: MMDDYY; Weekday: 1=Sunday 2=Monday, etc.);
- Date/Time (##/##/## or ##:##:## or ##-##-## or ##:##:##).

User can be informed about the current set format, by looking at the left of the bottom screen line. Here a dynamic pattern shows the format and how many decimal ciphers are set. Another way is thru the window of Config option by menu (MENU → INFO → CONFIG).

Set a global format, applying to all the values of sheet, by MENU→SHEET→ NUMBER_FORMAT, or a local format DATE/TIME to be applied only to the cell where the cursor is currently positioned.
Date/Time format asks you for the separator character too. You can choose between "-", "/", "." or ":". This separator will apply to all the cells with a date/time format over the sheet.

Automatic format scaling engine. If the value to be visualized cannot be fit in the current format mask, then the system automatically switches to scientific mode (example: a value of 12345,6 cannot fit inside #.###,## mask, then it will

be visualized as 1234E+01). Scientific format works with a column size not less than 6 characters (7 if value is negative). If you don't like it, you always can enlarge the column width.

1.4 - Decimal places (you can set from 0 to 6 ciphers after the decimal point, by MENU→NUMBER →FORMAT→DECIMAL). This parameter is immediately applied to the whole visualized grid. You can see the current set parameter on the pattern located in the bottom left corner of screen.

Automatic format switcher. If the value to be visualized is not compatible with the visualization mask (for example 0.0012 with mask ###.##), the system automatically uses the scientific mode in order to visualize the value (12E-04 for the previous example). The scientific format works with a column size not less than 6 characters (7 if value is negative).

1.5 - Text alignment inside each cell can be set by MENU→CELLS→ALIGNMENT:
- Standard (left justify)
- Centered
- Right justify (Numerical values are automatically right-justified).
- As Date/Time (see above paragraph 1.3 "Formats to visualize numbers").
Warning: Texts with special characters (graphics, colors, reverse, etc.) cannot be centered nor right-justified.

1.6 - Sheet re-calculation: after an input: - Automatic (performed just after every cell input)
- Manual (by CTRL-A or by MENU→SHEET→CALCULATION→ EXEC)
- Iterations of recalculation (read more info below paragraph 9 "Automatic calculation").
Calculation mode (AUTO/MAN) and iterations are visualized as icons on the bottom screen line.

1.7 - Columns: can be as many as 26 named from "A" to "Z". You can set how many columns you want on the grid, by MENU→SHEET→GRID SIZE→COLUMNS. Of course if you have a small number of columns all calculations and screen updates become faster.
- Minimum width of a column is 3 characters.
- Each column can have its specific width (resizable by MENU→CELLS→COLUMN WIDTH).
 A column can be automatically sized by CTRL-L or by MENU→CELLS→COLUMN_WIDTH→ AUTO in case of a column having cells with varying data field widths.

- It is allowed to insert or delete a whole column by MENU→SHEET→INSERT/DELETE.
 All the formulas of the sheet will be automatically fixed in order to adapt their position and to all the referrals inside them (see below paragraph 4.6)

1.8 - Colors: There are 6 different color types that are fully customizable:
1- Background.
2- Grid and data inside cells.
3- Active cell (cursor-cell).
4- Service icons / selected bar in menu.
5- Error messages, cells containing error, error icon, RAM icon (when available RAM <2 Kb), cut icon.
.
6- Menu.

All of them can be changed by MENU→SHEET→COLORS. A special window will open and let you, by cursor, easily choose your preferred color and luminance for each one of the above types. If the result is not so good, then you can choose new colors or reset to default by menu choice.
When an SVS-Calc sheet is saved to file, its colors are saved too.
To load/save ready sets of colors from disk, use the Theme option.

<u>1.9 - Themes:</u> At any time you can LOAD one of the preset color-themes. The current sheet aspect will change accordingly, while maintaining your data, formulas, and any other setting. Just LOAD its filename and the system will acknowledge it as a theme.

Creating. To save the current colors as a new theme, you just have to save on disk by MENU→DISK→SAVE→THEME (any filename).
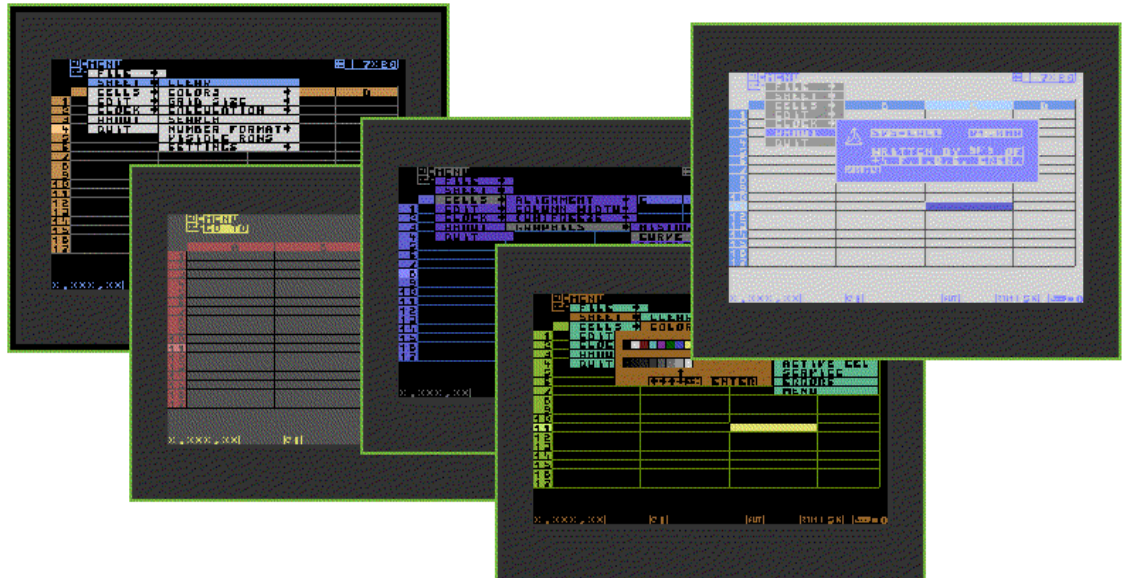
2 - M E N U: ([F1] to enter into menu tree)

Three levels drop down, with self-restoring background.

<u>2.1 - Navigating:</u>   - Cursor up/down; left/right; Enter (to execute); [£] (DEL-key on PC) or [ESC] (top left key on PC) (to leave menu tree from any position).
- Looping (pressing "up" when the cursor is on first line will move it to the last line and viceversa).
- When recalled, the main menu does remember the last choice.
- 74 operations are directly executable from the menu.
- 9 are also executable by shortcuts: CTRL+A = Sheet recalculation
CTRL+B = Go to blanking setting
CTRL+C = Cell datum copy
CTRL+D = View directory of <u>data</u> disk
CTRL+F = Cell freeze / unfreeze
CTRL+L = Column auto-sizing
CTRL+V = Memory paste (after CTRL-C or CTRL-X)
CTRL+X = Cell datum cut
CTRL+Y = Turn off alarm clock

3 - SERVICE ICONS:

3.1 - On top screen line: - Grid size (columns x rows)
- Clock (if enabled)
- Last loaded/saved filename
- F1, F2 meanings

3.2 - On top left grid: - Danger triangle (means that at least one error is present in the whole sheet).
- Flashing hammer (means recalculation in progress)
- Flash (means visible grid redraw in progress)
- Squared box (a selected area is present inside the grid, even if not in the visible zone)

3.3 - On bottom screen line:
- Format of numeric data (European, American)
- Number of decimals to be shown for numerical data
- Settings: 1) Filled box = blank screen during calculations: on; Empty box = off
                        2) Arrow + cursor = cursor auto moving after input: on; Lone cursor = off
- Round arrow and a number shows how many iterations per one sheet recalculation
- Padlock (if present there are one or more frozen cells)
- Double page (if copied data are present in memory). It is error-colored in case CUT
  function was used and not pasted yet.
- Picture icon: a graphic is in memory and can be inserted inside the grid.
- [MAN]ual or [AUT]omatic recalculation.
- [INS] if keyboard insert mode is active.
- Amount of RAM available for data (it becomes error-colored if less than 2 KB – see
  paragraph 1.8 color 5), and reversed if less than 1 KB (when less then 512 bytes, icon
  shows the exact number of bytes free, be careful).
  (You can always see the exact amount of free bytes by hitting CTRL-£).
- Keyboard buffered hits (useful for long operations like multiple cursor hits).

4 - C E L L S:

- Hit [RETURN] or just start to type any non-command text to enter into editing (insert/modify) mode for a cell's
        content;
- Active cell (cursor cell) focus: The headers (column and row) of the current cell (cursor cell) are of a slightly
        different color (normally lighter);
- Active cell has its own color and is visualized reversed. To customize colors see paragraph 1.8 (color 3).
- Active cell always remains on the visible grid (this is accomplished by automatic scrolling).
- 4.1 Moving active cell focus (cursor):
                - cursor keys UP/DOWN/ LEFT/RIGHT;
                - HOME (go to cell at top left position of current screen);
                - Shift-HOME (go to cell A1);
                - [£] ([DELETE] on PC) go to bottom lines of the grid;
                - multiple pressing of either cursor up/down/left/right is speeded up by updating the screen only
                        after last step. Check buffer icon on the bottom right of the screen to see how many
                        keys still remain to be processed. *(The feature is not enabled if a selected area is
                        present);*
                - CBM+Cursor move 5 positions in specified direction;
                - [F2] GO TO function to move the cursor to a specified cell (see below paragraph 7);
                - SHIFT+cursor Start/enlarge/reduce an Area Selection (see below paragraph 6.3);

---> Automatic cursor movement after an input (see here below paragraph 4.2).

*---> It is suggested, when inputting many values into cells, to disable AUTOMATIC recalculation (see paragraph
9 below) in order to avoid pauses due to recalculation time.*

- 4.2 - Automatic cursor movement: just after finishing an input, the system moves the cell-cursor to the next cell.
        The direction of movement is automatically calculated on the basis of user behavior. *(For example if you
        have inserted/modified data in cell A5 and then in cell A6, then system will move cursor onto cell A7; if
        you inserted data on cell A5, then on cell B5, cursor will be automatically moved to C5).*
        This feature can be disabled/re-enabled by Menu (SHEET→SETTINGS→AUTOCURSOR).
        A proper icon at bottom line of screen shows if this feature is enabled or disabled (see chapt. 3.3 "Service
        icons" above).

- 4.3 Cell with a formula:
        When the cursor is over a cell, then the text of the cell's formula is shown on the bottom line (the result
        value of the formula is shown on the cell itself). If the result of a formula is an error, then the error
        message is shown on the bottom line. In this case just type [RETURN] to see/edit the formula.

is visualized according to the space remaining before the screen right border. A column of cells can be visualized only if there are at least 4 spaces before the end of the screen line. If not, the rightmost column is not visualized until a scroll.

- 4.5 Text propagation:

Visualization of a text longer than the current cell size is continued onto the next cell(s) if empty. If the next cell is not empty, the text is visualized according to available cell size (set by column width).
If you want to automatically size the cell in order to visualize the entire string/value, just use CTRL-L or MENU→CELLS→COLUMN WIDTH→AUTO): the option will resize the column to the larger string/value.
- Text propagation is not applied to texts containing special characters (like graphic transfer, color codes, reverse, blink).

- 4.6 Insert or delete cell(s)/rows/columns:

You can perform this by menu: SHEET→INSERT (or DELETE)→ CELL
COLUMN
ROW

- All other cells are shifted in order to fit the new configuration. In case of insert or delete of a single cell (choice: CELL) you are asked for the direction of the shifting of the following cells.
Of course shifting time is affected by grid size: the larger the grid, the more time is required for shifting. During cell(s) movement, the "working" icon flashes on the top left corner of grid.

- Formulas are automatically adapted for the new sheet geography. This happens just after the shifting.
The result is that: the formulas are fixed for the new configuration of grid data. Possible unsolved situations (like a formula aiming a just deleted cell) will output an Error #16 message.
In this case the text of that formula will have a "?" instead of the bad coordinate.
Be informed that even formulas in frozen cells are auto-adapted. The lone way to avoid the auto-adaptation is to prefix referrals with a "$" (for example =6*$B3: referral B3 will not be adapted).

- 4.7 Copy / Cut / Paste a cell's content:

- COPY content of a cell can be performed by menu (MENU→EDIT→COPY) or by CTRL-C. If the copied cell data are different than null (that is only spaces), then an icon appears in the bottom screen line. It still remains even after a paste operation (because the data can be pasted again).
- CUT content of a cell by cleaning it, and moving datum into memory (MENU→EDIT→CUT) or by CTRL-X. If the cell was not empty then an icon appears in the bottom screen line (like COPY, but with error-color) indicating that the cell content is available for possible pasting (when a pasting is done, icon becomes of service-color).
- PASTE function can fit the currently active cell with the content of memory (coming from a previous COPY or CUT operation). It can be performed by menu (EDIT→PASTE) or directly by CTRL-V. The memory content still remains available for possible further pasting.
If the pasted datum is a formula, then possible referrals inside it will be automatically adapted to the new position, except those that are prefixed by "$" (see here above chapt. 4.6 CELL – Insert / delete).
- PASTE SPECIAL operations are available by menu (EDIT→PASTE SPECIAL→ ...). They allow pasting:
    - only the format of a source cell;
    - only its current value if the source cell contained a formula;
    - the formula without autoadapting *(ex. =3*B5 copied two rows down will not become =3*B7 but will be =3*B5).*
- WHAT menu function allows user to know what are the memory copied data and from which cell they came (allowing the user to jump there too).

- 4.8 Data protection:

Any single cell of the sheet can be frozen (that is protected from erase/modify). You can do this by hitting CTRL-F or by MENU→CELLS→(UN)FREEZE. That cell is then protected and nothing can erase, cut, or modify it (you can see a little triangle-sign on top left of protected cells).
Exception is the autoadapting engine for formulas after an insert/delete operation.

A protected cell can be unfrozen simply by hitting CTRL-F again while the cursor is focused on it (or by the menu).

Proper choices of the menu allow freezing or unfreezing the whole sheet (and also inverting all protection flags).

When one or more cells are frozen, then an icon (padlock) appears in the bottom line of the screen. This allows the user to know the info even for cells beyond the visible rows.

- 4.9 Searches:

you can search for any text or value inside the whole sheet, simply by MENU→SHEET→SEARCH. You are asked for the string (or number) to be searched for, then the process starts. The searched string can be any sequence of characters, signs or numbers (numbers have to be specified without punctuation, ex: 12345 is ok, 12.345 or 12,345 not).

The found cells can have the string in any part of their content (for example: search for "**us**" will find a possible cell with "**us**er" but also with "m**us**ic").

Once an occurrence is found, a proper message is shown in the bottom line of screen. You can decide to search for the *next* one, or to *jump* to the found cell address, or to *exit*.

Search is performed "by rows", that is first all cells on row 1, then cells on row 2, etc.

If a selected area exists, the system will ask you if you want to limit the searching to only inside the selected area.

5 - FORMULAS:

(§): in this manual, this symbol means that operands of these functions could be numeric, string or mixed)

Virtually unlimited number of nestings level, parentheses, functions, operators, or data.
No need of any prefix for data type. System is able to automatically understand which data type.

5.1 Syntax rules and elements:

- ❑ Type in a formula in a cell by starting with an "=".
- ❑ Spaces are not allowed.
- ❑ Constant numeric values. Input can be done as standard *(ex. 1200.00)* or as scientific notation *(ex. 12.E02, 12E+02, 12E2).*
- ❑ String constants: input between inverted commas *(ex. 'HELLO')*
- ❑ Math operators: + - * / ↑ %. *(ex. =3*2+4)*
- ❑ Negating minus – *(ex. =-12   ex2. =12*-B7)*
- ❑ Logic operators: (>,<,=,>=,<=,<>, OR, AND, XOR) *(§)* They return the value –1 for *TRUE* or the value 0 for *FALSE. (ex. =3>2   ex2. ='ABC'<'DEF').* See function IF().
- ❑ Functions. Just input their name, and possible arguments if needed, inside the parentheses. Separator of arguments must be ";" (see below table 5.5). *Ex.: IF(B12>1000;'yes';F4)   Ex2: LOG(F12)   Ex3: LEFT(B3;3).*   You can specify a formula as an argument *ex.: LOG(ROW*3/F6).*
- ❑ Parentheses: only "(" or ")" type. You can use them to force the standard priority of operands for processing *(ex. =3*(B4+7).* No limit of levels.
- ❑ Referrals to other cell content. *(ex. =B12*3 or $B3*3).* Be informed that after an INS/DEL of cells, all the referrals inside formulas are automatically adapted to the new geography of grid. If you want to avoid this auto-adapting, just prefix the referral with $. *(ex. =$B12*3).*
  - Another case of auto-adaptation is when you past a copied formula from a cell to another. In the new position the referrals inside the formula are automatically fixed according to the new location. If you don't want this, just use MENU→EDIT→PAST SPECIAL→W-OUT ADAPT.
- ❑ Referrals to a value in an external file. You can even use the data of an external SVS-Calc file, by function OUTER(). *Ex. OUTER('myfile2';F12).* File must be an SVS-Calc file and reside in the current data disk. *This feature allows, for example, use of a Calc-file showing the results of other single Calc-files with detailed data.*
- ❑ Names You can use previously defined Names for strings or values. Inside the formula just use the name in the place of the string/value. *See* chapter 5.6 *for more info.*
  *Ex. define name "CIRCLE" for "B2^2*PI"; formula =(3*B2^2*PI) can be written as =3*CIRCLE.*
  *Ex2: define name "KX" as "327.567"; formula =B2*327.567 can be written as =B2*KX.*
  Ex3: define name "TOTAL" for the cell with a value (say $B4). Each successive referral to this cell can be made by simply typing the word TOTAL, such as =B4/3 will be =TOTAL/3 - more easy to remember.

All the above data are freely mixed and nested inside a formula.

Examples: =IF(K18<>0;PUT(G18;'yes');M5/K18)
                =PUT(B7;SQR(PI*7.123))
                =IF(D12='end';'OK';LEFT$(D12;2))
                =12*(B7-(F14/2*G10))*LOG(EXP(H2))/PI

- 5.2 Calculations. When a cell contains a formula, then the result is shown on the grid. To see the original formula go over it with the cursor so that the formula will appear on the screen bottom line. If an error message is present press RETURN to view the formula and edit it. Just after inserted/modified, the formula is evaluated and the result is updated on the cell. During this time "working icon" flashes on the top left corner of the screen. The rest of the sheet is then recalculated but only if AUTOMATIC Calculation is on (see below "Automatic Calculation" paragraph 9)

- 5.3 Automatic Error checking for syntax and other errors even to detect possible "circular referrals" (referring to the same cell where the original formula resides).

- 5.4 Error propagation: when the formula of a cell does refer to another cell having error. (A specific Error #10 message is designed).

- 5.5 List of Functions: - Arguments inside functions must be separated by semicolons ";" except SUM, AVER and COUNT that do accept colons ":" too.

- Arguments could be constants, texts, functions, formulas, or other cells' coordinates. You can hit [STOP] key (TAB on PC) to insert automatically the coordinates of the Selected Area if it exists.

- Supported functions:

AVER(k:j)	Returns the average of the values of an area. Coordinates k:j follow the same rules as SUM(). Empty and non-numerical cells are not computed. *Ex. AVER(B7:C10); AVER(myarea).* *If no numeric value is found inside the area, function outputs Error 14 (division by 0).*
ABS(x)	Returns the absolute value of x. *Ex. ABS(F1) ABS(-12)*
ATN(x)	Returns the arc-tangent of x. *Ex. ATN(F3).*
COL	Returns the current column number (A=1, B=2, ... Z=26)
CONCAT(a;b)	Joins string *a* with string *b*. *Ex. CONCAT(B7;' BYE').*
COS(X)	Returns the cosine of x. *Ex. COS(123).*
COUNT(k:j)	Returns the number of cells containing values in the area. Coordinates k:j follow the same rules as SUM(). *Ex. COUNT(B7:C10).*
DAYS(x;y;z)	Returns how many days passed between date x and y. Dates must be in the format DDMMYY *(or MMDDYY depending by the choice set in MENU→SHEET→ →NUMBER_FORMAT).* The output Error#12 means an illegal date value. Since dates have 2 digits for year, parameter z is a flag indicating the centuries. It could be:

        z=0:   indicates x: 2000 y: 2000
        z=1:   indicates x: 1900 y: 2000
        z=2:   indicates x: 2000 y: 1900
        z=3:   indicates x: 1900 y: 1900

- Note that this function works with cell referrals too, even if referred cells are not date/time formatted. System will consider only their values, regardless of cell visualization mode.

Examples with European format (DDMMYY):
    DAYS(A3;B7;0)   DAYS(200210;B7;C4)
    DAYS(200258;010357;3) *returns 357 (from 01 Mar. 1957 to 20 Feb. 1958)*
    DAYS(200258;010157;2) *returns 36882 (from 01 Mar. 1957 to 20 Feb. 2058)*

> ***DAYS(022058;010157;3)*** *returns returns 357 (from 01 Mar. 1957 to 20 Feb. 1958)*
>
> ***DAYS(030100;010100;3)*** *returns 59 that is the number of days between Jan 1ˢᵗ, 1900 and Mar 1ˢᵗ, 1900 (whatever Excel says, indeed 1900 was not a leap year! ☺)*

EMPTY(k) — Returns TRUE (-1) if cell k is empty, else FALSE (0). *Ex. EMPTY(K3).*

ERR(k) — *Syntax 1:* returns TRUE (-1) if cell k does contain an error message, else FALSE (0). *Example: ERR(B3).*
Syntax 2: If k is the word "all" then returns TRUE if there is at least one error over the whole sheet. *Ex. ERR('all').*

EXP(x) — Returns *e* raised to x. *Ex. EXP(7)   EXP(K3).*

FACTOR(x) — Returns the factor of *x (for example: FACTOR(3) result is: 6 (that is 3*2*1)*. Warning: an overflow situation is easy with this function!

IF(w;y;z) — (§) Returns y if condition w is true, else returns z.
(w is a formula with a Boolean expression like, *for example: G21>400, 'ABCDE'<=H8).*
Mind that y or z could be even additional functions that should be executed. For example:
=IF(B3>F12;PUT(C4;'yes');'no') executes PUT(C4;'yes') in case result is true.

INT(x) — Returns the integer of x. *Ex. INT(C12).*

LEFT(w;y) — Returns the first y characters of string w.
Ex. LEFT('HALLO';3) result is HAL   Ex2. LEFT(M3;4)

LG(x) — Returns the *e*-based logarithm of x. *Ex. LG(F7).*

LOG(x) — Returns the 10-based logarithm of x.   *Ex. LOG(100) Result is 2.*

LOOKUP(k;j;x;a) — The function uses an area of cells indicated by coordinates k:j *(for example: A3:C12).* It scans its leftmost column of cells *(in the example A3:A12)* searching for the string a. If found, then it outputs the content of the cell in the same row but offset of x columns.
If not found, it will output "???".

Example: LOOKUP(A3:C12;2;"GAMMA")

	A	B	C
3	ALPHA	ONE	SUPERMAN
4	BETA	TWO	BATMAN
5	GAMMA	THREE	SPIDERMAN
…	…	…	…
12	DELTA	FOUR	HULK

Target is found on A5. Result will be "SPIDERMAN" staying on row 5, 2 column rightmost of the target.

MIDSTR(w;y;z) — Returns z characters of string w starting from y-th. character. *Ex. MIDSTR('HALLO';3;2) result is 'LL'.*

MOD(x;y) — Returns module from x/y. MOD(8;3) result is 2 (that is rest of 8/3).

NUMERIC(k) — Returns TRUE (-1) if cell k does contain a numeric value (even as the result of a formula); returns FALSE (0) if not a numerical string or an empty cell. *Ex. NUMERIC(F12).*

NOT(x) — Returns x negated. *Ex. NOT(F6).*

OUTER(w;y)	Retrieves datum from cell located at coordinate y from File w on the online data disk If the referred cell has a formula, the retrieved datum is the last calculated result. *Example: OUTER('myfile';B12).*
PI	Returns circle/diameter constant.
PUT(w;z)	(§) sets z on cell w (w=cell coordinate). *Examples: PUT(F4;'hello') PUT(G23;F2/PI).* A null value of z (z=") can be used to clear a cell. Function PUT can be nested inside other functions, for example IF(). *Ex.: IF(F12<0;PUT(H3;'negative!');PUT(H3;F12))* *Mind that the part of the formula not interested by with the true/false result, will be parsed only for syntax and not for logical errors (for example a possible "empty cell error" will not be detected).*
RANDOM(x)	Returns a random value from seed x. The result will be a value from 0 to 1. *Ex. RANDOM(D1)*
RIGHT(w;y)	Returns last y characters of string w. *Ex. RIGHT(C11;4).*
ROUND(x;y)	Rounds x with y precision (y can be negative). *Examples: ROUND(123.65;0) result is 124.* *ROUND(123.65;1) result is 123,7. ROUND(123.65;-1) result is 120.*
ROW	Returns the current row number.
SIN(x)	Returns the sine of x. *Ex. SIN(B11).*
SECONDS(x;y)	Returns how many seconds passed between time x and y. Values have to be supplied in the format HHMMSS or partial (MMSS, MSS, SS, etc.). Error#12 means an illegal time. *Ex: SECONDS(120420;120310) = 70* *SECONDS(B3;4010); SECONDS(TIME;D4)*
SGN(x)	Returns the sign of x. 1 if positive, -1 if negative, 0 if zero. *Ex. SGN(H2). SGN(23)the result is 1 (positive).* *Ex2: SGN(-23) the result is –1 (negative).*
SQR(x)	Returns the square root of x. *Ex. SQR(Z3).*
SUM(k:j)	Sums numerical contents of all cells included between coordinate k and coordinate j. *Example: SUM (B3:F6).* *Coordinates can be supplied in any order (for example F6:B3, F3:B6, B6:F3, B3:F6 all these do refer to the same cells area). Any text or empty cell found in the area, is ignored (without error warning).*
TAN(x)	Returns the tangent of x. *Ex. TAN(D1).*
TIME	Returns the current value of digital clock (HHMMSS). Mind that clock is synchronized with emulator speed (default is 200%).
VAL(w)	Returns the numeric value of the first characters of the string w. If the string has no numeric value, return is 0. *Ex: VAL('36abcd') returns 36; B6='hello' VAL(B6) returns 0.*
VER(x)	Returns SVS-Calc version: x=0 current running SVS-Calc version; x=1 version of the release that created the last loaded file (not the merged files).
WDAY(x;z)	Returns the day of week (a value from 1 to 7) of the date x. The date must be in the format DDMMYY *(or MMDDYY depending by the choice set in MENU→SHEET→ NUMBER_FORMAT→EUROPEAN / AMERICAN).*

Since date has only 2 digits for year, parameter z is a flag indicating the century (z=0 current; z=1 last).
Notice that the output value too is affected by above menu choice: European week starts with 1=Monday, while American with 1=Sunday.
Error#12 means an illegal date value.
Examples:

> *WDAY(251212,0)=2 (tuesday) – European format*
> *WDAY(122512,0)=3 (tuesday) – American format*
> *WDAY(010100;1)=1 (monday) (whatever Excel says, indeed 01 Jan, 1900 was Monday! ☺)*

- <u>Use of negating minus</u> (ex. -1) Without including it between parenthesis, it can be applied to any datum *(for example -K21 returns content of cell K21*-1).*

- <u>Nesting of functions</u> is always allowed. *For example you can insert PUT functions inside an IF like: IF(B2>10;PUT(F4;"YES");100). In this case if the condition is true, then the cell F4 will receive the string "YES" and the cell where the formula resides will only show the symbol [...]. If the condition is false, the cell where the formula resides will have as a result: 100*

<u>- 5.6 Names.</u> With this feature you can affix a "name" to any value or string. Every time you write that "name" inside a formula, system will use its associated string. This saves a lot of typing and makes the formula text. more readable

Examples:
1. Create Name "CIRCLE" associated to string "$B5^2*PI". Formula "=2.5*$B5^2*PI/4" can be written as "=2.5*CIRCLE/4".
2. Create Name "TOTALEXP" associated to "$B5:$B12". Formula "SUM($B5:$B12) can be written as "SUM(TOTALEXP)"
3. Create Name "P4" associated to "COMMODORE PLUS/4". Formula "=COMMODORE PLUS/4" can be written as "=P4"
4. Create Name "K" associated to "634.89". Formula "=B12*634.89" can be written as "=B12*K"

<u>Names management</u> *can be made by MENU➔CELLS➔NAMES. Then the following options:*

- *VIEW* to view a list of all stored Names and their associated strings. Press a key if the Names list exceeds the window (you'll see "HIT A KEY" message);
- *INSERT* create a new Name by these steps:
  - a) New name (max 10 characters long, only alphabetical letters, not the same names of functions);
  - b) Associated string. Type the string to associate (max 253 characters long). You can use all characters. The system will check to see if there is a relative cell coordinate present. If it finds one then you'll be prompted to make it absolute: Just prefix it by a "$" (example: the name TOTAL is associated with the string "B3+C12".It has to be fixed as "$B3+$C12").
  - c) At the end the system asks you for a flag in order to insert the string between parentheses or not (Y/N). If you hit Yes then the system will store the string between round parentheses. *Ex: Yes: "($B3+$C12)"; Not: "$B3+$C12".* This option is useful when the Name is a part of a formula. *Ex. formula =TOTAL/3 will be calculated as "$B3+$C12/3" that gives a different result than "($B3+$C12)/3".*
- *ERASE* to delete one or all of the Names. Every Name in the list is identified by a number. You can use that number to select the Name to delete. The system will warn you if that Name is present inside formulas on the sheet, and ask you to confirm. Once erased its position remains empty, but it will be used by the next new Name you insert. It is possible to clear all the Names by inputting 99 as the identifying number. In this case a check is performed for possible use inside formulas of the sheet. (Please read Edit warning paragraph here below).

Nesting Names can be nested. That is the string associated to a Name can itself refer to another Name, and so on. *Ex. Name: CIRCLE; associated string: $B3^2*PI.   Name: ALPHA; assoc. String: 12*CIRCLE.*

Saving and gaps. Of course Names are saved when you save a Calc on disk. Possible gaps caused by previous cancellations are packed when you load the file from disk (thus there will not be any gap, and numeration will be sequential). This does produce positive effects on memory and more cleaning on edit.

<u>Edit warning.</u> SVS-Calc translates every formula into a sequence of codes (RPN) that are used for the calculus process. In this way the formula string is parsed only once, just after the user hits [Enter] when finished with typing/editing it.

The Names are decoded only at that moment. Then the formula is calculated. It uses only the RPN codes already prepared. This means that if you erase/modify a Name (from the Names list), formulas with that name inside are not affected by erasing/modifying and the system will recalculate them as they were (you will have an error only if you edit and confirm the formula text with a name no longer existing).

<u>Names spy.</u> When SVS-Calc is idle and cursor is over a cell referred to by one or more Names, then you'll see on the bottom line of the screen a message like "NAMED: xxxxxx yyyyyyy …." where xxxxx and yyyyyyy are the Names in memory that do refer to that cell. This feature is enabled if the cell does not contain a formula.

Example: if the Name "TOTAL" is associated with string "$C7" then when the cursor is left over C7, you will see the message "NAMED: TOTAL".

6 - EDITING of cell content:

- No prefix is needed when entering data: The system is able to recognize what it is. Only formulas have to start with an "=".

- Insert/modify datum into a cell: Hit [RETURN] or just start to type the data: in fact if a non-command is typed, then you're redirected to entering data into the currently focused cell. If the cell is not empty then its contents is prompted to be edited. An existing formula is prompted even if the cell shows its result value. In case of an unwanted modification, just type [ESC] to restore the previous content.

- Maximum length of the input is 253 characters. When the input box is full, then the text is automatically scrolled. A bell rings when a border is reached.

- Inside a cell you can write numbers or texts. Numbers are automatically formatted (see par. 1.3). Control characters can be inserted in <u>text</u> cells, like color-codes (CTRL-1…8; CBM-1…8), reverse, blinking. Cells with one/more of these codes cannot do the so-called cell-propagation, and cannot use centering or right justifying.

- The 16 color codes of Plus4 have been improved in SVS-Calc. Many of them are brighter and code 1 is now gray instead of black.

- 6.1 Edit keys inside input box (23rd line of screen):
      - LEFT/RIGHT to move the cursor left/right
      - HOME (goes to the beginning of the string)
      - [£] (DELETE on PC) goes to the end of the string
      - [DEL] (BACKSPACE on PC) erases the previous character if any
      - [INST] (SHIFT-BACKSPACE on PC) switches on/off the insert mode. When the insert mode is on, then the icon [INS] appears on the bottom line of the screen.
      - [CLR] (SHIFT-HOME) clears the current input box.
      - [ESC] leaves the editor and restores the previous content of the cell.
      - [RUN/STOP] (TAB on PC) insert current selected area coordinates if present.
      - [ENTER] end of input/modify and return to grid. If "Automatic calculation" is set, then the whole sheet is recalculated. (If Manual calculation is set then only the current formula result is calculated. To recalculate the whole sheet hit CTRL-A or by Menu SHEET→ →CALCULATION→EXEC).

- 6.2 Automatic cursor movement: after finishing an input, the system moves the cell-cursor to the next cell. The direction of movement is automatically calculated on the basis of user behavior. (For example if you have inserted/modified data in cell A5 and then in cell A6, system will move cursor onto cell A7; if you inserted data on cell A5, then on cell B5, cursor will move to C5).
This feature can be enabled/disabled by Menu (SHEET → SETTINGS → AUTOCURSOR).
Current setting is always shown by an icon, on the bottom screen line, with a little lone rectangle (if autocursor off) or a rectangle preceded by a little arrow (if autocursor on).

- It is suggested, when inputting many values into cells, to disable AUTOMATIC calculation (see paragraph 9 below) in order to avoid pauses due to recalculation time.

- 6.3 Area selection: User can select a rectangular zone of cells in the grid, by cursor movements.

Creating: Just hold pressed [SHIFT] key while moving cursor and area is highlighted (cells are visualized reversed). You can resize the current area by cursor movements in any direction.
- During selection, the first cursor movement without [SHIFT] will finalize the area selection.
- An icon (grid shaped) at the top left corner of the screen appears when an area selection is present inside the sheet (even if not visible on the screen);
- If an area selection is present, any input requesting coordinates will be in terms of the top left/lower right of the selected area, or in some cases just the top left of the selected area.
- While cell content editing, the user can recall the area coordinates (of the existing area selection), by pressing [STOP] (TAB on PC).
- First cell of an area selection is the so-called *"anchor-cell"*. It is visualized with a little box-icon on its left. Any resizing will not affect that cell. That is the only one to continuously remain highlighted.

Editing: An already existing selected area can be modified later. Just move the cursor inside it, then hold [SHIFT] and move the cursor. Be informed that in an already finalized area, the *anchor cell* always is the top-left cell.

Deleting: To delete the area selection, just hit [ESC] key, no matter where the cursor is the icon disappears when the operation is completed.

Mind that if a Selected Area exists, then vertical cursor movements can take longer because of the way calculations are done in areas.

- 6.4 Clear sheet or a zone: To clear a zone of cells or all, use MENU→SHEET→CLEAR. Here you have these options:
- WHOLE GRID to clear all the cells and, optionally, all the Names;
- A ZONE to clear the cells of a specified rectangular area.

7 - GO TO cell [F2]:

Use it to jump onto any location of the active grid. The process is designed to show also the zone near the desired location. As result, the active cell will never be shown at the top or bottom line of the current screen grid.
If a selected area exists, the system prompts its top-left coordinate.
Example: To move cursor to cell B7:   [F2] B7 [Enter].

8 - CLOCK (real-time):

Managed by MENU→CLOCK, you can see a digital watch at the top right corner of the screen. You can make it visible or not visible. The user can set the current time by MENU→CLOCK→SET TIME (after setting, the clock will automatically become visible), otherwise it shows the time passed since the Plus/4 was started. Other menu choices are SHOW and HIDE.
The visualization updating is done when the system is idle. If you're inputting or calculating, the visualization could lag behind (but the clock still runs). When the system returns to idle, the visualized time is immediately updated.

- 8.1 Time synchronization
The clock is synchronized with emulator speed, then it does maintain the time regardless of emulator speed. This means that real time is preserved even if you play a fast speed of emulation. When setting the time, you are asked for the current emulator speed.
To know if the clock is correctly aligned to emulator speed, just use MENU→CLOCK→SHOW and the system will show it on the bottom system line (default is 200%).
After setting the time, the system asks the user if he wants to set an [A]larm (directly without recalling the menu option).
- Using time value: The clock value can be used inside formulas via the function TIME().

An alarm time can be set by menu choice (MENU→CLOCK→SET ALARM). When the current time reaches or overtakes the alarm time, a beep sounds and the visualization of the clock blinks from standard to reverse and vice-versa. The blinking ratio is adapted to the emulator speed.
To turn off the alarm ringing/blinking, just hit CTRL-Y or set a new alarm time "000000" by the menu.
Alarm feature is not allowed for emulator speeds lower than 50%.
After setting the alarm, the system asks the user if he wants to set [T]ime or [E]mulator speed (directly without recalling the menu options).

9 - AUTOMATIC CALCULATION:

When you insert or modify any value inside a cell, the system can perform a recalculation of the entire sheet in order to update all formula results. This is done by recalculating all the cells containing formulas.
The time needed for this process depends on the amount of formulae in the sheet and by the number of iterations. Sometimes it may be useful to temporarily suspend the auto-calculation (for example when you have to insert many values or only text data.
MENU→SHEET→CALCULATION allows setting the Auto/Manual calculation modes, or to perform an immediate recalculation (also available by CTRL-A).
During updating process you'll see a flashing hammer icon in the top left corner of the sheet. If there are more than 5 formulas, then a progress bar is visualized on the bottom side of the screen.
A proper icon on the bottom line indicates the current calculation mode [AUT.]/[MAN.].
Recalculation order is row by row. This means that formulas residing in the top rows are recalculated before the formulas residing in the bottom rows. Keep this in mind in case of formulae referring to other cells with formulae. Maybe you'll need more than one iteration (see below).

9.1 Iterations. By default a sheet is recalculated once, but some logically complex sheets need more iterations in
order to update all the formulas (for example when a formula refers to another formula residing in one of following rows). You can set iterations number by MENU→SHEET→CALCULATION→ITERATIONS. An icon (with a circular arrow) on the bottom line will show how many iterations are performed during recalculation. This value is also inserted into the SAVEd files.
- A request for a confirmation message appears if you set more than 2 iterations, warning you that recalculation time can be slow (anyway it is accepted).
- Mind that recalculation is always performed starting from the upper rows to the bottom rows.

10 - DISK OPERATIONS:

You can save the current sheet onto the online data disk by MENU→DISK→SAVE functions. You are asked for a filename (max 16 chars long) then the process starts. Possible errors are shown on the last screenline. The system creates USR file type. You can see, by the progress bar, the current status of the operation.
Saving options: - WHOLE SHEET saves all you have inside the current grid, data, formulas, colors, visualization modes and every other setting;
- COLOR THEMES saves current colors as a theme that can be loaded at any time (you can specify any filename. The system will understand that it is a theme).
- AS NEW PREFER. Saves the current sheet as PREFERENCES. This means that every time you start SVS-CALC this file is automatically loaded into the grid, with all its settings (to avoid loading hold the [ESC] key).
Old PREFERENCES file is not overwritten but renamed as PREFERENCES.OLD; this leaves you the possibility of a restore in case of problems with the new file.

To load an SVS-Calc file, just hit MENU→DISK→LOAD option, and type in its filename (wildcards "?" and "*" are allowed). If the file is found, then the loading operation starts. Like SAVEing, you can see the progress bar in order to know the current status of the operation. All the data and settings are restored, then the sheet is recalculated and resized if necessary.

If you load a THEME-file, only the colors will be changed: all your current data and settings will remain. (See above paragraph 1.9 "Themes" for info regarding the Themes feature). A large set of themes are still available in the system disk of SVS-Calc. Just load one like you use with your SVS-Calc file and the system will change all the colors automatically.

If you have just listed the Directory of the data disk, hit [L] to automatically do a file loading after completing the operations of the Directory process (see next paragraph 10.4 "Directory").

--- With both Save or Load calls, the system will prompt with the last filename used. You can confirm or modify it. Loading a colors-theme or saving a new Preferences file will not affect this feature.

--- On the top line of the screen you can always see the name of the last file loaded/saved. This name disappears only after a sheet CLEAR. Only the PREFERENCES file name, if loaded at boot, is not visualized.

- 10.3 MERGE

The merging feature allows loading of data from an SVS-Calc file without erasing the current sheet in the grid (as done by a plain LOAD). This means that you can add new values/formulas without losing current work. The lone caveat is that the imported data will take the same place on the grid as from where they were came. Thus the current value of a cell could be overwritten if datum from the disk does use the same cell address.
This powerful feature makes it possible to write complex formulas or common parts of a sheet only once.
To perform a merging, just use MENU→LOAD→MERGE and type in the name of the file you want to merge onto the current sheet in memory. Only cell content and stored Names are affected by the operation. No other settings are modified by the merging operation. The lone possibility of sheet modification is when the current grid size is lower than grid-size of the disk file. In this case the grid will be enlarged, so that all the values to be loaded can fit into the current sheet.

The merging process is preceded by a test for memory, grid and Names room. If the test fails (meaning merge is not possible) then the process is aborted and the sheet remains as it was before the command.

After a successful merging it is not possible to restore the previous sheet situation. So users not sure of the result are encouraged to save the sheet on disk before merging.

(See OUTER() function for other linking abilities – paragraph 5.5)

To merge only Names. *You can use this feature just to load a set of Names. First save a sheet, then* CLEAR *all cells but leave its Names. When you'll merge this file into your work-sheet it will load only Names, without cell value*s.

- 10.4 DIRECTORY

The directory function of MENU→DISK→DIRECTORY (or directly by CTRL-D) can help you know what files are stored in the current data disk. You can select the results using filters, as requested by prompt. (wildcards [*] [?] or file-type [=x]). The Directory list is produced in a separate overlaid window. To pause this listing, use CTRL-S or [spacebar] if you have OS96. *(Example 1: "BAL*" to view only files with name starting with "BAL"; Example 2: "*=U" to view all the USR-type files, which is the format of SVS-Calc files).*

The disk icon, visualized near the disk name, shows the device# assigned to that device (see paragraph 12.3 below).
After directory listing you can choose between these options:
- [ESC] Exit
- [@] New directory list (for example with another filter, or after changed disk).
- [R] Rename a file (see paragraph 10.5 below).
- [D] Delete file(s) (see paragraph 10.6 below).
- [L] Load a file. This option lets you automatically close the Directory window and, after restoring the screen and overlay, load an SVS-Calc file (sheet or theme).

- 10.5 RENAMING

You can rename a file on the data disk simply by inputting the old name and the new one. If you don't remember the name of the file to be changed, launch by [@] a Directory command to list all files. After the renaming process, you can check the new situation in the same way.

You can delete file(s) from the data disk by inputting its name (wildcards [*]/[?] are allowed for multiple scratching). If you don't remember the name of the file(s) to be deleted, launch by [@] a Directory command to list all files, then type the name. The system will make a selection and show the list of the file(s) to be deleted. If you confirm then the process starts.

Directory/Renaming/Deleting integration. These 3 options are integrated and the user can easy pass from one to another. Directory can even be invoked when inside Renaming/Deleting without exiting from the option.

- 10.7 DEVICES
There are 3 independent devices managed by SVS-Calc. To change device# just use MENU→SHEET→ SETTINGS then:

- System disk is the disk where SVS-Calc system files reside. It has to be online during boot operations and when an overlaying operation is requested. After modification of this setting, code tests if the new disk has the needed SVS-Calc system files.
- Data disk is the disk where the user loads/saves his spreadsheet files (it may be the same as the system-disk).
- Printer device is the disk (or PC folder) where you output the print-files (Print to file option of MENU/PRINT).

In order to see what are the current set devices, use MENU→INFO→CONFIG.

11 - GRAPHICS:

SVS-Calc can calculate and create 3 types of colored graphics in separate screen windows.
If a selected-area is existing then the system asks the user if he wants to graph the values of the area, starting from the top left cell.
If there is no selected area or if user replies "N", the values to be visualized are those of the cells in the currently focused row (where the cursor resides), starting from the current cell, to the rightmost cell of that row. Possible empty cells or texts are ignored; negative values are not visualized.
There could be 13 vertical levels and a max of 24 horizontal values.

- 11.1 Create a graphic. Use the menu to enter into graphic process, as follows:

MENU→CELLS→GRAPHICS→ HISTOGR. 3D   produces a multicolor 3D bar graph. 12 values are *shown (so that you can use it for monthly values, for example).*

CURVE   produces a "*simulated curve*" graph, using 24 values of the row. A second graph (next row of cells) can be displayed concurrently with the first one.

DOUBLE BAR   produces a double histogram of 12 values each, using 2 rows of data. First is the one pointed to by the cursor, or the selected-area top line; second is the data on the next row of cells.
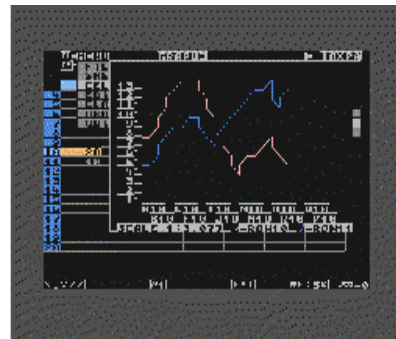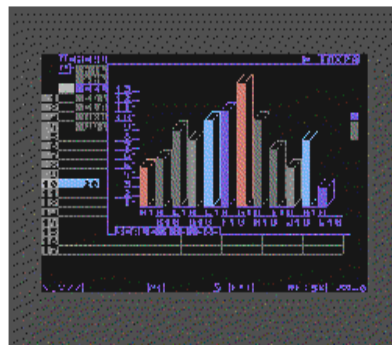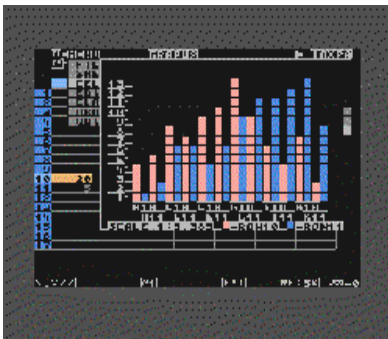
- 11.2 Scaling. If the values to be graphed are inside the range 0 to 13 then the real values are used in the y-axis (with option to stretch them in order to use the whole window extension). On the contrary if at least one value is greater than 13, then they are automatically scaled. The scale is visualized on the bottom of the graphic window.

- 11.3 Legend. In the case of 2 series of data visualized simultaneously, a legend appears in the bottom of graphic window (graph types: Curve, Double bar).

- 11.4 – Transferring a graph into grid. By this feature you can transfer the image of a graph from its window to a standard grid of the spreadsheet. It will use only 17 cells of a column (and temporarily 19 slots of formulas array). Just hit "T" [Return] at bottom input box, after created a graphic. If the operation succeeds (if there is sufficient memory) then the image is saved in memory and you can exit from graphic feature (or play with new graphics). On the bottom screen line, an icon with a graph appears to indicate the stored graph data.

   After exiting, the system reloads the overlay and when done it asks you for the coordinate of the top cell of the column where the graph will be inserted. Type in it or [ESC] to abort transferring. If you confirm the operation by supplying with the cell coordinate, the system will ask you for a mode: [O]verwrite cells' content, or [I]nserting the image by moving the previous content of the affected cells in the right direction.

   Graph colors are transformed to mono-color patterns in order to obtain a readable graph even on printer output.

   Transfer operation needs at least 1100 free memory bytes and 19 free slots for formulas (see MENU→INFO→CONFIG to know info on current situation). In case of insufficient resources the system will output an appropriate warning/info message, and the operation is aborted.

12 - SETTINGS:

There are many settings the user can manage:

- 12.1 Screen blanking. Enable/Disable screen blanking while *recalculation*, *overlay loading*, and *screen updating* (MENU→SHEET→SETTINGS→BLANKING) or by the short-key CTRL-B. If on, this feature causes a reduction of 30% of the time of some operations by temporarily turning off the video (you'll hear a brief beep). The blanked screen has a scrolling colored bar. Every 5 completed frames, the screen becomes transparent for 1 frame in order to let the user know the status of the current process.
The screen returns to normal after the process ends or in case of an error.
An icon with a rectangular box appears in the bottom screen line if this feature is active (filled box). Default is off.

- This setting is saved in case of sheet saving, then it is restored after a loading.

- 12.2 Automatic cursor movement. Enable/Disable automatic cursor movement after finishing an input (MENU →SHEET→SETTINGS→AUTOCURSOR) (see above paragraphs 4.2 or 6.2). A proper icon at the bottom of the screen line shows the current setting (a lone cursor = disabled, or a cursor preceded by an arrow = enabled). Default is on.

- 12.3 Disk units number identify. By options MENU→SHEET→SETTINGS→… you can set the device# for:
   a) System disk (where SVS-Calc resides);
   b) Data disk (where user stores his files. It could be the same as the System disk);
   c) Printer disk (where to store "print files"). This datum can also be set from MENU→PRINT→TO_FILE→ SET DEVICE.
These options allow the use of more than one disk (or PC folder when using an emulator). Of course possible values go from 8 to 14 (8…9 if 1551 drives). Menu options under the "FILE" choice will work only on the Data disk.
To see current disk settings, you can visualize MENU→ INFO→CONFIG.

- 12.4 Screen savers. You can set the screensaver feature that makes the screen colors darker when, during a selected time, the user does not use the keyboard. Hit MENU→SHEET→SETTINGS→SCREENSAV. and follows its requests.
When the screensaver starts, the screen luminance is reduced, but the colors and characters are maintained.

The FX choices are ([M]eteors or [S]tars). Activation time is supplied in minutes. Zero minutes disables the screensaver feature. Just after inputting the settings, you can try it by pressing [T]est.
Pressing any key will restore the screen to the previous content.
Be informed that the screensaver works only when the spreadsheet is idle, and not when either a menu, a sub-window, or an input box are open. During screensaver activity a possible clock is still updated, but its value will be visualized at the return to normal operation.

- 12.5 How to see all settings. You can see all the current settings by MENU→INFO→CONFIG. The opening window will show:

- Grid columns (max and current)
- Grid rows (max and current)
- Formulas (max and current)
- Names (max and current)
- Emulator speed
- Screensaver delay and mode
- Alarm time
- Errors flag
- Selected area
- Numeric format
- Disk devices

- 12.6 Fonts. You can change the characters font by simply using MENU→SHEET→SETTINGS→FONTS. Four font sets are available ([N]ormal, [C]ompact, [L]ight, [B]uck-Rogers^{tm}). After choosing a new font, hit [Return] and it will be instantly applied to the current sheet.

13 - SORTING:

You can sort the data of a grid zone, by MENU→CELLS→SORT→VERTICAL (or HORIZONTAL) on the basis of the content of the cells of a position (defined by user). These cells belonging to a specified column (or row) are sorted in alphanumeric order. All remaining cells of the same row (or column) will move coherently. *This can be useful for example if each row is a record (see* examples below*).*
Possible cells with formulas cannot be sorted; in this case the system will warn you.

- 13.1 Vertical order. If you choose VERTICAL, all rows of the area you've defined are sorted on the basis of the contents of cells of the so called "key column" (defined by user). Entire rows of the area are moved up/down so that the final result is that "key column's" cells are sorted.

- 13.2 Horizontal order. By choosing HORIZONTAL, all columns of the area are sorted on the basis of the contents of cells of the so called "key row". Whole columns are moved left/right so that the final result is that "key row's" cells are sorted.

- 13.3 Sorting direction. Sorting can be performed in either direction: [A]scending (0…→…9…A…→…Z) or [D]escending (Z…→…A…9…→…0).

- 13.4 Recommendations.
- Before starting the sorting process, be sure to have selected the correct area (or whole sheet). - Cells out of the area will not be affected by any moving.
- You cannot undo sort processing. The only way to restore is to reload the SVS-Calc file from disk. Then, if you are not so sure, please make a backup (saving) before sorting.
- During sort process you can have an idea of the remaining time by looking, at top right of screen, the red countdown number.
- If a formula is located inside the zone to be sorted, the sort process is not executed.

VERTICAL order:

Before to sort:

	A	B	C
1	PETER	PARKER	SPIDERMAN
2	CLARK	KENT	SUPERMAN
3	BRUCE	WAYNE	BATMAN

After sort (key column: A; direction: [A]scending)

	A	B	C
1	BRUCE	WAYNE	BATMAN
2	CLARK	KENT	SUPERMAN
3	PETER	PARKER	SPIDERMAN

After sort (key column: B; direction: [A]scending)

	A	B	C
1	CLARK	KENT	SUPERMAN
2	PETER	PARKER	SPIDERMAN
3	BRUCE	WAYNE	BATMAN

HORIZONTAL order:

Before to sort:

	A	B	C
1	PETER	BRUCE	CLARK
2	PARKER	WAYNE	KENT
3	SPIDERMAN	BATMAN	SUPERMAN

After sort (key row: 1; direction: [D]escending)

	A	B	C
1	PETER	CLARK	BRUCE
2	PARKER	KENT	WAYNE
3	SPIDERMAN	SUPERMAN	BATMAN

After sort (key column: 2; direction: [A]scending)

	A	B	C
1	CLARK	PETER	BRUCE
2	KENT	PARKER	WAYNE
3	SUPERMAN	SPIDERMAN	BATMAN

14 - PRINTING:

Sheet data can be printed on a real printer or to a file. Choose MENU→PRINTER then either TO PRINTER or TO FILE.

After inserting all parameters and the confirmation, printing starts and you will see a "*paper page*" icon in the left side of screen. Possible new pages are also visualized as new icons.

The first line printed always is the string "FILE: filename", then the data follow. At the end of each page, there is printed on the penultimate line, the string "PAGE: n" (n = page#). The last line of a page is left empty.

-14.1 To Printer: The type of print has to be selected when an online printer is connected to your system (or what printer emulation in case you are running a Plus4 emulator). See chapter 14.4 below for more details.

A menu is open and the user is asked for the following settings:
- Printer col.? Input how many characters could support the printer in a single line.
- [T]ext or [G]raphic? Text quality produces an output file without CBM font characters, only standard ASCII. System substitutes each CBM character with an ASCII code, but this isn't possible in all the cases. Read chapter 14.3 below.
- CR+LF?; type "Y" if you want to add a further new-line command to the printer every time a Carriage-return is sent (some non CBM printers need this).
- Area: Top left, Bottom right: Insert the coordinates of the corners of area to be printed. If a Selected Area exists, then its coordinates are prompted.
- Print C/R Headers? Type "Y" if you want to print also the headers of columns and rows.
- Print grid? Type "Y" if you want the grid lines printed with the data.
- Lines of a page? Type how many rows have to be printed before a new page is used.

-14.2 Paging split: In case the size of a printer line is smaller than the total horizontal size of the area to print, system prints as many completed cells as possible. The remaining unprinted rightmost cells will be printed on the next page(s).

Example:
- *area to print: A2:G50. (Total size of cells A…G: 120 characters).*
- *Line of printer: 80 characters (columns E, F, G are beyond a printer line)*
- *Page size: 24 printer lines.*

Since first A…D columns sizes are filling a printer line, the system will print the following ones (E, F, G) using another page (see pages #4 #5 #6).

Printer output:

FILE: filename

	A	B	C	D
1				
2				
3				
…				
…				
20				

PAGE: 1

FILE: filename

	A	B	C	D
21				
22				
23				
…				
…				
40				

PAGE: 2

FILE: filename

	A	B	C	D
43				
…				
…				
50				

PAGE: 3

Below printing of remaining rightmost columns:

FILE: filename

	E	F	G
1			
2			
3			
…			
…			
20			

PAGE: 4

FILE: filename

	E	F	G
21			
22			
23			
…			
…			
40			

PAGE: 5

FILE: filename

	E	F	G
49			
…			
…			
50			

PAGE: 6

On each page only 20 rows of the sheet are printed being, in the example, the page size is set at 24: One of which is for FILENAME, another is for column headers, and 2 are for PAGE# and the last empty line (20+1+1+2=24).

-14.3 To File: This option lets the user store the printing output as a text file. The menu lets you set the device# of the output drive, or go directly to print window settings. If you are using an emulator, the device# could even point to the PC folder where you want the output file. If you set as device# a CBM disk drive, the system will create a SEQ file.

Output will have only standard ASCII characters, and all semi-graphic CBM characters are converted into the near ASCII ones. Read Text mode on chapter 14.4 for more details.

Parameters:
- File? Type the filename for output (max 16 chars), the suffix .TXT even if prompted, is optional but recommended for later use on a PC.
- CR+LF?; type "Y" if you want to add a further new-line command to the printer every time a Carriage-return occurs (this could be needed for the online printer).
- Area: Top left, Bottom right: Insert the coordinates of the corners of area to be printed.
- Print C/R Headers? Type "Y" if you want to also print the headers of columns and rows (If Yes, headers will not be saved in reverse).
- Print grid? Type "Y" if you want the grid lines printed with the data.
- Lines of a page? Type how many rows have to be printed before a new page occurs.

-14.4 Print modes: The printing modes are [T]ext and [G]raphic. They set how characters of the CBM font are treated. This parameter is not requested for Print-to-file, it being forced into theText mode.
- Text mode converts any non-standard ASCII character into the nearest standard one (for example "|" will be converted to "!". This will assure a good readability by PC applications like Notepad.
Mind that possible non convertible CBM characters are sent "as they are", for example reversed characters used in possible graphic images embedded inside the sheet grid. Since for these codes ASCII has a different shaped character, this could cause readability problems.
- Graphic mode sends non-standard ASCII characters as they are without any conversion. Result is good if you have either a real CBM 801/803 printer, or if you use an emulator with bitmap abilities (output file will be a BMP image).

Best results: It is obvious that in order to obtain a good quality output you should set SVS-Calc according to your real online printer or the emulator printer abilities.

15 - ERRORS:

The system is able to detect errors either syntactic or logical. This means that if you input a wrong formula or a wrong value in a cell, it will detect the mistake. Also when a sheet recalculation is performed, the system detects possible logic errors.

Warning: the only error not detectable is a numeric overflow as the result of a calculation. The Plus4 cannot manage values larger than 1.70141884e+38. Unfortunately, due to an Austrospeed bug on the TRAP() function, there is no way to intercept these errors. Please operate carefully using large values, for ex. with function FACTOR().

15.1 Errors visualization: The error number and a brief description are visualized in the affected cells, using errorcolor. The formulas' texts will not be lost. Just hit [Return] to enter into the edit mode and the original formula will be prompted.

If a cell with an error has a size shorter than the error message, just put the cursor over it in order to read the whole description on screen bottom line.

At the top left corner of the screen, a danger-signal shaped icon indicates, if present, that there are errors over the current sheet, even if in a cell not currently visualized.

15.2 Error propagation: if a formula refers to another cell containing an error, the result of the current formula will be ERR#10 and so on for possible further referrals in a chain.

Please correct the original cell (if MANual calculation is on, hit CTRL-A or MENU→SHEET→CALCULATION→ EXEC in order to perform a sheet recalculation) and all cells will be cleared from Error# 10.

15.3 Hidden errors: By this feature when a logical error occurs in a part of the IF() function that is not concerned with the Boolean result of a conditional expression, then that error is ignored and not visualized. The same error is shown only in case the part is executed for the Boolean result. *For example: IF(3>2;F4*5;6/B2*PI) the Boolean result of 3>2 is TRUE then the part to be executed will be F4*5. Well: a possible logical error in the part 6/B2*PI (like B2 empty or B2=0) is ignored.*

Syntax errors on the contrary are parsed in the whole formula.

15.4 ERRORS LIST:

1 – SYNTAX	Syntax in the formula. Mind: Spaces are not allowed - Operand separators are ";" – Decimal separator is ".").
2 – WRONG NUMBER	Possible overflow, unknown cipher, etc.
3 – NOT EXISTING CELL	Referring to a non-existing cell (outside current set grid)
4 – NON NUMERICAL OPERAND	After a numeric value a valid numerical operator was expected
5 – UNKNOWN CHAR	Character is unknown (is not alphanumeric, operator, punctuation mark). Space is not allowed.
6 – UNKNOWN OPERATOR	An operator was expected (maybe it is a wrong separator?). Spaces are not allowed.
7 – MISSING PARENTHESIS	Parenthesis not found. It could refer to open or close parentheses.
8 – MISSING OPERAND	The function needs more operands. *Ex. SUM(D3) is wrong; SUM(D3:D6) is OK.*
9 – CIRCULAR REFERRAL	Formula includes the cell where it resides, or just refers to itself. *Ex. writing on cell F3: =SUM(F2:F5).*
10 – REF.TO ERR.CELL	Referring to a cell containing an error (error propagation). This error could even be propagated by another cell with the same Err#10. In this case you have to go back and find the first cell causing the error chain (it has an error different than #10).
11 – REF. TO EMPTY CELL	Referring to an empty cell. Functions SUM(), AVER(), COUNT() ignore this situation.

12 – INCOHERENT DATA	Operands are not coherent or invalid date/time (DAYS(), WDAY(), SECONDS() functions).
	Ex. MIDSTR('ABC';4;2): begins from 4th character when string is 3 chars long.
	Ex2: 310412 as date 31 April 2012 – Ex3: 290211 for date 29 February 2011.
13 – FORMULA TOO COMPLEX	The number of tokens inside a formula is greater than 255 or RPN string becomes greater than 255 bytes. There are too many elements inside the formula (operators, operands, data, etc.). Possible Names are decoded and their elements counted.
14 – DIVISION BY ZERO	(used too in AVER() when no numeric datum exists in the area).
15 – DISK TROUBLE/NOT SVS-CALC FILE	Any disk error, or a file to load is not in the SVS-Calc format.
16 – REF.COORD.TO BE FIXED.SEE [?]	The formula had been modified in order to adapt itself to new grid geography. This is automatically done after an insert/deleting of a cell, a column or a row (MENU→EDIT). In this formula however the system was not able to predict a new coordinate because the aimed cell lno longer exists or has gone out the grid borders. The user has to manually edit the formula and substitute for the "?" with the correct new value. *Ex. =B?*12 Ex2. =?23*PI.*
17 – ILLEGAL QUANTITY	The operand supplied with the function is wrong making the result impossible *(for ex. negative values for SQR() or 0^0).*
18 – TOO MANY FORMULA IN SHEET	The formula just imputed has exceeded the max number of formulas in the grid, which you've set during SVS-Calc Configuration.
19 – DESTIN.CELL FROZEN	PUT() function cannot modify the destination cell because that cell is protected. Move cursor over it and hit CTRL-F to unfreeze it, then recalculate the sheet.
20 – RESULT.STRING TOO LONG	The result of an operation is a string greater than 255 characters.
21 – LOADING FILE CANNOT FIT GRID	The max size of the grid you have set during SVS-Calc Configuration is not big enough to load the file (NB.- not the current size of grid, rather the max possible stretchable size).
22 – OUTER FILE NOT AVAILABLE	You have supplied function OUTER() with a name of a file that was not found on the online Data disk. The external file has to be a valid SVS-Calc file (Check if the file is correctly closed, if it is a USR type, if the driver is ready). Maybe the Device# for the Data-disk is incorrect (see MENU→SHEET →SETTINGS→DATA DISK)
23 – WRONG TEXT OR UNKNOWN NAME	Formula parser does not understand what that string means, not being one of set Names, nor a Function. Remember that texts have to be inserted between single quotation marks *(ex. 'TEXT').*
24 – NAME CAUSES TOO LONG FORMULA	The de-crunching of a Name causes the new size of a formula to become greater than 255 characters.
25 – OUTER() REF.TO CURRENT FILE	The file OUTER() function refers to, is indeed the same file loaded and present in the grid.
26 – OUTER CELL NOT FOUND	The external file you have set by function OUTER() has a grid not containing that cell.

16 - MEMORY:

While SVS-Calc works, the available free RAM is always monitored. You can see its amount at the icon on the bottom screen line. The free RAM is shown as Kbytes or optionally (CTRL-£) as bytes. The Icon changes to the error-color when the amount of free RAM goes under 2 KB. It becomes reversed if lower than 1 KB. When less than 512 the exact number of free bytes is shown.

The amount of free RAM depends on the Configuration of SVS-Calc, and on how many data are stored inside cells. Mind that to restrict the current grid via the menu does not affect the free RAM space. You only obtain a faster calculation.

16.1 Warning window: At any moment and during any process, the system will warn you if the amount of free RAM goes under 1 KB, by opening an overlaid window that informs about the current available memory. You can choose:

- [ESC] to continue;
- [X] to continue and exclude further window warnings;

After user choice, the screen is restored and processing continues.

If [ESC] was pressed, the system will warn again with a new window message in case available RAM drops a further 200 bytes, and so on. After an [X] press, no new warnings will be produced in case of decreased RAM.

Periodically the system performs cleaning of the temp strings so that the amount of free RAM will be the maximum possible. When this happens, if free RAM becomes greater then the last warning amount, the warning is reset.

If the warning happens while two levels of windows are open (for ex. menu and parameters windows), then the warning is shown as a message box in the bottom screen line (see following paragraph).

16.2 Warning message box: If free RAM is lower than 300 bytes, it does not allow even the window-warning. Thus the system will produce an one-line warning at the bottom screen line, with the blinking message "WARNING! VERY LOW FREE MEMORY. ESC/[X]".

Even if it has been reported that SVS-Calc does work with so little memory, you are strongly urged to perform a saving operation as soon as possible. After saving, consider rebooting SVS-Calc and set up the Configuration with lower resources allocated, leaving more room for data. Then you can load your saved file and continue your work.

17 - BUGS & DEBUGGING:

Please report any problem or bug to: **SVS** (svs.fire@teletu.it), thank you.

- *In case of trouble with layers on screen* (wrong restoration of previous content after closing a screen window), you can press CRSR-Left or, if this doesn't succeed, ESC twelve to restore work screen.
- *In case of crash*, the screen will be unreadable due the new charset. Hit **F3** in order to make it visible and take note of the error message.

17.1 SPECIAL DEBUG COMMANDS:

The source code of SVS-Calc is provided with some internal Debugging Tools. Their routines, however, have not been compiled in the official release, in order to save more room in memory for user data (except CTRL-U).
But, if someone wants it, I can include them in a special release.
Debug commands:

CTRL-R	to see the RPN (Reverse Polish Notation) coded string of the formula residing in the cell highlighted by the cursor. An additional key press will show the same one with index-coded operators.
CTRL-O	to browse the tokens vector of a just calculated formula (+:next -:previous ESC:exit).
CTRL-P	to browse the formulas archive (+: next -:previous ESC:exit to CTRL-R)
CTRL-U	performs a STOP to the running of program (CONT is not allowed!). This command works in all releases. User is asked for a confirmation before the halt.

17.2 HOW TO SPEED UP THE PROGRAM:

Maybe sometimes SVS-Calc runs a bit slow. Minding what was written on the first line of this manual, there are some tips to gain a better speed:

- *If you are running an emulator, set its speed to 200% of the real Plus4 speed.*

- *Enable screen blanking to automatically reduce by 30% the time of calculation, loading from*

disk, and screen updating. If you use a 1551 drive (even emulated) you can monitor what system does while blanking is on. CTRL-B to set/reset the feature.

- *Configure the sheet dimension for the amount of cells you need. This has to be done by Configurator, when SVS-Calc boots. Remember that leaving a good amount of memory to the system will allow it to work better and faster.*

- *Once set the Config, you can work only with a part of the possible field of cells. For example if now you have nothing to write beyond column D, set current grid size till column = "D". This avoids useless scans of the columns beyond "D" (later, you can enlarge the grid whenever you want).*

- *When you type in many data or formulas inside cells, you should disable Automatic Calculation in order to avoid that after each [Enter] the entire sheet is recalculated.*

- *The time of sheet recalculation depends only by the number of formulas and not by the cells with constants or texts. Then: less formulas means more speed.*

- *Calculation iterations, if more than 1 will directly increase the calculation time. For example: Calculation iterations = 3 means triple time of each recalculation. (Of course in some cases the type of spreadsheet indeed needs more than 1).*

- *The screen updating can be speeded up by reducing the number of visible columns. To do this you can enlarge the column's size in order to visualize less columns.*

- *Visible rows are 17 by default. But if you choose to view a lower number of them, screen updating will be proportionally faster.*

- *To move cursor faster, use CBM+cursor: it will move 5 steps a time.*

- *Navigating engine optimizes the cursor movements: when user hits the same cursor-key several times, system will execute sequentially all of them, but will update the screen only after the last one. This gear is disabled when you've set a Selected-Area then: canceling the Selected-Area will restore the standard navigation speed.*

18 - BETA TESTING:

I wish to thank for their appreciated work of testing and suggesting: Litwr (initial part), NightBird (moral support) and especially MikeZ (deep testing).

Have fun!

P.S. – There is even an Easter-egg somewhere… ☺

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