
**ATLAS
COMPUTER
LABORATORY**

**S-C 4020
SUPPLEMENT
(FORTRAN)**

**SCIENCE
RESEARCH
COUNCIL**

S-C 4020
SUPPLEMENT
(FORTRAN)

OCTOBER 1969

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NEW ROUTINES

The subroutine plotting package will now function satisfactorily with the FORTRAN4 and FORTRAN compilers in addition to HARTRAN. However, subroutines C4020H and C4020V and the directive *UNLOAD 99 must not be used except with HARTRAN.

WRITE (14,99) LIST
99 FORMAT (2HGN, etc.)

Will output software characters of varying size. The position of the centre of the first character to be printed (i.e., the first following N) can be adjusted using, say, MOVETP(X,Y) or SCFOR(7,AX,AY,48.0,0.0). AX and AY in Option 7 may be outside the limits of Option 2.

N = 0 to 9. With N = 0, size of the characters is compatible with the hardware ones. The size increases uniformly, until with N = 9, character-size is the same as in the Job Number on the identification frame.

WRITE (14,100)
100 FORMAT (2HG*)

Will change from horizontal character strings to vertical ones and vice-versa when used with WRITE(14,99)LIST

POSC(K)

Reads one line at each call from a private input tape or input stream K and outputs it to the SC 4020. A call of the appropriate exit routine at the termination of input determines the form of output from the SC 4020:-

Exit Routines

POSCHD	Hardcopy only.
POSC16	16 mm. microfilm only.
POSC35	35 mm. " "
POHD16	Hardcopy and 16 mm. microfilm.
POHD35	" " 35 mm. "

FPOSC(K)

This should be used in preference to POSC(K) if no case-change is present in the data.

STLCAM

For use with the Still Camera employing sheet film 8" x 8".

SCSTOP

STLCAM must be called once for every still picture and subroutine SCSTOP called after the last one. Useful for making form-slides and transparencies.

	△	▽	□	◇	○	田	⊠
⊠	⊗	✱	◊	⊠	+	×	∕
∞	√	A	B	Γ	Δ	E	Φ
Γ	H	I	⊠	K	Λ	M	N
⊠	Π	⊠	P	Σ	T	Y	Ψ
Ω	X	Y	Z				
C	D	V	<	>		⊥	
∩	∪	°	↓	—	‘	’	⌋
)	~	∫	±	≠	≦	≧	→
2	≡	α	β	γ	δ	ε	∅
γ	η	ι	θ	κ	λ	μ	ν
ο	π	ω	ρ	σ	τ	υ	ψ
ω	χ	υ	ζ				

SAVEAA(N)
 SAVEBB(N)
 USEAA(N)

Enables different sets of SC 4020 information to be saved and output when required. N may take values from 1 - 7 and are in addition to SAVEA, SAVEB and USEIT on page 57. (SAVEAA(0) is identical to SAVEA.) Note that as well as being saved, the plotting information is also output unless subroutine BANKIT has been called.

BANKIT(I)

After a call of BANKIT(I) with $I \neq 0$, all output between matching SAVEAA's and SAVEBB's is saved, but only output when USEAA's are called.

NOLIM

Removes the size limit on SAVEAA(N) - SAVEBB(N) sequences although not on STOREZ which remains fixed.

REUSE(N)

Enables SAVEAA(N) to SAVEAA(7) to be re-used by the current program for changed data.

STOREZ

Stores SC 4020 data from SAVEAA(0) to SAVEAA(7) onto TAPE 98 N1496 SC DATA.

RESTOR(K)

The block number from where STOREZ stores the data is printed out on Output Stream 13. If K is set to this value on a subsequent run, the information is restored from block K on TAPE 98 N1496 SC DATA for use with the USEAA(N)'s as in the original program.

SCBLOCK(K)

K is set to the value of the first block on TAPE 98 N1496 SC DATA which the next call of STOREZ will access.

SCFADE(N)

Replaces two basic SC 4020 commands in SAVEAA(N) from SAVEAA(0) at each call. SAVEAA(N) should be the last one used by the program, otherwise overwriting of the last one may occur. N is set to zero on completion of FADE.

(STPTYP - This routine may be used to fade a scene to a blank screen when used in SAVEAA(0). The number of times it is called depends on the length of the sequence in SAVEAA(N). STPTYP is, in this application, a No-Operation command.)

BLANKS(N)

Replaces two basic SC 4020 commands in SAVEAA(N) by NOP's each call. N is set to zero on completion of fade.

INBLOC

DISC COMMON 98/M may be used as an alternative to TAPE 98 N1496 SC DATA for test purposes. It is then necessary to call INBLOC once at the beginning of the program.

New Blocked Common - RECORD and ZONAL

New Options (11 - 18)

SCFOR(11,AX,AY,THETA,SW1)

This will cause output using Options 7, 8, 13, 14, 15 and 17 to be rotated THETA degrees clockwise about the point AX,AY.

If SW1 is non-zero, the rotation will occur before conversion to the SC 4020 raster. If SW1 is zero, the rotation will be after conversion.

SCFOR(12,AA,BB,SW2,OBJECT)

AA - An integer value similar to LTHICK operating on Options 8, 13, 14, 15 and 17.

BB - If positive, causes masking of lines and points crossing the limits defined in Option 2.

- If zero, scissoring takes place.

- If negative, neither scissoring nor masking occurs.

SW2 - If non-zero, permits the saving of the Option 7, 8, 13, 14 and 15 calls in an array in blocked common:-

COMMON/ZONAL/ARRAY(N)

for reference by the name 'OBJECT' in Option 17.

- If zero, no saving takes place.

- If negative, the information is saved but not output until a call of Option 17.

N.B. The COMMON/ZONAL/ARRAY(N) should be referenced in a users subroutine in order for sufficient space to be allocated according to dimension N. Initially, four words should be allowed for every call of Option 7 and 8, although compression will take place. Option 17 will, in fact, give the last word of the array occupied by 'OBJECT'.

SCFOR(13,TITLE,SS,AX,AY)

Outputs the text word TITLE, horizontally, starting at AX,AY of size SS in terms of Option 2. SS is in terms of the X-scale only.

SCFOR(14,TITLE,SS,AX,AY)

Outputs the text word TITLE vertically. Other variables are as in Option 13.

Note: Options 13, 14 and 15 all call Option 8.

SCFOR(15, FN, X, Y, PAIRS)

(The last four arguments are of real mode as with the other options).

This option draws sets of fans between sets of given pairs of lines. The original lines are not drawn.

"Pairs" is the number of fans to be drawn, and may be a maximum of 25.

"FN" is a one-dimensional array, each element of which specifies the number of lines in each fan. There is no limit to the density of the fan. FN(i) corresponds to the ith. columns of "X" and "Y".

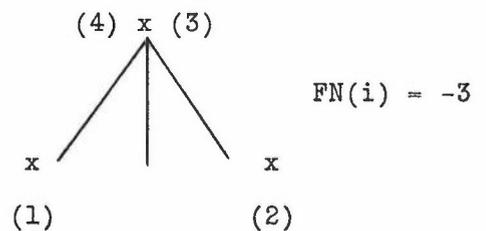
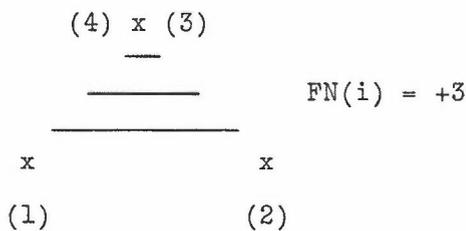
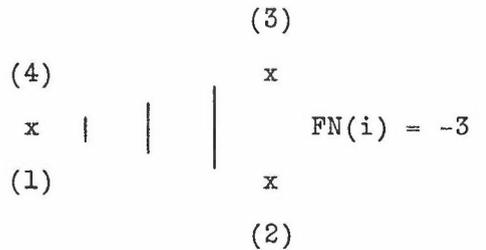
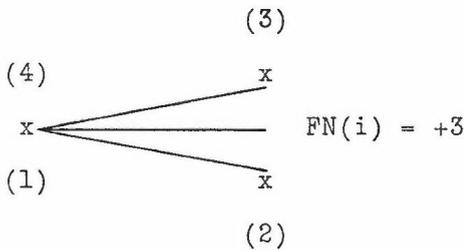
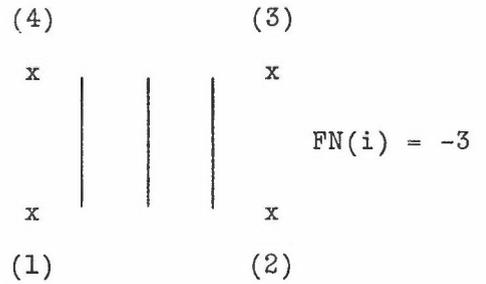
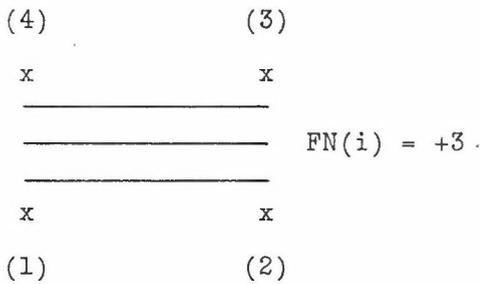
"X" and "Y" are two-dimensional arrays (4 x "pairs"). They contain the coordinates of the four end points of each pair of original lines; points 1 and 2 specifying the first line, and 3 and 4 specifying the second line working around the enclosed area in either a clockwise or an anticlockwise direction. Hence the pair of original lines should not normally cross each other, but any two successive points may be coincident.

If the element of "FN" is positive, the fan is drawn in the same sense as the original lines. If it is negative, the lines of the fan would cross those of the previous case. (See examples.)

Examples

Points 1 and 2 specifying the first line are x(1,i), y(1,i) and x(2,i), y(2,i) respectively.

Points 3 and 4 specifying the second line are x(3,i), y(3,i) and x(4,i), y(4,i) respectively.



SCFOR(16,X,Y,PHI,EXPAND)

Allows the information saved by calling Option 12, for use by Option 17, to be expanded and rotated PHI degrees clockwise about the point X,Y.

N.B. Any rotation introduced by calling Option 11 also remains effective. Expand is a factor of expansion, and for the same size object as the original must equal 1.0.

SCFOR(17,DISPX,DISPY,SIZE,OBJECT) Outputs the information stored and labelled as 'OBJECT' by Option 12. The information may be displaced by an amount DISPX,DISPY and is in addition to any expansion or rotation produced by Option 16.

DISPX and DISPY are in terms of the current setting of Option 2.

SIZE, which must be a variable name and not a numerical value, is set equal to the last word used in the COMMON/ZONAL/ARRAY(N) by 'OBJECT'. This is useful in gaining a more accurate idea of how much storage space is required on subsequent runs.

SCFOR(18,P,Q,R,S)

P - If positive, outputs every Pth call of Option 7 and 8, generated by Option 17.

- If zero, outputs every call of Option 7 and 8, produced by Option 17.

- If negative, omits every Pth call of Option 7 and 8 generated by Option 17.

Q - If positive, outputs only first Q calls of Option 7 and 8 generated by Option 17.

- If zero, all calls are output.

- If negative, omits first Q calls of Option 7 and 8.

R - If positive, stores addresses used by Option 7 and 8, not specific values, after an appropriate call of Option 12.

- If zero, specific values are stored.

- If negative, stores basic SC 4020 calls generated by Options 7 and 8. Output from Option 17 cannot be rotated, etc., but is relatively fast. SW2 of Option 12 must be positive.

LINKOB(OBJ1,OBJ2,BREAK)

If BREAK is zero, OBJ1 is linked to OBJ2, replacing any previous links to OBJ1. Both OBJ1 and OBJ2, etc., are output by calling Option 17 referring only to OBJ1. If BREAK \neq 0, then the link is broken.

NUMOPT(OBJECT,TOTAL)

Gives total number of calls of Option 7 and 8 saved under 'OBJECT' for use with 'Q' in Option 18.

New Routines (not called directly by user)

CONADD
SCFR15
SCFR96-99
SEEBIT
SETADD
SETBIT
SETIOU
THICKV
VARADD
YSCFOR
ZTSPPP

Errata and Addenda

- E Page 9 TAPE 99 FORTRANLIB should now read:-
DISC 99 R500 FORTRANLIB.
- A Page 19 Vectors and axes are not affected by
CALL EXPHVY(X,CC,Y) or CALL EXPLGT(X,CC,Y).
- A Page 23 When specifying a format for use with WRITE(l4,f) list,
remember that an oblique indicates the beginning of
a new record and must have a 'G' as the first, if only,
character.
- A Page 30 Subroutine STPTYF need not now be called after
Typewriter-Mode subroutines.
- E Page 38 Calling Option 2 does not automatically produce the box
shown in the diagram and this ought to have been dotted.
- E Page 39 The scaling in the diagram should be -0.5 and 0.0,
not -0.5, 0.0, 0.5 and 1.0 for this example.
- E Page 42 CALL SCFOR(F,A,B,41.0, 1.0) should read:-
CALL SCFOR(7,A,B,41.0,1.0)
- A Page 53 Call IDST first if re-defining SCFONT.
- A Page 57 Write (l4,f) list may be included in a save sequence if
outputting software characters. This is when the first
two characters of a record are 'GN' where N goes from
0 to 9.

It is possible to produce a cine film simply by making slight movements in the displayed data from one frame to the next. However, other operations are required for a more finished product which holds the attention of the captured audience and highlights particular points in the presentation.

Such stock-in-trade devices of the professional film animator as ZOOMS, FADES, WIPES, etc., are necessary to create special effects. Over indulgence in these can be as bad as none at all, since the viewer will either be left stupefied or in a state of nervous expectation as to what is going to come next. The subject matter of the film itself will probably be overlooked!

Similarly, changing too much information on the screen at any one time should be avoided, particularly at widely-separated points on the screen with constant switching from one side to the other.

The length of time for which scenes are 'held' i.e., remain static, is important, and may be it is only gained through experience since it is to some extent dependent on the material presented. As a general guide, text should be held at least for twice as long as it normally takes to read. The same applies to the movements of specific items and few can say straight off exactly how many positions an object should be moved from frame to frame.

It is an art form, and as such cannot easily be reduced to rules or equations.

Some terms will be listed with their accepted meaning to the film industry, and an indication of how to achieve these in Fortran for use on the SC4020.

TRANSITIONAL DEVICES

FADE IN/FADE OUT	From blank screen to appearance of image by degrees or from image to blank screen. Standard fade is 32 frames from the range 16, 24, 32, 48, 64, 96.
IRIS IN/IRIS OUT	Image appears from centre of screen in enlarging circle or disappears in diminishing circle.
MIX or DISSOLVE	Alternative terms referring to melting of scenes together through superimposition of fade-in on to fade-out.
WIPE	One scene is 'wiped' off screen by following scene. Can be horizontal, vertical, or diagonal.
STRAIGHT CUT	Simple joining of adjacent scenes.
JUMP IN	Straight cut of additional image (such as lettering, arrow, etc.) on to existing scene.

CAMERA MOVEMENTS

ZOOM IN/OUT	An enlargement or reduction in the size of image, made optically without change of camera position, and alteration of perspective.
TRACK IN/OUT	Camera moving towards or away from subject. A tracking shot can be parallel to the subject.
PAN	A movement of the camera in a horizontal arc.
TILT	A movement of the camera in a vertical arc.
CRANE SHOT	A heightening or lowering of the camera.

TYPES OF SHOT

B.C.U.	Big close-up.
C.U.	Close-up.
M.C.U.	Medium close-up.
M.S.	Medium (or Mid) shot.
M.L.S.	Medium Long Shot.
L.S.	Long Shot.

OTHER TERMS

Animation	Giving apparent motion through sequential drawings.
Stop Motion	Giving apparent motion through manipulation of objects and filming each frame individually.
Overlay	Synonomous with Super-imposition for titles.
Take	Each attempt at a particular scene.
Hold and 'freeze frame'	An arresting of action where the same frame is repeated as required.

TERMMETHOD IN FORTRAN

FADE IN/FADE OUT

Although not a true FADE - or MIX - (i.e., one in which scenes are super-imposed with varying exposure), new information appearing and/or old information disappearing on successive frames give a similar visual effect.

Normally achieved by programming suitable loops which output more/less each frame. Computing time may be saved by using Options 12, 17 and 18.

A fast sequential method is to use the MIX or DISSOLVE system with one scene made up of STPTYP's.

MIX (or DISSOLVE)

An alternative to using Options 12, 17 and 18 is as follows:-

Save the new or replacement scene in a

```
CALL SAVEAA(0)
...
CALL ENDFME
CALL SAVEBB(0) sequence
```

Save the old scene in the last

```
CALL SAVEAA(N)
...
CALL ENDFME
CALL SAVEBB(N) to be used.
```

The CALL SCFADE(N) to replace two basic SC 4020 commands each call. CALL USEAA(N) will output the MIX at suitable stages. The completion of the MIX or DISSOLVE is indicated by N being set to zero.

N.B. It is advisable not to include camera advance commands in the SAVEAA(N) - SAVEBB(N) sequences, or routines which type hardware character strings, e.g. HORAM.

Note, also, that the first time through a 'save', the picture is produced as well as saved. However, if CALL BANKIT(I) with $I \neq 0$ has been executed prior to a 'save', a picture is not produced until CALL USEAA(N). Alternatively, the replacement scene may be directed to the Hardcopy camera.

WIPE (Horizontal or Vertical)

Use two pictures per frame, each with their own SCFOR (1, XSCO, YSCO, XSCR, YSCR) and SCFOR (2, XMIN, YMIN, XMAX, YMAX) calls and having a common boundary.

Gradual changes in the variables in the two options will produce the desired effect.

STRAIGHT CUT

As with WIPE except that the variables in Option 1 remain fixed.

- ZOOM IN/ZOOM OUT Most easily produced by either changing the variables in Option 1 or 2 without changing the plotting information co-ordinates.
- By setting PUBLIC NILVEC \neq 0, zero-length vectors completely disappear. This prevents black spots being left at the beginning or end of a zoom.
- HOLD Up to 31 repeats of a frame may now be obtained using ADVREP(I,M).
- For longer 'holds' use SAVEAA(N), SAVEBB(N) and USEAA(N). This is also useful for outputting constant backgrounds to changing data.
- ROLLING TITLES SCFOR (13, TITLE, SS,AX, AY) has been provided for this purpose, to be used in conjunction with Option 2.
- It is normally necessary to thicken software characters used in this by calling SCFOR (12, AA, BB, 0.0, 0.0) first.
- MASKING (OR SHIELDING) Again using Option 12, this time with the variable BB>0, it is possible to plot only those lines and points which lie outside the limits of Option 2.
- MANIPULATION OF OBJECTS The objects and titles formed by calls of Options 7, 8, 13 and 14 may be saved, labelled, rotated, expanded and moved using Options 12, 16 and 17. They may also be linked together using subroutine LINKOB.
- Option 18 enables FADES and MIXES to be produced from the labelled objects. It also permits the storing of addresses from Options 7 and 8 calls, rather than actual values.

N.B. DO NOT FORGET A 200-FRAME LEADER AND TRAILER ON YOUR MICROFILM FOR
THREADING THROUGH THE PROJECTOR.

A D-Mac Pencil Follower for digitizing maps, etc., is now installed
in the Laboratory.

Equipment available for handling 16 mm. cine film
at the Atlas Computer Laboratory

- (i) A Bell & Howell projector (Model 8D644) is set up for immediate use in the Archives Room opposite the library. It has optical and magnetic sound heads, magnetic recording facilities, and animation including reverse running of the film. A Revox A77 stereo tape-recorder is provided for merging sound tracks straight into the film projector for recording on to magnetically striped film.
- (ii) A Muray editor is located in the microfilm unit in the large conference room which produces a cine effect as well as allowing the user to notch his films for subsequent cutting.
- (iii) A Premier splicer cuts films and permits very strong joins to be made midway between frames, suitable for running through projectors. One or two frames are lost in the process but normally there is an overlap of scenes from separate computer runs, or several duplicate frames as in a 'hold'.
- (iv) A second splicer (an HP QUIKSPLICE) is available which does not lose any frames, but the join is made with clear adhesive tape which in fact covers the frames either side of the cut.
- (v) A 3M's Reader/Printer in the Ancillary Equipment room enables one to obtain an enlarged reversal print of any 16 mm. frame (also 35 mm. and microfiche) on photographic paper within seconds.
- (vi) A Bell & Howell Helvetia reader is located in the large conference room for 16 mm. strip and rolls up to a maximum length of 100 ft. A Mascot viewer for 16 mm. microfiche is kept in the library.

A few plastic 35 mm. slide viewers are generally available for 35 mm. strip, and a pocket magnifier of X50 magnification for close inspection of 16 mm. There is also a 3-D viewer for stereoscopic pictures of up to 9" square produced by the 3-D plot program.

The 16 mm. and 35 mm. film

We are presently using Ilford Track Chamber Film which is a fairly high contrast, blue-sensitive film. It is capable of reversal processing, although we always process it as a negative film ourselves. Since we are photographing a cathode-ray tube this means we obtain black lines on a clear background. For positives we duplicate our negatives on an ordinary film contact printer available at A.E.R.E. Harwell, or use commercial firms.

We use a J. Hadland 16/35 mm. processor which gives quite satisfactory results, although somewhat better quality can be achieved on a more expensive processor. We are willing, however, to provide users with unprocessed film if they wish to do it themselves.

In a few months' time we hope to be able to introduce a colour capability on to the SC4020 without affecting the black-and-white output. It is also planned to permit the recording of output on large sheets of film used in place of the hardcopy.

Commercial firms provide special processes for cine film such as magnetic striping, permafilm and scratch-resistant treatment. Names will be supplied on request.

P. M. Nelson

October 1969