MCM TAPE TAPE-13.TXT

TAPE LABEL/ANNOTATIONS: "NY (MY?) Utilities (Group 0)
Feb. 22/78"

DATE CREATED: 1978

GROUPS:
0

NAMES IN GROUP 0:

AIP	ALA	ALT	ASO	BIG	BOO	BOX	BRE	BRK	CEN	CHA	CHG
CHK	COM	COP	CPΔ	CRT	DES	DIG	DM1	DMD	DOW	DXΔ	EDI
EDT	EHT	ENI	ER_	ERR	FIN	FNΔ	FSΔ	FTΔ	GPΔ	INΔ	ITΔ
IVP	LIS	LM	LRG	MMD	MOD	NIP	NPG	OUΔ	PAG	PCT	PFT
PIT	PLT	POS	PRT	PSI	PΔ	QQX	RAM	RCS	REC	RED	ROL
ROM	RST	RTJ	SAV	SCA	SEA	SIZ	SOR	SPA	STA	TIT	TRC
TYP	UBK	UP	VDE	VOL	WID	WR	XPΔ	XRE	XRF	ΔA1	ΔCK
ΔCR	ΔDS	ΔFM	ΔGT	ΔIN	ΔLD	ΔM1					

```
    ∇ZΔ←AIP MΔ
[1]   ⍝     ZΔ←AIP MΔ          AUG 25/76
[2]   ⍝ZΔ IS KEYBOARD INPUT PROMPTED BY MΔ
[3]    ZΔ←(⍴MΔ)↓⍞MΔ
    ∇
```

```
        ∇ALARM;N
[1]   ⍝    ∇ALARM          2/3/78
[2]   ⍝SOUND ALTERNATING HIGH/LOW FREQUENCY BEEP
[3]   ⍝SOUNDS FOR ~12 SECONDS. INCR/DECR 'TEST' BY 2 FOR EACH ADD'L SEC. DESIRED
[4]   ⍝USE FOR ALERTING UNATTENDED OPERATOR OF NEED FOR ATTENTION
[5]   ⍝REQUIRES  VDU/9620 ATTACHMENT
[6]   N←0
[7]   START:⎕ΔB∘⎕BO 96∘⎕OU 254 6
[8]   ⎕ΔB∘⎕BO 80∘⎕OU 254 6
[9]   TEST:→START⌈⍳(N<25)∘N←N+1
[10]   ⎕BO 32∘⎕OU 254 6
    ∇
```

```
        ∇ALTERNATE
[1]   ⍝          ALTERNATE          JANUARY 19, 1978
[2]   ⍝ SELECT ALTERNATE ASCII CHARACTER SET FOR CRT.
[3]   CRT
[4]   →0×⍳~FLAG
[5]   ∘⎕OU 0∘'O'⎕YX⍳0
[6]   ΔM1 ⎕ΔM ΔA1
[7]   ⎕ΔA 1
    ∇
```

```
    ∇RESULT←ASORT MATRIX
[1]   ⍝     RESULT←ASORT MATRIX     OCT. 9, 1977
[2]   ⍝ SORT THE ALPHA MATRIX INTO ASCENDING SEQUENCE
[3]   ⍝ CAN BE USED FOR SORTING GROUP NAMES EG., Z←SORT □XN 2
[4]   ⍝ NOTE: BLANKS SORT LOW
[5]   RESULT←MATRIX[⍋39⊥39|⍉□Y MATRIX;]
    ∇

BIG   [1 by 59 array of type char; element size 3 byte(s)]
5C2EFC
2E68C0
0B3D46
DB0A16
060E00
46840A
0950BB
0B46AD
00069D
2DFA15
15153D
46AD07
1D3D46
C8003C
1148AC
0B46DB
0AD006
605135
153D11
333525
35CF25
F92515
3DEBF4
3D46FF
09C814
0125C1
CF70AF
2EF825
2E1836
00C12D
3DCF46
A4001D
1D1DEF
250640
02B1E0
CFC41A
E040D4
2EB068
DD2EF9
44D62E
3E27C3
2DA844
C62EC0
357091
2E0640
02A7B5
E850EC
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```
2E0E27
066C2D
253515
F93D25
44B62E
114807
02AC2E
CA2ECE
2ED22E
DA2EDF
2EE82E
F6AE00
```

```
    ∇Z←BOOL B
[1]   ⍝     Z←BOOL B            NOV. 7, 1977
[2]   ⍝ RETURNS 1 IF B IS BOOLEAN VALUED, 0 OTHERWISE.
[3]   Z←∧/,B=B=1
    ∇
```

```
    ∇S BOX C;H;V;IO
[1]   ⍝     S BOX C             MAY 04/77 NT
[2]   ⍝DRAW A BOX WHERE S IS START POINT - HOR. AND VER. DISTANCE T
[3]   ⍝FROM CURRENT LOCATION TO LOWER LEFT CORNER IN INCHES.
[4]   ⍝C IS WIDTH, HEIGHT OF BOX IN INCHES.
[5]   POS S∘□IO←1⌈IO←□IO
[6]   V[''ρρV;]←0∘V←(¯4+8×⍳1+⌈12×¯1↑C)∘.×0 1
[7]   H[''ρρH;]←0∘H←(¯2+6×⍳1+⌈20×1↑C)∘.×1 0
[8]   POS 1 ¯1×C∘'-'PΔ H∘POS 0 1×C∘'-'PΔ H∘'|'PΔ V
[9]   □IO←IO∘POS -S+1 0×C∘'|'PΔ V
    ∇
```

```
    ∇ R←C BREAK V
[1]   ⍝     R← C BREAK V                    JUNE 1977 T
[2]   ⍝USED AFTER ENTRY OF CHARACTER INFO AS VECTOR,
[3]   ⍝WITH CONTROL CHARACTER AS SEPARATOR.
[4]   ⍝BREAK VECTOR V USING CONTROL CHARACTER C.
[5]   ⍝CREATES MATRIX WHERE C DESIGNATES EACH NEW ROW.
[6]   ⍝IF C IS NUMERIC, DO NOTHING.
[7]   ⍝IF C IS AN ALPHA SCALAR, GENERATE EMPTY ROWS (MODE 1).
[8]   ⍝IF C IS A 1 ELEMENT ALPHA VECTOR, DO NOT GENERATE EMPTY ROWS (MODE 2).
[9]   C←+/(128×1=ρC),□Y C∘→(0=0\0↑C)/OK
[10]   OK:R←V □ZZ[C]BRK
    ∇

BRK   [3 by 1 by 36 array of type char; element size 3 byte(s)]
```

```
    ∇Z←WIDTH CENTER TEXT
[1]   ⍝     Z←WIDTH CENTER TEXT           OCT. 14, 1977
[2]   ⍝CENTERS TEXT, LINE BY LINE (SINGLE OR MULTIPLE LINE)
[3]   ⍝WIDTH:NUMBER OF CHARACTERS ON PAGE (OR SCREEN)
```

```
[4]   ⍝TEXT :NAME OF ARRAY TO BE CENTERED
[5]   Z←⍳0
[6]   →0×⍳2<⍴⍴TEXT
[7]   →L1⌈⍳0≠⍴⍴TEXT
[8]   →0×⍳0=⍴TEXT←,TEXT
[9]   →L2
[10]   L1:→0×⍳0=∧/×⍴TEXT
[11]   L2:→L3⌈⍳1≠⍴⍴TEXT
[12]   →0×⍳WIDTH<⍴TEXT
[13]   TEXT←TEXT,(WIDTH-⍴TEXT)⍴' '
[14]   →L4
[15]   L3:→0×⍳WIDTH<1↓⍴TEXT
[16]   TEXT←TEXT,((1↑⍴TEXT),WIDTH-1↓⍴TEXT)⍴' '
[17]   L4:Z←(-⌊((TEXT=' ')⊥1)÷2)⌽TEXT
    ∇


    ∇Z←CHARMAT V;A
[1]   Z←(⍴A)⍴(,A←A∘.≥⍳⌈/0,A←(A≠0)/A←A-1+0,¯1↓A←A/⍳⍴A)\(~A←V∈' ,')/V←V,' '
    ∇


    ∇Z←CHG MATRIX;I;INDEX;LINE;POINTER;VECTOR
[1]   ⍝     Z←CHG MATRIX                        SEPT 1977
[2]   ⍝THIS FUNCTION WILL CHANGE NEGATIVE SIGN (¯) NOTATION TO
[3]   ⍝PARENTHESIS NOTATION IN A FORMATED MATRIX OF FIGURES.
[4]   Z←MATRIX,(((1↑⍴MATRIX),1)⍴' ')
[5]   LINE←⎕IO
[6]   L1:VECTOR←Z[LINE;]
[7]   →(~('¯'∈VECTOR))/L3
[8]   VECTOR[INDEX←(VECTOR='¯')/⍳⍴VECTOR]←'(' 49
[9]   I←⎕IO
[10]   L2:POINTER←INDEX[I] 0
[11]   VECTOR[POINTER+1↑(' '=(POINTER↓VECTOR))/⍳⍴(POINTER↓VECTOR)]←')'
[12]   →((I←I+1)≤⍴INDEX)/L2
[13]   Z[LINE;]←VECTOR
[14]   L3:→((LINE←LINE+1)≤1↑⍴MATRIX)/L1
    ∇

CHK   [3 by 1 by 42 array of type char; element size 3 byte(s)]



       ∇COMMENTS FUNCTION;IO;Z
[1]   ⍝          COMMENTS FUNCTION          12/28/77
[2]   ⍝ FUNCTION TO EXTRACT ONLY COMMENT LINES OF A FUNCTION.
[3]   ⍝     EXIT IF NOT A FUNCTION.
[4]   →L1⌈⍳3=⎕NC FUNCTION
[5]   FUNCTION,' NOT A FUNCTION!'
[6]   →0
[7]   ⍝     SET INDEX ORIGIN TO ONE.
[8]   L1:IO←⎕IO
[9]   ⎕IO←1
[10]   ⍝     CHANGE FUNCTION TO CHARACTER.
[11]   Z←⎕CR FUNCTION
[12]   ⍝     ELIMINATE ALL BUT COMMENT LINES, AND ELIMINATE COMMENT CHARACTERS.
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```
[13]   Z←Z[(,Z[;2]='⍝')/⍳(''ρ(1↑ρZ));] IO
[14]   Z←0 2↓Z
[15]   □←Z B
[16]   □←''
[17]   ⍝     RESET INDEX ORIGIN.
[18]   □IO←IO
    ∇


    ∇ Δ1Δ COPY Δ2Δ;Δ3Δ;Δ4Δ
[1]    ⍝     Δ1Δ COPY Δ2Δ
[2]    ⍝Δ1Δ:FROM-TO UNIT NOS.
[3]    ⍝Δ2Δ:GROUPLIST (WHEN EMPTY,COPY ALL GROUPS)
[4]    ⍝(WHEN GROUPLIST IS MATRIX: ROW 1 IS SOURCE,ROW 2 IS OBJECT GROUP NOS.)
[5]    ⍝Δ3Δ:CURRENT GROUP NAMELIST
[6]    ⍝Δ4Δ:CURRENT OBJECT
[7]    →0×⍳2≠ρΔ1Δ∘→0×⍳1≠ρρΔ1Δ
[8]    ∘⍋(1=ρρΔ2Δ)/'⍋(0=ρΔ2Δ)/''Δ2Δ←□XN[1↑Δ1Δ]⍳0'''
[9]    □PT←10∘⍋(1⩾ρρΔ2Δ)/'Δ2Δ←(2,ρΔ2Δ)ρΔ2Δ←,Δ2Δ'
[10]   Δ8Δ:Δ3Δ←□XN[1↑Δ1Δ] ,1 1↑Δ2Δ∘→Δ9Δ×⍳0=1↓ρΔ2Δ
[11]   Δ3Δ←Δ3Δ[⍋39⊥⍉□Y Δ3Δ;]
[12]   Δ7Δ:→Δ6Δ×⍳∨/□SI[;⍳3]∧.=Δ4Δ∘Δ3Δ←1 0↓Δ3Δ∘Δ4Δ←,1 3↑Δ3Δ∘→Δ5Δ×⍳0=1↑ρΔ3Δ
[13]   →Δ7Δ∘□EX Δ4Δ∘Δ2Δ[2;1] □XW[1↓Δ1Δ] Δ4Δ∘→Δ7Δ×⍳0=□NC Δ4Δ∘Δ2Δ[1;1] □XR[1↑Δ1Δ] Δ4Δ
[14]   Δ6Δ:→Δ7Δ∘Δ2Δ[2;1] □XW[1↓Δ1Δ] Δ4Δ            1]
[15]   Δ5Δ:'GROUP',(4 0 0⍕Δ2Δ[1;1]),'  COPIED'
[16]   →Δ8Δ∘Δ2Δ←0 1↓Δ2Δ
[17]   Δ9Δ:□PT←0∘□XF[1↑Δ1Δ]⍳0∘□XF[1↓Δ1Δ]⍳0
    ∇

CPΔ   [1 by 117 array of type char; element size 3 byte(s)]
00004B
0168C0
0B1F1D
20A84C
04B048
C00B74
C8BF48
A20B3C
116C03
3C0903
749B3A
5AC1B2
2B1F13
20F930
FA749B
DDE6C6
82F0C5
89E83D
251DC7
0405F0
2E003D
462801
749B46
EA006C
111600
560324
7FD02D
3F35C2
```

272D3D
2F4EEA
35CDD6
1F1420
C79231
C79976
58745E
463501
2E014E
03C580
E84635
014CF8
CD1F13
203E14
30FA30
F9303E
02303D
77ADC3
3C1660
900B46
280174
9B1DD7
10C274
892510
10C227
F8154E
39749B
25750D
68A20B
0E0175
0F3F74
82DF3E
0015E7
2FFC1D
FB2574
D1F835
0746EA
00252F
FA15C2
247F6C
D6BA4C
073F0D
25C22D
4EEAD0
25CF15
25F915
114CF7
3F74A4
15CF0D
254ED7
3D463F
01D010
116C2E
C715B9
6CF83F
0D463F

```
01922F
3C0301
1E116C
14C715
B94CF8
C23C03
64F3C7
B94CEF
15C71D
B94CE9
462101
3480D0
073546
3F0192
D007C9
F9C8B0
0B74C8
3C110B
0E2707
90C11A
C8C21A
D0C1B0
07C496
C39D4C
03C496
13067F
074000
45006A
007400
9000C2
00EC00
FB001B
012381
```

```
         ∇CRT
[1]   ⍝          CRT          12/24/77
[2]   ⍝ FUNCTION TO CHECK IF CRT IS ACTIVE.
[3]   'I' ⎕YX ⍳0
[4]   FLAG←133=¯1↑⎕IN 254
[5]   'I' ⎕YX ⍳0
[6]   ⍬⎕IN 0
    ∇
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```
    ∇DESCRIBE GROUP;FΔ;TΔ;SΔ;UL;IΔ
[1]   ⍝     DESCRIBE GROUP        SEPT 1977
[2]   ⍝ DESCRIBE FUNCTIONS IN GROUP(S).
[3]   ⍝ SET OUTPUT TO HYTYPE. ESTABLISH PAGE SIZE AND LEFT MARGIN
[4]   LM 9⍬PAGE PSI⍬⎕OU(⎕YA 66),16⍬UL←70⍴'_'
[5]   ⍝ EXTRACT NAMES OF FUNCTIONS IN ACTIVE GROUP
[6]   DNG:→(0=×/⍴FΔ←(3=⎕NC FΔ)⌿FΔ←⎕XN ⎕XV⍬⎕XS 1↑GROUP)/NON
[7]   ⍝ INTERROGATE LINE COUNTER
[8]   NPG⍬→(10<60-1↓⎕PC⍳0)/GNP
[9]   GNP:⎕←2 0⍴''⍬⎕←UL⍬⎕←'GROUP',(5∓1↑GROUP),'   ',GPΔ⍬⎕←''⍬⎕←UL
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[10]   DNF:SΔ←1 4↑FΔ∘IΔ←⎕IO
[11]   ⍝ EXTRACT LINES IN FUNCTION THAT ARE COMMENTS (I.E. '⍝')
[12]   DFN:→DFN∘⍞←7↓TΔ∘→('⍝'≠TΔ[6+⎕IO])/NXT∘→(5=ρTΔ←(,SΔ) ⎕ZZ[IΔ←IΔ+1]FNΔ)/NXT
[13]   NXT:→(0≠×/ρFΔ←1 0↓FΔ)/DNF∘⍞←''
[14]   NON:→(0≠ρGROUP←1↓GROUP)/DNG∘⍞←''
[15]   LM 0∘NPG∘⍞←UL
[16]   ⍝*** REQUIRES MCP-132 PRINTER ***
    ∇

DIG   [3 by 1 by 98 array of type char; element size 3 byte(s)]


DM1   [6 by 75 numeric array; element size 1 byte(s)]
10 127 9 9 1 1
11 32 84 84 84 120
12 127 72 72 72 48
13 56 68 68 68 0
14 48 72 72 72 127
15 56 84 84 84 88
16 8 126 9 2 0
17 72 84 84 84 122
18 127 8 8 112 0
19 0 72 122 64 0
20 0 32 64 58 0
21 127 16 40 68 0
22 0 65 127 64 0
23 124 4 120 4 120
24 124 4 4 120 0
25 56 68 68 68 56
26 124 20 20 8 0
27 56 68 84 36 88
28 124 8 4 4 0
29 72 84 84 84 36
30 4 63 68 32 0
31 60 64 64 64 60
32 4 24 96 24 4
33 60 64 48 64 60
34 68 40 16 40 68
35 68 40 16 8 4
36 68 100 84 76 68
37 127 8 8 8 127
38 127 64 64 64 0
41 62 93 85 93 94
42 40 124 40 124 40
43 34 69 127 81 34
44 67 19 100 97 0
45 28 34 127 34 0
46 58 69 74 32 80
47 84 56 124 56 84
48 0 28 34 65 0
49 0 65 34 28 0
52 16 16 16 16 0
53 64 64 64 64 64
54 40 40 40 40 0
55 16 16 124 16 16
56 127 9 9 9 6
```

```
58 65 127 65 65 62
59 34 69 73 81 34
60 127 2 12 2 127
62 62 65 65 65 62
63 1 1 127 1 1
64 62 65 81 33 94
67 4 2 82 10 4
69 3 4 120 4 3
70 63 64 64 64 63
71 65 127 73 73 54
72 127 2 4 8 127
73 127 73 73 65 65
74 0 65 127 65 0
76 127 9 25 41 70
80 0 127 65 65 0
81 0 16 40 68 0
82 0 65 65 127 0
85 0 91 59 0 0
86 0 7 7 0 0
87 54 54 0 0 0
88 7 7 0 7 7
89 32 64 64 64 63
91 127 8 20 34 65
92 0 68 40 16 0
93 62 65 65 73 121
94 124 18 17 18 124
95 127 32 16 32 127
96 62 65 65 34 0
97 7 24 96 24 7
98 99 20 8 20 99
99 97 81 73 69 67
100 0 0 79 0 0
```

```
    ∇Z←A DMD B;IO;FUZZ;P;LA2;LB2;F;I;J;M2;I2;M1;I1;SIGMA;ALFA;U;T
[1]   ⍝     Z←A DMD B LS
[2]   ⍝ EXACT ALGORITHM FOR Z←A⌹B S
[3]   ⎕IO←1∘IO←⎕IO
[4]   'DOMAIN' ER_ROR 0≠0\0ρA
[5]   'DOMAIN' ER_ROR 0≠0\0ρB
[6]   'RANK' ER_ROR 2≠ρρB
[7]   'RANK' ER_ROR~(ρρA)∈ 1 2
[8]   'LENGTH' ER_ROR(1↑ρA)≠1↑ρB
[9]   'LENGTH' ER_ROR(1↑ρB)<1↓ρB
[10]   FUZZ←2*-56-⎕CT
[11]   LA2←((ρA),1)[2]
[12]   ON:LB2←1↓ρB
[13]   →AHEAD⌈⍳(0≠LA2)∧0≠LB2
[14]   Z←(LB2,LA2)ρ0
[15]   →FIN
[16]   AHEAD:P←⍳1↑ρB
[17]   F←÷⌈/[1]B÷⍉(⌽ρB)ρ⌈/|B
[18]   B←B×(ρB)ρF
[19]   I←0∘B←B,(2↑(ρA),1)ρA
[20]   LOOP:→END⌈⍳LB2<I←1+J←I
```

```
[21]   M2←⌈/[⎕IO]|(0,-LA2)↓(J,J)↓B
[22]   'DOMAIN' ER_ROR FUZZ≥⌈/M2
[23]   I2←J+M2ι⌈/M2
[24]   P[I,I2]←P[I2,I]
[25]   B[;I,I2]←B[;I2,I]
[26]   I1←J+M1ι⌈/M1←|J↓B[;I]
[27]   B[I,I1;]←B[I1,I;]
[28]   SIGMA←+/(J↓B[;I])*2 AΔ
[29]   U←B[I;I]-ALFA←(¯1*0≤B[I;I])×SIGMA*0.5
[30]   T←(U,I↓B[;I])+.×(J,I)↓B
[31]   T←T×÷SIGMA-B[I;I]×ALFA
[32]   B[J↓ι1↑ρB;I↓ι1↓ρB]←((J,I)↓B)-(U,I↓B[;I])∘.×T
[33]   →LOOP∘B[I;I]←ALFA
[34]   END:Z←(LB2,LA2)ρ0
[35]   I←(ι0)ρ1+LB2
[36]   QBACK:→RE⌈ι0=I←I-1
[37]   →QBACK∘Z[I;]←((LB2↓B[I;])-(LB2↑B[I;])+.×)÷B[I;I]
[38]   RE:Z←Z[⍋P;]×⍉(⌽ρZ)ρF
[39]   FIN:Z←,Z∘→EXIT⌈ι1≠ρρA UP
[40]   EXIT:⎕IO←IO
    ∇


    ∇DOWN NΔ;N
[1]    ⍝     DOWN NΔ              MAY 04/77 L
[2]    ⍝ROLL PAPER BACK NΔ LINES (OR TOP OF FORM) AND ADJUST ⎕PC
[3]    ∘⎕OU(1↑⎕OUι0),136+1↑N∘⎕BO ¯1↑N←32 256⊤16×NΔ←NΔ⌊(⎕PCι0)[1+⎕IO]
[4]    ∘⎕PC(⎕PCι0)-0,NΔ
    ∇


    ∇DXΔ XΔ;DΔ;NΔ;NMΔ;HΔ
[1]    ⍝     DXΔ XΔ               JUNE 14/76
[2]    ⍝SUBFUNCTION TO ΔCR
[3]    ⍝CAN BE USED SEPARATELY TO LIST FUNCTIONS WITH LINE NUMBERS
[4]    ⍝WILL WORK ON ANY VALID OUTPUT DEVICE (ΔCR REQUIRES MCP-132)
[5]    →(VΔΔ,VΔ,VΔ,FΔΔ,VΔ,A2Δ)[⎕IO+⎕NC XΔ]
[6]    FΔΔ:NΔ←⎕IO-1
[7]    FΔ:→EΔ∘→(5≠ρ⎕←XΔ ⎕ZZ[NΔ←NΔ+1]FNΔ)/FΔ
[8]    VΔ:NMΔ←'(',(⍕ρDΔ),')',((6ρ0)≠0\0ρDΔ←⍎XΔ)/' ALPHA'
[9]    NMΔ[(' '=NMΔ)/ιρNMΔ]←','
[10]    →EΔ∘⎕←⍎XΔ∘⎕←XΔ,':  ',NMΔ
[11]    A2Δ:→EΔ∘⎕←XΔ,'- SYSTEM VARIABLE'
[12]    VΔΔ:⎕←XΔ,' NO VALUE'
[13]    EΔ:⎕←''
    ∇


    ∇RESULT←EDIT TEXT;I;J;K;M;RC;BC M1
[1]    ⍝     RESULT←EDIT TEXT       MAR 22/77
[2]    ⍝ EDIT NUMERIC OR ALPHA MATRIX TEXT ONE ROW AT A TIME
[3]    ⍝ LEFT MOST PART OF THE DISPLAY IS THE CURRENT ROW NUMBER
[4]    ⍝ OF THE ARRAY 'TEXT'
[5]    ⍝
[6]    ⍝ CHECK IF TEXT IS NUMERIC OR ALPHA
[7]    →NUΔ⌈ι0=0\0ρTEXT∘I←⎕IO∘BC←(RC←¯1↑ρRESULT←TEXT)ρ' '
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[8]   ⍝ EDIT ALPHA TEXT
[9]   NXΔ:→DUN⌈⍳0⩾K←⌶3↑J∘→((3↑J)⎕ZZ CHK)/LNE∘J←5⍞(1⌽4⍕I),RESULT[I;]
[10]   K←I+1∘RESULT[I;]←RC↑(4↓J),BC∘→NLΔ⌈⍳I≠K
[11]   NLΔ:→NXΔ⌈⍳(1↑⍴RESULT)⩾I←K
[12]   DUN:'EDIT IS COMPLETE'
[13]   →0
[14]   LNE:'LINE NUMBER ERROR'
[15]   →((0=0\0⍴TEXT)/NUΔ),NXΔ
[16]   ⍝
[17]   ⍝ EDIT NUMERIC TEXT
[18]   NUΔ:→DUN⌈⍳0⩾K←⌶1↓4↑J∘→((1↓4↑J)⎕ZZ CHK)/LNE∘J←6⍞('[',(3⍕I),']'),⍕RESULT[I;]
[19]   K←I+1∘RESULT[I;]←J∘→ERR⌈⍳RC≠⍴J←⌶J∘→ERR⌈⍳((J←5↓J) ⎕ZZ CHK)∘→MUΔ⌈⍳K≠I
[20]   MUΔ:→DUN∘→NUΔ⌈⍳(1↑⍴RESULT)⩾I←K
[21]   ERR:'ERROR, REENTER DATA'∘⎕PT←20
[22]   →NUΔ∘⎕PT←0
    ∇

          ∇Z←A EDT B;IO
[1]   ⍝          Z←A EDT B          JANUARY 20, 1978
[2]   ⍝ FUNCTION TO EDIT AN ALPHA MATRIX.
[3]   ⍝ "A" IS THE NAME OF THE ALPHA MATRIX.
[4]   ⍝ "B" IS THE LINE NUMBER WHICH IS TO BE EDITED.
[5]   →0×⍳2≠⍴⍴A
[6]   →0×⍳0=0\0⍴A
[7]   →0×⍳85<1↓⍴A
[8]   ⎕IO←1∘IO←⎕IO
[9]   Z←A
[10]   Z←Z,((1↑⍴Z),1)⍴'.'
[11]   Z[B;]←⍞Z[B;]
[12]   Z←0 ¯1↓Z
[13]   ⎕IO←IO
    ∇


    ∇EHT;T;I;X;IO;PΔ;CΔ
[1]   ⍝       EHT            SEPT 1977
[2]   ⍝ EDIT HYTYPE CONTROL TABLE
[3]   ⍝
[4]   ⍝ QUERRY IF ⎕OUT IS POINTING TO A HYTYPE
[5]   →ERR⌈⍳0=1↑⎕OU ⎕YA 66
[6]   ⍝ READ IN CURRENT HYTYPE CONTROL TABLE
[7]   T←,⎕YO[0]⍳11∘⎕IO←0⌊IO←⎕IO
[8]   T[2]←⌈120÷ENI'CHARACTERS PER INCH: '∘PΔ←120÷T[2]∘CΔ←(⍳5),6 8 10 12
[9]   T[3 27]←⌈96÷ENI'LINES PER INCH: '∘PΔ←96÷T[3]∘CΔ←(⍳4),6 8 12
[10]   T[4]←ENI'PRINT WIDTH: '∘PΔ←T[4]∘CΔ←⍳132
[11]   T[9]←ENI'LEFT MARGIN: '∘PΔ←T[9]∘CΔ←⍳100
[12]   T[6]←ENI'INDENT: '∘PΔ←T[6]∘CΔ←⍳30
[13]   CE:PΔ←(2 3⍴'YESNO ')[T[5]=128;]
[14]   →CE⌈⍳0=⍴,X←24↓⍞'CONTINUATION CHARACTER: '
[15]   T[5]←128 130['Y'=1↑X]
[16]   T[24]←ENI'PRINT LINES PER PAGE: '∘PΔ←T[24]∘CΔ←⍳90
[17]   T[25]←ENI'SKIP LINES END OF PAGE: '∘PΔ←T[25]∘CΔ←⍳10
[18]   ⍝ WRITE THE EDITED TABLE OUT
[19]   →0∘⎕IO←IO∘(11 4⍴T)⎕YO[0]⍳11
[20]   ERR:'PRINTER MUST BE CONNECTED'
    ∇
```

```
    ∇RESULT←ENI PROMPT
[1]   ⍝          RESULT←ENI PROMPT              JUL 22/77
[2]   ⍝
[3]   ⍝ PROMPT IS DISPLAYED ON SELF SCAN AND HAS A PRESET RESULT
[4]   ⍝ INPUT IS CHECKED FOR NUMERIC VALIDITY T
[5]   →((RESULT←(⍴PROMPT)↓(⎕IO+⍴PROMPT)⍞PROMPT,⍕PΔ)⎕ZZ CHK)/ERR
[6]   →ERR⌈⍳(⍴,PΔ)≠⍴,RESULT←⍎RESULT
[7]   ⍝ CHECK INPUT TO SEE THAT IT IS A SUBSET OF Z
[8]   ⍝ THE PREDEFINED VARIABLE 'CΔ'
[9]   →0×⍳∧/RESULT∈CΔ
[10]   ERR:'ERROR, REENTER DATA'⋄⎕PT←20
[11]   →1⋄⎕PT←0
    ∇


    ∇A ER_ROR B OD
[1]   ⍝     A ER_ROR B
[2]   ⍝ SUBFUNCTION TO "DMD"
[3]   A,' ERROR'⋄→0×⍳~∨/B
[4]   ⎕IO←IO
[5]   →
    ∇


    ∇ERR TYP
[1]   TYP,' ERROR--ΔFMT'
[2]   'EXECUTION TERMINATED!'
[3]   →
    ∇


   ∇Z←MATRIX FINDROW STRING;LEFT;RIGHT;SCV
[1]   ⍝     Z←MATRIX FINDROW STRING
[2]   ⍝THIS FUNCTION LOCATES THE ROWS OF A MATRIX WHOSE FIRST LETTERS BEGIN WITH STRING.
[3]   ⍝RETURNS ROW NUMBER(S) MATCHING STRING
[4]   ⍝RETURNS EMPTY IF NO MATCH FOUND
[5]   →(2≠⍴⍴MATRIX)/0 F
[6]   LEFT←⍴,STRING
[7]   RIGHT←(1↓⍴MATRIX)-LEFT
[8]   →(LEFT>1↓⍴MATRIX)/0
[9]   SCV←'(',(⍕LEFT),')=',STRING,'(',(⍕RIGHT),')≠',(RIGHT⍴'0')
[10]   Z←MATRIX ⎕ZZ SCAN
[11]   →(2=⎕NC 'Z')/0
[12]   Z←⍳0
   ∇

FNΔ   [3 by 1 by 52 array of type char; element size 3 byte(s)]


FSΔ   [3 by 1 by 23 array of type char; element size 3 byte(s)]


FTΔ   [1 by 12 by 23 array of type char; element size 3 byte(s)]


GPΔ   [vector of type char of length 16; element size 1 byte(s)]
GLOBAL FUNCTIONS
```

```
INΔ   [1 by 217 array of type char; element size 3 byte(s)]
000058
021F1D
203E00
30167F
FAC046
260277
3D74A4
1D1DD7
151506
27F815
114CFB
160E1E
172625
0E0273
E26C20
C7B070
AC0BEA
F31DC7
3C0248
B60B1D
1DC73C
0648AC
0B1DC7
243F3C
0148AC
0BCAD1
1F1420
FA30FB
D22174
9B3D6C
031D1D
F72E7F
3D74A4
3D46F6
01D2E8
71AEC2
3C6E68
0401C1
24406C
20C23C
274C0E
749B68
750146
EC01C6
B04C77
4E7B3C
6F4C09
749B68
5B0116
274E07
C23C27
4C020D
D7C23C
6F6C34
```

0DFA46
BD0135
25356C
4C7611
293D06
7F951F
1D2097
5AB401
25153D
4E1328
3D2573
041D73
04D746
BD0173
043DA8
4ABD01
71FA4E
91D2E8
35251F
1E20CF
35B968
F300B1
760528
3D254E
D9293D
25D715
3D4EDC
3D253D
4EDA3D
253D73
04C4B0
4AF601
4ECE35
353571
FA749B
0B1F1D
20D774
A41D1D
C792FA
27247C
D874A4
C22DCD
D6745E
F2D3E9
44CC05
0D2574
A4BB6C
07C62C
FF8427
D007C4
96D007
352535
2B760C
293D25
D2E8D7
1546BD

014EEF
283D25
D746BD
017304
1D7304
4EE1D2
E84629
011F1D
20C792
C85AB0
010DA8
817E03
157453
3E274E
19D2E8
462901
46B401
762EC7
92C86C
0A1627
25C7FA
D01509
4CF90D
25D27E
F01600
FA3048
9501F0
100407
01FB3D
EA3D25
3D463B
0135D6
D27EFA
44D200
06FF4E
020601
1F1D20
8733F8
07E2D2
863D1F
1420C7
B06C22
C730F7
E81D1D
DF1515
18196C
15C7BC
6C0506
062D4E
F41525
D27E14
06F025
0E0574
533507
06FD1F
002187

```
F044B2
00749B
2B4629
013546
EC01C7
92D035
EA293D
253D46
3B01D6
3515CF
153DC1
375605
C12C7F
04021F
1E20F8
E8F231
3D253D
07749B
2B1DC7
3C0248
B60B1D
E71DBF
48AC0B
74C8C8
749BD7
0948AC
0BC7B0
68AC0B
D815C7
375601
A81583
BA6054
02D021
4CEA07
0F0065
006F00
7E0081
009000
A500B8
00C900
D000E1
000001
490152
015E01
670178
017B01
9801A6
01AE01
FA01FE
010A02
518200


ITΔ   [1 by 196 array of type char; element size 3 byte(s)]
683893
3A1F1D
```

204635
3A160E
1E1726
250E02
73E26C
20C7B0
70AC0B
EAF31D
C73C02
48B60B
1D1DC7
3C0648
AC0B1D
C7243F
3C0148
AC0BCA
D11F13
203E00
30FA30
FB4600
3AD2E8
71AEC2
3C6E68
A139C1
24406C
2DC23C
27682C
393C42
4C0416
664E26
3C344C
041641
4E1E3C
6F6865
39B068
DF383C
014C06
06801F
1320F8
71FA4E
C6C23C
274C02
0DD7C2
3C6F6C
1D1F13
20C7B2
D00DFA
46D239
35250D
25C5BB
4C04C6
BC6C1A
153D71
FA4E9B
0D2574
A4C5BB

4C04C6
BC6CC7
351D73
01D746
D2393D
D27E14
07F84E
E0D2E8
35250D
CF253D
0627B9
4CD31D
15C1CF
F8C5BB
4CF8C6
BC4CF4
1EF826
FFD27E
F43CF9
685B39
1921F3
CFF4F9
BB4CF7
900E07
31F809
4CFB4E
A73525
0D253D
250E27
151DC1
CFF8C5
BB4CF8
C6BC4C
F4D27E
C83EF9
D80407
E06C08
F4C7F3
F81820
4CF80D
1DC115
040701
FBD7E9
46D239
CDD27E
F9440C
39350D
1E270E
101640
C7BB4C
071D11
4CF809
4CF306
41922D
2574A4
1D1DF9

351544
930529
2B3F35
153DD2
E8D746
D2392F
4EF1E2
D2863D
1F1420
C730F7
E8B06C
1E1D1D
DF1515
18196C
15C7BC
6C0506
062D4E
F41525
D27E14
06F025
0E0574
533507
D221C9
FFD0C9
F982C8
4C0108
749BE9
68C339
061092
B960A2
0B3509
6C0506
402D4E
F83D3D
2E2046
C33935
D27E3E
202F35
D2E844
1E396C
20749B
1DC73C
0248B6
0B1D06
109760
BB0B1D
C73C40
48BB0B
1DC724
113C11
48AC0B
1F933A
3D77AD
26101E
400627
F81519

```
4CFB21
4CF41D
3D74A4
3D2574
9B2BCD
D61D1D
EF2829
2B3FE9
F20E40
D71525
FA1525
094CF7
CDD62F
4EEB11
401002
7038A9
38B338
BE38D3
38D738
FC3822
395039
98399F
39CD39
103A27
3A333A
58BA00
```

```
    ∇Z←IVP M;I;J;K;P;S
[1]   ⍝     RESULT←IVP MATRIX
[2]   ⍝ THIS FUNCTION PRODUCES THE INVERSE OF THE MATRIX BY EMPLOYING
[3]   ⍝ GAUSS-JORDAN (I.E., COMPLETE ELIMINATION) METHOD USING PIVOTING.
[4]   ⍝     ROUGHLY EQUIVALENT TO MONADIC ⌹.
[5]   ⍝     Z←⌹M
[6]   M←⍉(1 0+⍴M)⍴(,⍉M),~J←1<P←⍳I←1↑⍴M
[7]   S←÷⌈/|M
[8]   Z←|M[⍳I;1]×I↑S
[9]   K←Z⍳⌈/Z
[10]   M[K,1;⍳⍴P]←M[1,K;⍳⍴P]
[11]   S[K,1]←S[1,K]
[12]   P[K,1]←P[1,K]
[13]   P←1⌽P
[14]   S←1⌽P
[15]   M[1;]←M[1;]÷1⍴M
[16]   M←1⌽(J,1)⊖M-(J×M[;1])∘.×M[1;]
[17]   →3⌈⍳0≠I←I-1
[18]   Z←M[;⍋P]
    ∇
```

```
          ∇LIST OBJECTS;DATE;F1;F2;F3;HEADING;IO;ITEM;ROW
[1]   ⍝          LIST OBJECTS          12/27/77
[2]   ⍝ FUNCTION TO LIST OBJECTS IN A GIVEN ORDER.
[3]   ⍝ OBJECTS MUST BE IN ACTIVE WORKSPACE.
[4]   ⍝     IF OBJECTS IS A VECTOR, THEN CHANGE IT INTO A MATRIX;ELSE, CONTINUE.
```

```
[5]   →L1⌈⍳2=⍴⍴OBJECTS
[6]   ⍝          IF OBJECTS IS NOT A VECTOR, THEN EXIT;ELSE CONTINUE.
[7]   →0×⍳1≠⍴⍴OBJECTS
[8]   ⍝          BREAK OBJECTS INTO A MATRIX USING SPACE (⎕Y 39) AS DELIMETER.
[9]   OBJECTS←OBJECTS ⎕ZZ[' ']BRK
[10]   ⍝           END (IF-THEN-ELSE)
[11]   ⍝     END (IF-THEN-ELSE)
[12]   ⍝     SET INDEX ORIGIN AND INITIALIZE PARAMETERS.
[13]   L1:IO←⎕IO
[14]   ⎕IO←1
[15]   ROW←1
[16]   DATE←6↓⎕'DATE: '
[17]   HEADING←9↓⎕'HEADING: '
[18]   ⍝           SETUP PRINTER.
[19]   ∘⎕OU 1
[20]   ∘PAGE 60 66
[21]   ⍝     PRINT HEADING AND DATE.
[22]   ⎕←HEADING,(10⍴' '),DATE
[23]   ⎕←2 0⍴''
[24]   ⍝     DETERMINE HOW OBJECTS ARE TO BE PRINTED.
[25]   F1←1↑16↓17⎕'PRINT COMMENTS? Y'
[26]   F2←1↑17↓18⎕'CROSS REFERENCE? N'
[27]   →L2⌈⍳F2='Y'
[28]   F3←17↓18⎕'PROGRAM LISTING? Y'
[29]   ⍝     DO WHILE THERE ARE STILL OBJECTS TO BE PRINTED.
[30]   L2:→L6⌈⍳ROW>1↑⍴OBJECTS
[31]   ITEM←OBJECTS[ROW;]
[32]   ⍝           PRINT INDIVIDUAL OBJECT.
[33]   ⍝                PRINT COMMENTS IF REQUIRED.
[34]   →L3⌈⍳F1≠'Y'
[35]   COMMENTS ITEM
[36]   ⎕←''
[37]   ⍝                PRINT CROSS REFERENCING IF REQUIRED.
[38]   L3:→L4⌈⍳F2≠'Y'
[39]   →L4⌈⍳3≠⎕NC ITEM NJ
[40]   XRF ITEM
[41]   →L5
[42]   ⍝                PRINT OBJECT.
[43]   L4:→L5⌈⍳F3≠'Y'
[44]   L4:DX∆ ITEM
[45]   ⍝           INCREMENT OBJECT COUNT.
[46]   L5:ROW←ROW+1
[47]   ⍝     END (DOWHILE LOOP L2)
[48]   →L2
[49]   L6:NPG
    ∇


    ∇LM X∆
[1]   ⍝     LM X∆               JULY 16/76
[2]   ⍝SET LEFT MARGIN ON MCP-132 TO X∆
[3]   (0,X∆,0 0)⎕YO[⍳1]2
    ∇
```

```
          ∇Z←LRG X
[1]   ⍝          Z←LRG X         JANUARY 24, 1978 AS
[2]   ⍝ FUNCTION TO PRODUCE BIG LETTERS.
[3]   ⍝ CRT MUST BE CONNECTED.
[4]   CRT
[5]   →0×ι~FLAG
[6]   ALT∘⎕OU 0∘⎕BO 128∘⎕OUT 254 6∘⎕ΔC
[7]   ⎕←X ⎕ZZ['⍈']BIG
[8]   ∘⎕DL 5
[9]   ⎕ΔA 0∘⎕OUT 0∘⎕BO 0∘⎕OUT 254 6∘⎕ΔC
    ∇


    ∇Z←MMD B
[1]   ⍝     Z←MMD B
[2]   ⍝ EXACT ALGORITHM FOR Z←⍈B
[3]   Z←((ι1↑ρB)∘.=ι1↑ρB)DMD B
    ∇


    ∇MOD
[1]   58 ⎕YO[3] '¯'
    ∇


    ∇ZΔ←NIP MΔ
[1]   ⍝     ZΔ←DNI MΔ          AUG 25/76
[2]   ⍝ZΔ IS KEYBOARD INPUT PROMPTED BY MΔ
[3]   ⍝INPUT IS CHECKED FOR NUMERIC VALIDITY.
[4]   →0∘ZΔ←⍞∘→((ZΔ←(ρMΔ)↓⍕MΔ)⎕ZZ CHK)/ERR
[5]   ERR:'ERROR, REENTER DATA'∘⎕PT←20
[6]   →1∘⎕PT←0
    ∇


    ∇NPG
[1]   ⍝     NPG                 APR 30/76
[2]   ⍝FORCE NEW PAGE ON PRINTER. NOTE PAGEING MUST BE ON.        CE
[3]   ⎕←((0⌈(1↑⎕YO[ι1]6)-1↓⎕PCι0),0)ρ''
    ∇

OUΔ   [1 by 93 array of type char; element size 3 byte(s)]
000009
0168C0
0B74C8
3C1148
AC0B74
9B3A5A
C1B26C
46749B
C22DC1
85E81D
3D160E
1E1726
250E02
73E26C
```

20C7B0
70AC0B
EAF31D
C73C02
48B60B
1D1DC7
3C0648
AC0B1D
C7243F
3C0148
AC0BCA
D11F14
20FA30
FB749B
1D46C1
004C06
3535D2
214E24
D22115
D74692
002535
296C0E
3DD27E
EBF43C
F864ED
46DC00
4EE635
BB6406
4C09C4
BE6405
0E7F44
D4003D
250E0F
46D400
4EC3E2
D2863D
1F1420
C7B06C
22C730
F7E81D
1DDF15
151819
6C15C7
BC6C05
06062D
4EF415
25D27E
1406F0
250E05
745335
072574
9B1DC7
0E01B0
6C04C7
7489CF
E93DEB

```
F4073D
1FFD20
F9304E
063D1F
FE200E
7FF91F
2F21E7
20216C
131E53
06FF41
B048FE
0071A1
194CF4
214CEF
4E02D2
0ED255
6C0335
2F0735
075600
650076
008700
8E00F2
800000
```

```
    ∇ZΔ←PAGE MΔ
[1]   ⍝     ZΔ←PAGE MΔ          APR 6/76
[2]   ⍝SET PAGEING TO PRINT 1↑MΔ LINES ON
[3]   ⍝A PAGE WHICH IS 1↓MΔ LINES LONG T
[4]   ⍝RESULT (ZΔ) IS THE PREVIOUS SETTING
[5]   →(⩽/MΔ)/L8∘→(0=ρ,MΔ)/L8
[6]   'RANGE ERROR'
[7]   →
[8]   L8:((⌽-\⌽MΔ),(ρ,MΔ)↓ZΔ←⎕YO[⍳1]6)⎕YO[⍳1]6
[9]   ZΔ←⌽+\⌽2↑ZΔ∘⎕PC 0 0
    ∇
```

```
    ∇PCT N
[1]   ⍝     PCT N                       SEPT 1977
[2]   ⍝ SHOW PERCENTAGE OF SPACE USED IN THE FILE ON UNIT N.
[3]   'FILE SPACE USED IS ',(4 0 0∓(1↑⎕ZZ[N]FSΔ)÷10.23 8),' PERCENT'
    ∇
```

```
    ∇PFT X
[1]   ⍝     PFT                 APR 12/77
[2]   ⍝PRINT FOOTING X, FORCE NEW PAGE ON PRINTER. NOTE PAGEING MUST BE ON.
[3]   ⎕←((0⌈(1↑⎕YO[⍳1]6)-(1+(2=ρρX)×¯1+1↑ρX)+1↓⎕PC⍳0),0)ρ''
[4]   ⎕←X
    ∇
```

```
    ∇R←PITCH X;Y
[1]   ⍝     R←PITCH X
[2]   ⍝CHANGE NUMBER OF CHARACTERS PER INCH TO X (1≤X≤60)
[3]   ⍝RESULT R IS THE PREVIOUS SETTING
[4]   ⍝PITCH REMAINS UNCHANGED IF X ISEMPTY.
[5]   →((1≤X)∧X≤60)/L8∘→(0=⍴,X)/L8
[6]   'RANGE ERROR'
[7]   →
[8]   L8:R←120÷(Y←⎕YO[⍳1]0)[2+⍳1]
[9]   Y[2+⍳1]←X+2|X←⌈120÷X∘→(0=⍴,X)/0
[10]   Y ⎕YO[⍳1]0
    ∇

PLT   [4 by 66 array of type char; element size 2 byte(s)]
F4EB 0668 2D06 4E84
F815 0600 8BF8 46C8
003C 0340 AC0B 46AD
0028 063C 2D1E 2026
210E 3F46 5300 2E21
3633 C753 453C 4248
5720 4621 2046 AD00
0688 2D1E 2026 210E
B446 5300 46E0 07B0
2B2E 00F5 3D3D 4657
0868 A120 1640 4659
2046 5708 1688 6859
2046 5920 4621 2044
362C 071A 1C13 181E
0F1C 1513 1820 0B16
130E 2719 1F1E 1A1F
1E27 0E0F 2013 0D0F
2E20 3614 C73C 6C60
2D20 0627 D046 AD00
2806 7B2D C22D C7B0
504E 20D0 46AD 0028
06E7 2DC2 247F 2DC7
464E 2015 C7D0 46AD
20C2 0257 0620 5507
3525 3525 3D46 8B20
3DC6 94F0 C59B E840
7620 C22C 08D0 A896
F006 009D E846 AD20
C657 C524 07B2 5507
C0C0 C0C0 C0C0 C0C0
C0C0 2E20 3600 C70A
0A0A 0A24 08AA D036
08C7 24FE 31EF F007
06E0 5544 BB0B 06E0
5544 BB0B 45C8 2403
2C01 44BD 20C0 C0C0
C0C0 C0C0 48C9 20C1
24E0 3CE0 2B44 AD20
06E0 5546 AD00 066A
2D44 C40B 45C8 2403
2C01 484E 20C1 24E0
3CE0 4821 2046 FF09
```

```
2E20 3614 D048 4020
3E59 0725 2E21 362C
C7B0 484B 2011 25FA
0746 AD00 066A 2D44
C40B 46AD 0006 722D
44C4 0B30 3132 3334
3536 3738 3946 6162
6364 6566 6768 696A
6B6C 6D6E 6F70 7172
7374 7576 7778 797A
484C 202E 4023 2425
5E26 2A28 2900 822D
5F3D 2B50 8444 534D
864F 5451 882F 3F8A
5955 424E 4549 2C52
8C8E 905B 3C5D 9294
3B27 3A22 4A96 4B3E
4741 5743 5658 5A21
989A 9C9E 3EB0 A028
5429 5450 4F2E 4B2F
5F3F 5F4F 4D4F 5F4F
3F48 4D47 4D43 4A42
4A2C 5F4C 2B4C 4B4E
4AC3 12D8 4633 2724


    ∇POSITION S
[1]   ⍝     POSITION S          MAY 04/76
[2]   ⍝POSITION THE CARRIAGE ON THE MCP-132 TO LOCATION S E
[3]   ⍝S IS THE X AND Y COORDINATES IN INCHES Y
[4]   ⍝POSITIVE DIRECTIONS ARE ↑ AND →
[5]   ' 'PΔ⌊120 96×S
    ∇


    ∇PRT B;T;A
[1]   ⍝     PRT B          SEPT 1977
[2]   ⍝ PRINT B ON MCP-132 WITHOUT DESTROYING EIA TABLES
[3]   ⍝
[4]   ⍝ SAVE THE CURRENT OUTPUT DEVICE ADDRESS IN 'A' AND CURRENT DEVICE TABLES IN
'T'
[5]   'O' ⎕YX ⍳0∘'O' ⎕YR 'T'∘A←⎕OU ⍳0
[6]   ⍝ ASSIGN HYTYPE AS OUTPUT DEVICE AND PRINT 'B'
[7]   ⎕←B∘⎕OU ⎕YA 66
[8]   ⍝ RESET OUTPUT DEVICE ADDRESS AND WRITE BACK THE TABLES FOR THE DEVICE
[9]   ∘'O' ⎕YW 'T'∘⎕OU 1↑A
    ∇

PSI   [numeric vector of length 2; element size 1 byte(s)]
60 66

    ∇C PΔ A
[1]   ⍝     C PΔ A         SEPT 1977
[2]   ⍝ SUBFUNCTION TO CALL PLOTER PLT
[3]   A ⎕ZZ[C] PLT
    ∇
```

```
QQX   [3 by 1 by 26 array of type char; element size 3 byte(s)]


    ∇RAM X
[1]   ⍝     RAM  X              APR 30/76
[2]   ⍝CHECK RANDOM ACCESS MEMORY
[3]   ⍝X IS MEMORY SIZE, IE. 2 4 OR 8
[4]   →(0=⎕_0 X)/OK
[5]   'RAM MEMORY ERROR'
[6]   →0
[7]   OK:'RAM MEMORY OK'
    ∇

RCS   [numeric vector of length 19; element size 3 byte(s)]
179798 173599 165295 175999 156499 163119 219896 166212 172482 172372 171720
160806 250427 171172 168887 155953 163022 522240 522240


    ∇REC;IΔ_;NΔ_
[1]   ⍝     RECOVER             JAN 03/77
[2]   ⍝RECOVER INFORMATION FROM A TAPE WHERE THE DIRECTORY
[3]   ⍝HAS BEEN DESTROYED. MOUNT DEAD TAPE ON DRIVE 1,
[4]   ⍝INITIALIZED TAPE ON DRIVE 2.
[5]   NΔ_←''∘⎕PT←10∘IΔ_←2
[6]   JΔ_:IΔ_←(1↑IΔ_)⎕ZZ QQX
[7]   (1↓IΔ_)⎕XW[3]NΔ_←(1 0↓⎕FN)⌿4 0↓⎕VA
[8]   →JΔ_∘⎕EX NΔ_∘⎕←(,NΔ_),6⍕IΔ_
    ∇


    ∇RED IΔ_;NΔ_
[1]   ⍝     RED IΔ_  (RECOVER FOR DISKETTE)   JAN 03/77
[2]   ⍝RECOVER INFORMATION FROM A DISK WHERE THE DIRECTORY
[3]   ⍝HAS BEEN DESTROYED. MOUNT DEAD DISK ON LEFT DRIVE,
[4]   ⍝INITIALIZED DISK ON RIGHT DRIVE.
[5]   ⍝IΔ_ IS NEXT BLOCK TO BE COPIED
[6]   ⍝IF DAMAGED BLOCK IS ENCOUNTERED, IT IS NECESSARY TO MANUALLY INTERVENE
[7]   ⍝SEE UTILITY MANUAL FOR DETAILS
[8]   NΔ_←''∘⎕PT←10
[9]   JΔ_:IΔ_←¯1 0+(1↑IΔ_)⎕ZZ QQX ¯1
[10]   (1↓IΔ_)⎕XW[2]NΔ_←(1 0↓⎕FN)⌿4 0↓⎕VA
[11]   →JΔ_∘⎕EX NΔ_∘⎕XF[2]⍳0∘⎕←(,NΔ_),6⍕IΔ_∘255 ⎕XW[2]'IΔ_'
    ∇


    ∇R←ROLL X;Y
[1]   ⍝     R←ROLL X
[2]   ⍝CHANGE NUMBER OF LINES PER INCH TO X (1≤X≤48)
[3]   ⍝RESULT R IS THE PREVIOUS SETTING
[4]   ⍝ROLL IS UNCHANGED IF X IS EMPTY.
[5]   →((1≤X)∧X≤48)/L8∘→(0=⍴,X)/L8
[6]   'RANGE ERROR'
[7]   →
[8]   L8:R←96÷(Y←⎕YO[⍳1]0)[3+⍳1]
[9]   Y ⎕YO[⍳1]0∘Y[3+⍳1]←⌈1↑96÷X,R
    ∇
```

```
    ∇ROM ;C
[1]   ⍝     ROM                  APR 14/77
[2]   ⍝CHECK ROM MEMORY.
[3]   ⍝RCS IS CHECK SUMS FOR DISK SYSTEM
[4]   →OK⌈⍳∧/RCS=⎕_1⍳19
[5]   'ROM MEMORY ERROR'
[6]   →0
[7]   OK:⎕←'ROM MEMORY IS GOOD'
    ∇


        ∇RST
[1]   ⍝     RST                        SEPT 1977
[2]   ⍝ SUBFUNCTION TO ΔFMT
[3]   ⍝ RESTORE PRINTER OUTPUT TABLES AFTER "ΔFMT".
[4]   ∘⎕OU 1∘'O'⎕YX ⍳0 1
    ∇


    ∇Z←WIDTH RTJ TEXT
[1]   ⍝     Z←WIDTH RTJ TEXT            OCT. 14, 1977
[2]   ⍝ RIGHT JUSTIFY TEXT ONLY (NO LEFT JUSTIFICATION)
[3]   Z←⍳0
[4]   →0×⍳2<ρρTEXT
[5]   →L1⌈⍳0≠ρρTEXT
[6]   →0×⍳0=ρTEXT←,TEXT
[7]   →L2
[8]   L1:→0×⍳0=∧/×ρTEXT
[9]   L2:→L3⌈⍳1≠ρρTEXT
[10]   TEXT←TEXT,(WIDTH-ρTEXT)ρ' '
[11]   →L4
[12]   L3:→0×⍳WIDTH<1↓ρTEXT
[13]   TEXT←TEXT,((1↑ρTEXT),WIDTH-1↓ρTEXT)ρ' '
[14]   L4:Z←(1-(TEXT=' ')⊥1)⌽TEXT
    ∇


    ∇SAVE OBJECTS;GROUP Δ
[1]   ⍝     SAVE OBJECTS                    SEPT 1977
[2]   ⍝ SAVES OBJECTS IN CURRENT AVS GROUP.
[3]   ⍝ *** THIS FUNCTION MUST BE IN GROUP 0 ***
[4]   ⍝ EXITS IF AVS NOT ACTIVE.
[5]   GROUP←⎕XV
[6]   →0×⍳0=ρ,GROUP
[7]   ⍝ AVS IS ACTIVE!
[8]   ⍝ APPENDS OBJECTS TO GROUP 0, THEN SELECTS 0.
[9]   ⎕XA OBJECTS
[10]   ⎕XS 0
[11]   ⍝ WRITES OBJECTS INTO FORMERLY ACTIVE GROUP.
[12]   GROUP ⎕XW OBJECTS
[13]   ⍝ DELETES OBJECTS FROM GROUP 0, AND REACTIVATES PREVIOUSLY ACTIVE GROUP.
[14]   ⎕EX OBJECTS
[15]   ⎕XS GROUP
    ∇
```

```
SCA   [3 by 1 by 99 array of type char; element size 3 byte(s)]


    ∇R←W SEARCH T
[1]   ⍝     R←W SEARCH T                                SEPT 1977
[2]   ⍝ LOCATES THE OCCURRANCE OF A CHARACTER STRING W IN A VECTOR T. G
[3]   R←(∧⌿(¯1+⍳⍴W)⌽W∘.=T)/⍳⍴T
    ∇


    ∇R←SIZE M
[1]   ⍝     R←SIZE M           MAY 03/77
[2]   ⍝R IS SIZE IN BYTES OF DATA M
[3]   R←1+⌊.125+256⊛1⌈⌈/,⌈/⌈/|M∘→MA∆⌈⍳R←0≠0\0⍴M
[4]   MA∆:R←2+(⍴⍴M)+(×/⍴M)×R
    ∇


    ∇RESULT←SORT MATRIX  Q
[1]   ⍝     RESULT←SORT MATRIX     SEPT 1977
[2]   ⍝ SORT THE ALPHA MATRIX INTO ASCENDING SEQUENCE  A
[3]   ⍝ CAN BE USED FOR SORTING GROUP NAMES EG., Z←SORT ⎕XN 2 W
[4]   ⍝ NOTE: BLANKS SORT HIGH
[5]   RESULT←MATRIX[⍋39⊥⍉⎕Y MATRIX;]
    ∇


    ∇Z∆←SPACE X∆
[1]   ⍝     Z∆←SPACE X∆         MAY 03/76
[2]   ⍝1↑Z∆ IS THE NUMBER OF BLOCKS USED ON FILE X∆
[3]   ⍝1↓Z∆ IS 1+LAST BLOCK USED ON FILE X∆
[4]   ⍝IF 1↓Z∆ IS MUCH LARGER THAN 1↑Z, THE FILE
[5]   ⍝SHOULD BE COPIED TO COMPRESS UNUSED SPACE
[6]   ⍝A DISK CONTAINS 1023 - 256 BYTE BLOCKS, AND A 300
[7]   ⍝FOOT TAPE APPROXIMATELY 800 - 128 BYTE BLOCKS.
[8]   Z∆←⎕ZZ[X∆]FS∆
    ∇


    ∇STATUS X;S;AS
[1]   ⍝     STATUS X            APR 30/76
[2]   ⍝RETURN STATUS OF OMNIPORT DEVICE
[3]   ⍝DISPLAY STATUS OF DEVICE X (IE. STATUS 2) OR
[4]   ⍝DISPLAY STATUS FROM ANSWER-BACK (IE STATUS ⎕OU⍳0)
[5]   ∘⎕OU S∘X←⎕OU X∘S←1↑⎕OU⍳0∘→(3=⍴,X)/S1
[6]   S1:AS←8 3⍴'NO YES'[,(S×3)∘.+⍳3]∘S←(8⍴2)⊤X[3]
[7]   →(0 66 193 196 197 225=X[2])/NO,HY,ROF,TAP,DSK,RON
[8]   'DEVICE TYPE UNKNOWN'
[9]   'STATUS : ',⍕S
[10]   →0
[11]   NO:'NO DEVICE AT THIS ADDRESS'
[12]   →0
[13]   HY:'DEVICE : MCP-132'
[14]   'PAPER FEED READY?      ',AS[1;]
[15]   'CARRIAGE READY?        ',AS[2;]
[16]   'CHARACTER PRINT READY? ',AS[3;]
```

```
[17]   'RIBBON UP?             ',AS[4;]
[18]   'RIBBON RED?            ',AS[5;]
[19]   'PAPER OUT?             ',AS[6;]
[20]   'PRINTER CHECK?         ',AS[7;]
[21]   'PRINTER READY?         ',AS[8;]
[22]   →0
[23]   ROF:'RS-232C (PROMPT OFF)'
[24]   →R
[25]   RON:'RS-232C (PROMPT ON)'
[26]   R:'READ OVERRUN?          ',AS[1;]
[27]   'READ PARITY ERROR?     ',AS[2;]
[28]   'READ FRAMING ERROR?    ',AS[3;]
[29]   'DEVICE READY?          ',AS[4;]
[30]   'RECEIVE CARRIER OFF?   ',AS[5;]
[31]   'BREAK RECEIVED?        ',AS[6;]
[32]   'TRANSMIT BUFFER EMPTY? ',AS[7;]
[33]   'RECEIVE DATA READY?    ',AS[8;]
[34]   →0
[35]   TAP:'DEVICE : CASSETTE TAPE'
[36]   'RECEIVE DATA READY?    ',AS[1;]
[37]   'TRANSMIT BUFFER EMPTY? ',AS[2;]
[38]   'PARITY ERROR?          ',AS[3;]
[39]   Δ
[86]   'READ OVERRUN?
[40]   'END OF TAPE?           ',AS[5;]
[41]   'CASSETTE NOT MOUNTED?  ',AS[6;]
[42]   'FILE WRITE PROTECTED?  ',AS[7;]
[43]   'INTER-RECORD GAP?      ',AS[8;]
[44]   →0
[45]   DSK:'DEVICE : FLOPPY DISK'
[46]   'UNIT BUSY?             ',AS[1;]
[47]   'TRACK ZERO?            ',AS[2;]
[48]   'NOT INDEX MARK?        ',AS[3;]
[49]   'POWER ON?              ',AS[4;]
[50]   'HEAD DOWN?             ',AS[5;]
[51]   'MOTOR ON?              ',AS[6;]
[52]   'UNIT ERROR?            ',AS[7;]
[53]   'FILE PROTECTED?        ',AS[8;]
[54]   →0
    ∇


    ∇S TITLE X;P;R;HEI;CPI;Y
[1]    ⍝     S TITLE X           MAY 04/77
[2]    ⍝X IS ALPHA VECTOR TO BE PRINTED
[3]    ⍝S IS THE X AND Y DISPLACEMENT FROM THE CURRENT LOCATION
[4]    ⍝CHARACTER HEIGHT IS SET BY HEI AND
[5]    ⍝CHARACTERS PER INCH IS SET BY CPI IN LINE 6
[6]    ⋄'DEFAULT SETTING IS:'⋄HEI←.25⋄CPI←5
[7]    POS S
[8]    P←PITCH ⌈6×CPI⋄R←ROLL 7×÷HEI
[9]    ⋄⎕PC Y⋄⎕←(X ⎕ZZ['.']BIG)⋄Y←⎕PC⍳0
[10]    ⋄PITCH P⋄' 'PΔ⌈0 96×7÷ROLL R
[11]    POS -S
[12]    ⍝*** REQUIRES MCP-132 PRINTER ***
    ∇
```

```
    ∇TΔ TRC ΔNM;QΔ;IΔ;XΔ;LNΔ;AΔ
[1]   ⍝     TΔ TRC ΔNM       (TRACE)        JUNE 1977 E
[2]   ⍝TΔ IS VECTOR OF LINE NUMBERS TO BE TRACED
[3]   ⍝ΔNM IS FUNCTION NAME TO BE EXECUTED AND TRACED
[4]   ⍝RESTRICTIONS:
[5]   ⍝ 1. TRACED FUNCTION MUST BE NILADIC
[6]   ⍝ 2. USER MUST INSURE NO CONFLICTS EXIST BETWEEN LOCALS
[7]   ⍝    AND LABELS IN TRC AND TRACED FUNCTION
[8]   ⍝ 3. EACH TRACED LINE MUST HAVE A RESULT.
[9]   ⍝ 4. SUBFUNCTIONS ARE NOT TRACED.
[10]   ⍝BUILD LABLE TABLE
[11]   XΔ←''ρρAΔ←1 0↓(⎕CR ΔNM)[;⍳3]
[12]   AΔ←AΔ,'←',⍕((~⎕IO)+⍳XΔ)∘.+,0
[13]   XΔ←1↑ρAΔ←(' '≠,AΔ[;IΔ←⎕IO])⌿AΔ
[14]   AΔ[(QΔ←':'=AΔ[;1+⎕IO])/⍳XΔ;1+⎕IO]←' '
[15]   AΔ[(QΔv':'=AΔ[;2+⎕IO])/⍳XΔ;⎕IO+2]←' '
[16]   ⍝GENERATE GLOBAL VARIABLES FROM LABLES
[17]   LΔ1:→LΔ1∘IΔ←IΔ+1∘⍎AΔ[IΔ;]∘→GΔ⌈⍳IΔ>XΔ-~⎕IO
[18]   ⍝PRINT FUNCTION HEADER LINE
[19]   GΔ:⎕←(ΔNM ⎕ZZ[IΔ←⎕IO]FNΔ)∘⎕OU ⎕YA 66
[20]   ⍝EXECUTE AND TRACE FUNCTION U
[21]   LΔ:→(1=QΔ←1+ρLNΔ←5↓LNΔ∘⍎((IΔ-⎕IO)∈TΔ)/'⎕←LNΔ'∘LNΔ←ΔNM ⎕ZZ[IΔ←IΔ+1]FNΔ)/ENΔ
[22]   →BΔ⌈⍳QΔ≠XΔ←(~⎕IO)+LNΔ⍳'→'
[23]   LNΔ←XΔ↓LNΔ∘→EΔ⌈⍳QΔ=XΔ←(~⎕IO)+LNΔ⍳':'
[24]   EΔ:→LΔ∘⍎(2×~(IΔ-⎕IO)∈TΔ)↓'⎕←⍎LNΔ'
[25]   ⍝COME HERE TO EXECUTE BRANCH STATEMENTS
[26]   BΔ:∘⍎((IΔ-⎕IO)∈TΔ)/'⎕←''→ '',⍕LNΔ'∘LNΔ←⍎XΔ↓LNΔ
[27]   →LΔ⌈⍳⎕IO≤IΔ←(''ρLNΔ)-~⎕IO∘→LΔ⌈⍳0=ρ,LNΔ
[28]   ⍝EXPUNGE LABLE TABLE
[29]   ENΔ:⎕EX AΔ[;⍳3]
    ∇


    ∇TYPE
[1]   ⍝     TYPE                                SEPT 1977
[2]   ⍝FUNCTION TO ALLOW PRINTER TO BE USED AS A TYPEWRITER.
[3]   ⍝TO EXIT PRESS (CONTROL, SHIFT, →) SIMULTANEOUSLY.
[4]   ∘⎕OU 1
[5]   GO:⎕←⍞''
[6]   →GO
    ∇

UBK   [1 by 57 array of type char; element size 3 byte(s)]
B8225E
233D68
C00B1F
212074
C83C11
48AC0B
0D1DC7
3C0248
B60B1D
DF1DE7
0D253D
```

```
160025
19186C
173D25
3D464A
232068
BB0BC2
8460BB
0BD035
2535C4
2D4EE5
773D25
1F2120
FB30FC
0D6C34
464A23
D43525
35C42D
3DC474
89253D
1F2120
74B2CA
111025
4A5300
46FF09
68A70B
1F2C21
CF0981
3C6D40
A70BC0
C0EBF4
F8154E
C246A4
001D1D
C71401
23F815
152DDD
E61544
930535
250D25
293D25
C42D21
202B1D
C73C27
0B214E
F5E422
04A300
```

```
    ∇UP B
[1]   ⍝     UP B              SEPT 1977
[2]   ⍝FEED PAPER UP B LINES OR TO END OF PAGE R
[3]   ⍝ CHECK CONTROL TABLE FOR CURRENT PAGE SETTING AND COMPARE TO
[4]   ⍝ THE LINE COUNTER. OUTPUT X ROWS OF BLANKS.
[5]   □←((B⌊(1↑□YO[⎕IO+1]6)-1+1↓□PC⎕IO),0)⍴''
    ∇
```

```
    ∇VDESCRIBE GROUP;FΔ;TΔ;SΔ;UL;IΔ
[1]    ⍝    VDESCRIBE GROUP        SEPT 1977
[2]    ⍝ DESCRIBE FUNCTIONS IN GROUP(S).
[3]    ⍝ WILL DISPLAY ON VDU 9620 OR ANY OTHER VALID OUTPUT SELECTED
[4]   UL←70ρ'_'
[5]    ⍝ EXTRACT NAMES OF FUNCTIONS IN ACTIVE GROUP
[6]   DNG:→(0=×/ρFΔ←(3=⎕NC FΔ)⌿FΔ←⎕XN ⎕XV∘⎕XS 1↑GROUP)/NON
[7]    ⍝ INTERROGATE LINE COUNTER
[8]    →(10<60-1↓⎕PCι0)/GNP
[9]   GNP:⎕←2 0ρ''∘⎕←UL∘⎕←'GROUP',(5∓1↑GROUP),'  ',GPΔ∘⎕←''∘⎕←UL
[10]   DNF:SΔ←1 4↑FΔ∘IΔ←⎕IO
[11]    ⍝ *** EXTRACTS LINES IN FUNCTION THAT ARE COMMENTS (I.E. '⍝') ***
[12]   DFN:→DFN∘⎕←7↓TΔ∘→('⍝'≠TΔ[6+⎕IO])/NXT∘→(5=ρTΔ←(,SΔ) ⎕ZZ[IΔ←IΔ+1]FNΔ)/NXT
[13]   NXT:→(0≠×/ρFΔ←1 0↓FΔ)/DNF∘⎕←''
[14]   NON:→(0≠ρGROUP←1↓GROUP)/DNG∘⎕←''
[15]   ⎕←UL
    ∇

VOL   [vector of type char of length 31; element size 1 byte(s)]
GENERAL SOFTWARE UTILITIES TAPE


    ∇R←WIDTH X;Y
[1]    ⍝     R←WIDTH X
[2]    ⍝CHANGE PRINT WIDTH TO X (30⩽X⩽132)
[3]    ⍝IF 2=ρX CHANGE OVERFLOW CHARACTER
[4]    ⍝IF 3=ρX CHANGE OVERFLOW CHAR AND INDENT'
[5]    ⍝RESULT R IS THE PREVIOUS WIDTH D
[6]    ⍝WIDTH IS UNCHANGED IF X IS EMPTY.
[7]    →L8[ι(30⩽1↑X)∧(1↑X)⩽132∘→(0=ρX)/L8
[8]    'RANGE ERROR'
[9]    →
[10]   L8:R←(ρ,X)↑Y←⎕YO[ι1]1
[11]   (X,(ρ,X)↓Y)⎕YO[ι1]1
    ∇


    ∇WR X
[1]    ⍝     WR X                      JUNE 1977
[2]    ⍝WORKSPACE RELEASE -- ROLLOUT UNDER AVS.
[3]    ⍝X IS IN BYTES OF STORAGE.
[4]    →0×ι0⩾X←X-50
[5]    WR X
    ∇

XPΔ   [1 by 37 array of type char; element size 3 byte(s)]
00006B
0068C0
0B1F11
00A84C
04B048
C00B74
C8BF48
A20B3C
```

```
140B74
9BC72D
3D3D77
ADC33C
166090
0B35C7
15D024
7F6C1E
BA6C0C
D0CF15
25F915
25114C
F74EEA
3F749B
15CF2F
25F915
114CFB
254EDB
749B25
750D68
A20B0E
01750F
3F7482
DF3E00
15E72F
FC1DFB
2574D1
F80708
800000
```

```
    ∇XREF ΔFN;CDS;K;ALN;ALF;OPR;C;R;I;J;A;O;B;CD
[1]   ⍝     XREF ΔFN                    JUNE 1977
[2]   ⍝CROSS REFERENCE PROGRAM FOR MCM/APL
[3]   ⍝INITIALIZE VARIABLES
[4]   CDS←0⍴K←⎕CT←0◦⎕IO←1◦PAG 60 66◦TIT←12⍴' '
[5]   ALN←' ',(ALF←⎕Y (10+⍳28),10),⎕Y (⍳9),0◦OPR←⎕Y 37+⍳70
[6]   C←1↓⍴ΔFN◦R←1↑⍴ΔFN←⎕CR FNN←ΔFN
[7]   ⍝PROCESS FUNCTION LINE BY LINE
[8]   NXL:→(R<K←K+1)/END
[9]   →('⍝'=1↑1↓L←ΔFN[K;])/NXL
[10]   I←J←0◦A←L∈ALF◦O←L∈OPR◦L[(≠\L∈'''')/⍳⍴L]←' '
[11]   INL:→(C<I←J+(J↓A)⍳1)/NXL
[12]   B← 1 ¯1[1+':'=L[C⌊J←I+(I↓O)⍳1]]×K-1
[13]   CD←(1+⍴ALN)⊥¯1+ALN⍳12↑((J-I)↑(I-1)↓L),TIT
[14]   →((⍴CDS)≥W←CDS⍳CD)/INS
[15]   →INL◦⍎'Δ',(⍕W),'←I,J,B'◦CDS←CDS,CD
[16]   INS:→INL◦⍎'Δ',(⍕W),'←Δ',(⍕W),',B'
[17]   ⍝END OF LINE PROCESSING
[18]   END:K←0◦SCD←⍋CDS
[19]   ⍝PRINT OUT RESULTS
[20]   ⎕←3 1⍴' '◦⎕←TIT←'CROSS-REFERENCE OF PROGRAM **',FNN,'**'
[21]   ΔCR FNN
[22]   ⎕←3 1⍴' '◦⎕←TIT
[23]   OLP:→((⍴CDS)<K←K+1)/FIN J
```

```
[24]   M←⍎'Δ',⍕SCD[K]
[25]   TT←2↑((((M[3]≠0)∧~T),T←'¯'∊T)/'○*'),'  '∘T←4 0⍕2↓M
[26]   ⎕←(14↑ΔFN[1+|M[3];¯1+M[1]+ιM[2]-M[1]],14ρ' '),TT,4 0⍕2↓M
[27]   →OLP
[28]   FIN:⎕←'FINISHED'∘⎕←2 1ρ' '∘⎕EX 'FNN ΔFN SCD M T TT TIT W'
    ∇


    ∇XRF F;N;L;LN;J;I;K;IL;T;TT;X;IO;SO;SU;SCV;LW;DAT;M L
[1]   ⍝     XRF F                              SEPT 1977
[2]   ⍝ PRINT FUNCTION AND CROSS REFERENCE
[3]   DAT←6↓⍞M∘M←'DATE? ' R
[4]   ⍝ PRINTER OR RS-232 OPTION REQUIRED G
[5]   →OK⌈ι0≠(⎕YA 66)⌈⎕YA 1 31
[6]   →0
[7]   ⍝ SAVE COMMUNICATIONS OUTPUT TABLE IF PRESENT
[8]   OK:∘'O'⎕YR'SO'∘→NOU⌈ι0=SU←1↑⎕OUι0∘⎕IO←1⌈IO←⎕IO
[9]   ⍝ SET UP COMMUNICATIONS OUTPUT TABLE TO TRANSLATE ALL OPERATORS TO BLANKS
[10]   NOU:I ⎕YO[3]⎕Y I←¯1+ι108∘'O'⎕YXι0∘⎕OU (⎕YA 66)⌈⎕YA 1 31 G
[11]   39 ⎕YO[3]'''⍞!⊖$⍝⍱⍲⊛⍀⌿⌽⍪⌹⍉⍋⍒⍎⍕"¯<≤=≥>≠∨∧-÷+×?ω∊ρ~↑↓ι○*→←α⌈⌊∇∘()[]⊂⊃∩∪⊥⊤|;:\,./'
[12]   ⍝ INITIALIZE
[13]   L←(20,LW←20)ρ-T←20ρ1+IL←I←0∘N←20 10ρ' '
[14]   ⍝ GET LINE/DELETE CHARACTERS BETWEEN QUOTES/TRANSLATE
[15]   NL:X←⎕Y ⎕YO[3](~2|+\X='''')/X∘→NL⌈ι'⍝'=X[7]∘→END⌈ι5≥ρX←F ⎕ZZ[I←I+1]FNΔ
[16]   ⍝ BREAK LINE INTO NAME ARRAY, SELECT GOOD AND QUAD NAMES
[17]   K←1∘→NL⌈ι0=1↑ρX←(('⎕'=X[;1])∨4≠⎕NC X)⌿X←(X ⎕ZZ BRK)∘TT←1+' '≠X[6]
[18]   ⍝ SEARCH FOR NAME IN LIST
[19]   ILP:→RA⌈ι0≠ρJ←(N ⎕ZZ SCA)∘SCV←'(10)=',LN←10ρX[K;],9ρ' '
[20]   ⍝ CHECK IF LIST NEEDS EXPANDING
[21]   T←T,10ρ1∘L←L⍪(10,LW)ρ¯1∘N←N⍪10 10ρ' '∘→TOK⌈ι(1↑ρL)≥J←IL←IL+1
[22]   TOK:TT←TT⌈3×I=1∘N[J;]←LN
[23]   ⍝ INSERT CURRENT LINE NUMBER AND TYPE
[24]   RA:TT←1⌊T[J]←T[J]⌈TT∘L[J;LN]←I-1∘→XPL⌈ιLW<LN←L[J←''ρJ;]ι¯1
[25]   →NL∘→ILP⌈ι(1↑ρX)≥K←K+1
[26]   ⍝ EXPAND WIDTH OF LABEL TABLE
[27]   XPL:→RA∘LW←LW+5∘L←L,(⌽5,1↑ρL)ρ¯1
[28]   ⍝ PRINT FUNCTION AND XREF LISTING
[29]   END:DXΔ F∘LM 9∘PAG 60 66∘⎕OU ⎕YA 66∘'O'⎕YXι0
[30]   ⎕←''∘⎕←'CROSS REFERENCE FOR :',(,F),'       DATE :',DAT
[31]   ⎕←''∘⎕←'TYPE   NAME         LINE NUMBERS'
[32]   ⍝ SORT TABLE, BLANKS SORT LOW
[33]   J←⍋39⊥39|⍉⎕Y(IL,10)↑N∘I←1∘TT←3 7ρ'      LABEL  LOCAL  '
[34]   PL:NPG∘→PL⌈ι(ρJ)≥I←I+1∘⎕←TT[T[K];],N[K;],3⍕(X≥0)/X←L[K←J[I];]
[35]   ⍝ RESTORE COMMUNICATIONS OUTPUT TABLE
[36]   ∘'O'⎕YW'SO'∘→0×ι0=⎕NC'SO'∘'O'⎕YXι0∘⎕OU SU∘⎕IO←IO
    ∇


ΔA1   [numeric vector of length 76; element size 2 byte(s)]
138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157
158 159 160 161 162 163 164 165 166 169 170 171 172 173 174 175 176 177 180 181
182 183 184 186 187 188 190 191 192 195 197 198 199 200 201 202 204 208 209 210
213 214 215 216 217 219 220 221 222 223 224 225 226 227 228 231
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    ∇Z←ΔCK X
[1]   ⍝     Z←ΔCK X          OCT. 14, 1977
[2]   ⍝ DETERMINE IF X IS ALPHA OR NUMERIC.
[3]   ⍝ RESULT IS 0 IF ALPHA AND 1 IF NUMERIC.
[4]   Z←0=0\0ρX
    ∇


    ∇ΔCR GNΔ;IΔ;GΔ;NMΔ;DΔ
[1]   ⍝     ΔCR X               APR 30/76
[2]   ⍝DISPLAY FUNCTION X (FORMATTED WITH LINE NUMBERS)
[3]   ⍝IF X IS NUMERIC, DISPLAY ALL FUNCTIONS IN THE GROUP(S) X
[4]   →0∘DXΔ GNΔ∘→(0=0\0ρGNΔ)/LΔ∘⎕OU (⎕YA 66),16
[5]   LΔ:0 9 0 0 ⎕YO[⍳1]2∘PAG 60 66∘DΔ←5↓⍞'DATE? '
[6]   L0Δ:GNΔ←GNΔ[⍋GNΔ←((GNΔ⍳GNΔ)=⍳ρGNΔ)/GNΔ←,GNΔ]
[7]   L1Δ:→EΔ⌈⍳0=ρGNΔ
[8]   ∘⍎(0=⎕NC'GPΔ')/'GPΔ←'' ''''∘⎕XS GΔ∘NMΔ←⎕XN GΔ←''ρGNΔ
[9]   ⎕←''∘⎕←'GROUP: ',(⍕GΔ),'    ',(46ρGPΔ,46ρ' '),DΔ
[10]   ⎕←''∘⎕←(((⌈(×/ρNMΔ)÷80),80)ρNMΔ⍪20 4ρ' '
[11]   L3Δ:IΔ←⎕IO-1
[12]   L2Δ:→(IΔ=⎕IO+¯1+1↑ρNMΔ)/E1Δ
[13]   →L2Δ∘DXΔ NMΔ[IΔ←IΔ+1;]
[14]   E1Δ:→L1Δ∘GNΔ←1↓GNΔ∘NPG
[15]   EΔ:→0∘⎕XS 0 P:
    ∇


    ∇Z←UNI ΔDS GRP
[1]   ⍝     UNIT ΔDS GRP                    OCT. 14, 1977 IP
[2]   ⍝ DISPLAY NAMES OF OBJECTS IN 'GRP' ON DRIVE 'UNIT' M1
[3]   ⍝ EQUIVALENT TO ',⎕XN GRP' WITHOUT LENGTH LIMIT TO 255 CHARACTERS
[4]   Z←(((⌈(×/ρ⎕XN[UNI]GRP)÷120),120)ρ(⎕XN[UNI]GRP)⍪(((120-120|×/ρ⎕XN[UNI]GRP)÷4),4)ρ' '
    ∇


    ∇Z←FMT ΔFMT MAT;COL;COU;R1;R2;TYP;W
[1]   ERR'RANGE'∘→2⌈⍳3=1↓ρFMT∘→3⌈⍳2≠ρρFMT
[2]   →7∘TYP←3
[3]   ERR'RANGE'∘→4⌈⍳1=ρρFMT
[4]   →7∘TYP←2
[5]   ERR'RANGE'∘→6⌈⍳0=ρ,FMT
[6]   TYP←1
[7]   COU←COL←1∘Z←((1↑ρMAT),0)ρ''
[8]   →10⌈⍳3≠TYP∘W←((ρ,W),1)ρW∘R2←(W=0)/⍳ρ,W∘R1←(W<0)/⍳ρ,W←MAT[;COL]
[9]   →12∘COU←COU+1∘W←FMT[COU;]⍕W
[10]   →12∘W←FMT⍕W∘→11⌈⍳2≠TYP
[11]
[107]   W[R1;1↓ρW]←')'∘→13⌈⍳0=ρ,R1∘W←W,(((1↑ρW),1)ρ' ')
[13]   W[R2;]←((ρR2),(1↓ρW))ρ' '∘→14⌈⍳0=ρ,R2
[14]   →8⌈⍳(COL←COL+1)≤1↓ρMAT∘Z←Z,W
    ∇


    ∇ΔGT;GROUP;CNTR
[1]   ⍝     ΔGT        SEPT 1977
[2]   ⍝ LIST GROUP TITLES ON PRINTER
[3]   ⍝ VARIABLE GPΔ MUST BE PREDEFINED FOR EACH GROUP
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[4]   ⍝ GPΔ IS A DESCRIPTION OF A GROUP THAT RESIDES IN THAT GROUP
[5]   ⍝
[6]   ⎕←''∘⎕←'    FILE:  ',(50↑VOL,50ρ' ')∘WID 90∘PAGE 60 66∘LM 9
[7]   ⎕←''∘⎕←'    GROUP     TITLE'∘GROUP←⎕XN⍳0×CNTR←⎕IO∘⎕←''
[8]   L1:⎕←(7⍕GROUP[CNTR]),'   ',GPΔ∘⎕XS GROUP[CNTR]
[9]   →((CNTR←CNTR+1)≤ρGROUP)/L1
[10]   ⎕←'DISK SPACE USED IS',(3 0 0⍕(1↑SPA 1)÷10.24),' PERCENT.'∘UP 2
[11]   ⎕XS 0∘NPG
    ∇


    ∇Z←ΔIN;BUF;CAT
[1]   ⍝  ΔIN             JANUARY 4,1978
[2]   ⍝USED FOR GENERATING TEXT
[3]   Z←0 0ρ''
[4]   INP:→0×⍳'.'=1↑(BUF←⍞''),' '
[5]   →CHK⌈⍳0≠ρ,BUF
[6]   →LAM∘BUF←(1,1↓ρZ)ρ' '
[7]   CHK:→AHE⌈⍳'→'≠¯1↑(' ',BUF)
[8]   'LENGTH ERROR--RETYPE LINE!'∘→GO⌈⍳255≥(ρBUF←¯1↓(' ',BUF))+ρCAT←⍞''
[9]   →INP
[10]   GO:→CHK∘BUF←BUF,CAT
[11]   AHE:→GT⌈⍳(ρBUF)>1↓ρZ
[12]   →LAM∘BUF←(1,ρBUF)ρBUF←BUF,(((1↓ρZ)-ρBUF)ρ' ')
[13]   GT:BUF←(1,ρBUF)ρBUF∘Z←Z,(((1↑ρZ),(ρBUF)-1↓ρZ)ρ' ')
[14]   LAM:'PARAGRAPH TOO LONG!'∘→INP⌈⍳3900>×/ρZ←Z⍪BUF
    ∇


    ∇ΔLD;DAT;ΔG;ΔI;ΔX;XΔ;ΔRX
[1]   ⍝     ΔLD                  JUNE 14/76
[2]   ⍝LIST GROUP TITLES AND NAMES ON PRINTER
[3]   DATE←5↓⍞'DATE:'
[4]   ⎕←'FILE:  ',(50↑VOL,50ρ' '),DATE∘PAGE 60 66∘⎕OU(⎕YA 66),16
[5]   ⎕←'ACTIVE GROUPS ARE: ',⍕ΔG←⎕XN⍳0×ΔI←⎕IO∘⎕←''
[6]   ΔL:⎕←'GROUP',(7⍕ΔG[ΔI]),'   ',GPΔ∘⎕XS ΔG[ΔI]∘⎕←''
[7]   ⎕←XΔ←((ΔRX∘→(0=ΔRX←⌊(×/ρΔX)÷80)/ΔN),80)ρ(ΔX←⎕XN ΔG[ΔI])∘⎕←''∘0 6 0 0 ⎕YO[⍳1]2
[8]   ΔN:⎕←,ΔRX↑ΔX∘→(0=×/ΔRX←¯1 1×(ρΔX)-20 0×ΔRX)/ΔM
[9]   ΔM:→((ΔI←ΔI+1)≤ρΔG)/ΔL∘0 0 0 0 ⎕YO[⍳1]2
[10]   NPG
    ∇

ΔM1   [12 by 76 numeric array; element size 2 byte(s)]
1364 1024 1024 1360 1024 1024 1024 0 0 0 0 0
0 0 336 4 340 1028 340 0 0 0 0 0
1024 1024 1024 1360 1028 1028 1360 0 0 0 0 0
0 0 336 1024 1024 1024 336 0 0 0 0 0
4 4 4 340 1028 1028 340 0 0 0 0 0
0 0 336 1028 1364 1024 340 0 0 0 0 0
64 272 256 1344 256 256 256 0 0 0 0 0
0 4 336 1028 340 4 1364 0 0 0 0 0
1024 1024 1024 1344 1040 1040 1040 0 0 0 0 0
0 64 0 320 64 64 336 0 0 0 0 0
0 16 0 16 16 272 64 0 0 0 0 0
1024 1024 1040 1088 1280 1088 1040 0 0 0 0 0
320 64 64 64 64 64 336 0 0 0 0 0
```

0 0 1296 1092 1092 1092 1092 0 0 0 0 0
0 0 1344 1040 1040 1040 1040 0 0 0 0 0
0 0 336 1028 1028 1028 336 0 0 0 0 0
0 0 1344 1040 1344 1024 1024 0 0 0 0 0
0 0 336 1028 1092 1040 324 0 0 0 0 0
0 0 1104 1280 1024 1024 1024 0 0 0 0 0
0 0 340 1024 336 4 1360 0 0 0 0 0
256 256 1344 256 256 272 64 0 0 0 0 0
0 0 1028 1028 1028 1028 336 0 0 0 0 0
0 0 1028 272 272 64 64 0 0 0 0 0
0 0 1028 1028 1092 1092 272 0 0 0 0 0
0 0 1028 272 64 272 1028 0 0 0 0 0
0 0 1028 272 64 256 1024 0 0 0 0 0
0 0 1364 16 64 256 1364 0 0 0 0 0
1028 1028 1028 1364 1028 1028 1028 0 0 0 0 0
1024 1024 1024 1024 1024 1024 1364 0 0 0 0 0
336 1028 1364 1300 1364 1024 340 0 0 0 0 0
0 0 272 1364 272 1364 272 0 0 0 0 0
336 1092 320 64 80 1092 336 0 0 0 0 0
1296 1280 64 0 256 80 1104 0 0 0 0 0
64 336 1088 1088 1088 336 64 0 0 0 0 0
256 1088 256 1088 1028 1040 324 0 0 0 0 0
0 0 1092 336 1364 336 1092 0 0 0 0 0
16 64 256 256 256 64 16 0 0 0 0 0
256 64 16 16 16 64 256 0 0 0 0 0
0 0 0 0 1360 0 0 0 0 0 0 0
0 0 0 0 0 0 1364 0 0 0 0 0
0 0 0 1360 0 1360 0 0 0 0 0 0
0 0 64 64 1364 64 64 0 0 0 0 0
1360 1032 1032 1360 1024 1024 1024 0 0 0 0 0
1360 1032 1028 1028 1028 1032 1360 0 0 0 0 0
680 1028 1024 680 4 1028 680 0 0 0 0 0
1028 1300 1092 1028 1028 1028 1028 0 0 0 0 0
680 1060 1044 1028 1028 1028 680 0 0 0 0 0
1364 64 64 64 64 64 64 0 0 0 0 0
680 1028 1028 1028 1028 1092 680 8 0 0 0 0
0 336 1028 16 64 0 64 0 0 0 0 0
1028 520 272 160 64 64 64 0 0 0 0 0
1028 1028 1028 1028 1028 1028 680 0 0 0 0 0
1360 1032 1032 1360 1032 1032 1360 0 0 0 0 0
1028 1284 1156 1092 1060 1044 1028 0 0 0 0 0
1364 1024 1024 1360 1024 1024 1364 0 0 0 0 0
336 64 64 64 64 64 336 0 0 0 0 0
1360 1032 1032 1360 1152 1056 1032 0 0 0 0 0
336 256 256 256 256 256 336 0 0 0 0 0
0 0 16 64 256 64 16 0 0 0 0 0
336 16 16 16 16 16 336 0 0 0 0 0
320 320 0 320 320 64 256 0 0 0 0 0
320 320 320 0 0 0 0 0 0 0 0 0
0 1280 1280 0 1280 1280 0 0 0 0 0 0
1300 1300 1300 0 0 0 0 0 0 0 0 0
8 8 8 8 8 520 336 0 0 0 0 0
1028 1040 1088 1280 1088 1040 1028 0 0 0 0 0
0 0 256 64 16 64 256 0 0 0 0 0
336 520 1024 1024 1044 516 340 0 0 0 0 0
160 272 520 1028 1364 1028 1028 0 0 0 0 0

1028 1028 1028 1092 1092 680 272 0 0 0 0 0
336 520 1024 1024 1024 520 336 0 0 0 0 0
1028 1028 1028 520 272 160 64 0 0 0 0 0
520 272 160 64 160 272 520 0 0 0 0 0
680 16 32 64 128 256 680 0 0 0 0 0
64 64 64 64 0 0 64 0 0 0 0 0
2730 2730 2730 2730 2730 2730 2730 2730 2730 2730 2730 2730