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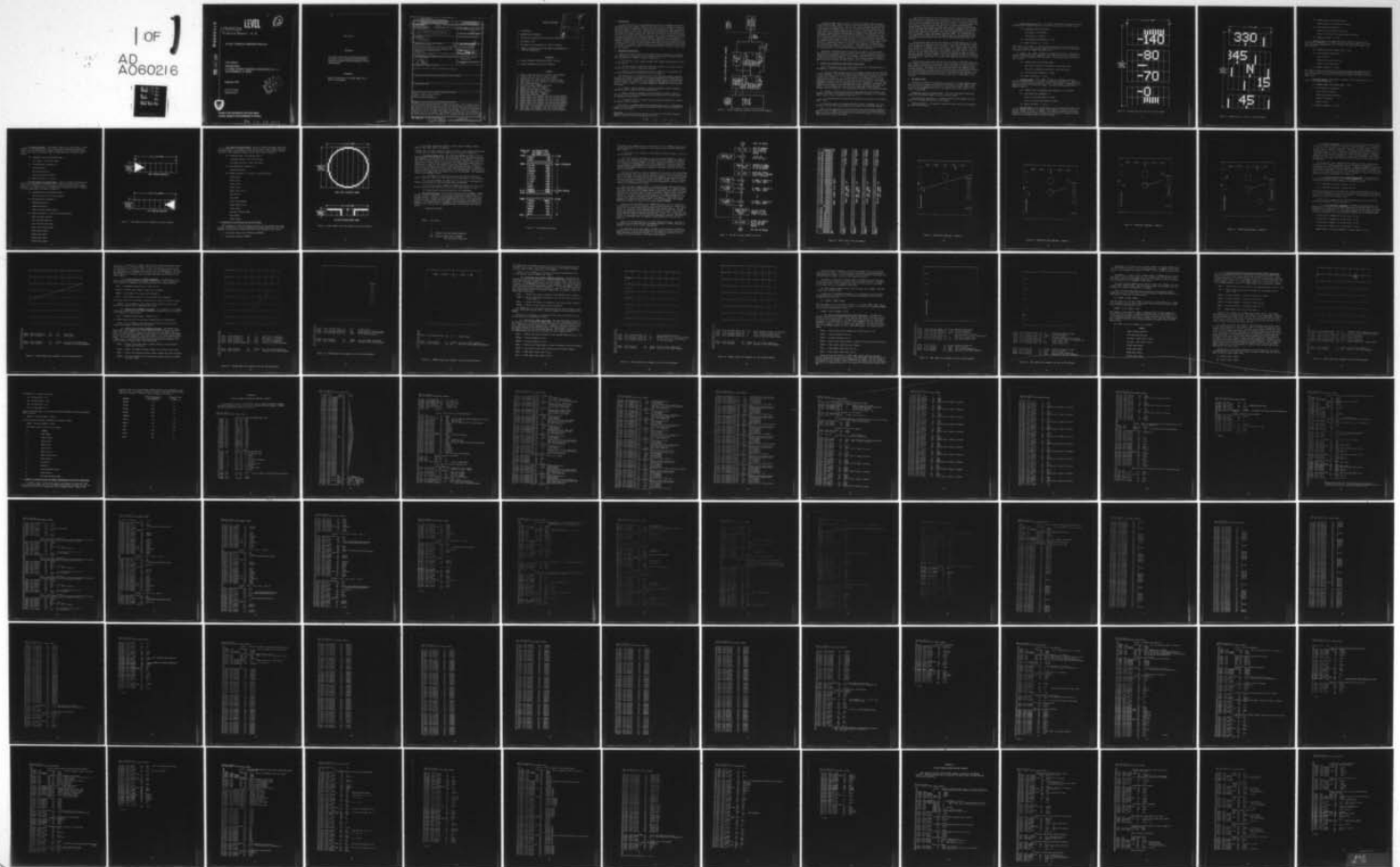
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Technical Report - 78-43

DIGITAL SYMBOLOGY GENERATOR PROGRAM

Tunis Robbins
HEADQUARTERS
U S ARMY AVIONICS RESEARCH & DEVELOPMENT ACTIVITY
FORT MONMOUTH, N J 07703

September 1978

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1. INTRODUCTION

A large percentage of the simulation and flight test programs conducted by the Advanced Avionic Systems Technical Area have a need to display a variety of different types of command and flight control information to a pilot to assist him in performing a task (e.g., hovering or nap-of-the-earth (NOE) maneuvering). To satisfy this need, a project was undertaken to develop, for R&D purposes, a TV display which would provide the reliability and ease of set-up that is necessary for an airborne device and, at the same time, allow for adequate flexibility to quickly reconfigure the displayed symbols. The purpose of this report is to provide documentation for the Digital Symbology Generator (DSG) program, the software portion of this display system. This report is not intended to provide a detailed insight into the various algorithms used to generate each symbol, but is intended to provide an understanding of the program's capability and to serve as a guide to enable the reader to understand what must be done to operate and use the program.

2. BACKGROUND AND APPROACH

Earlier TV displays used by the Technical Area for simulation and flight test experiments have been of the all analog type and have suffered from several disadvantages. The most serious of these are:

a. The addition of new symbols require that hardware modification be made to the display.

b. Displays used for laboratory simulation studies are not easily incorporated into the follow-on flight test programs.

c. Numerous trim pot adjustments (such as, symbol size, centering, and scaling) are generally necessary for the initial set-up.

The acquisition by the Technical Area of two SKC-2000 airborne computers has made it possible to consider an all-digital approach in the development of an R&D display which would possess the characteristics needed for both simulation and flight test studies. A block diagram of the approach which has been taken is shown in Figure 1. The block diagram is divided into three sections as follows:

a. A digital computer program to generate symbology (Digital Symbology Generator) within a 256 by 256 bit binary matrix.

b. Special purpose TV/Computer interface (Digital-to-Video Converter-DVC) electronics to convert the digitally stored 256 by 256 bit binary array to composite TV video signal.

c. A standard 525 line TV monitor with conventional deflection circuitry and picture tube electronics.

This report is concerned mainly with subparagraph a above. Subparagraphs b and c above are covered in detail in Reference 1 and will be only briefly explained in this report.

¹ECOM-4506, "A Digital-to-Video Converter for Airborne Television Displays," Edward A. Karcher, Avionics Laboratory, July 1977.

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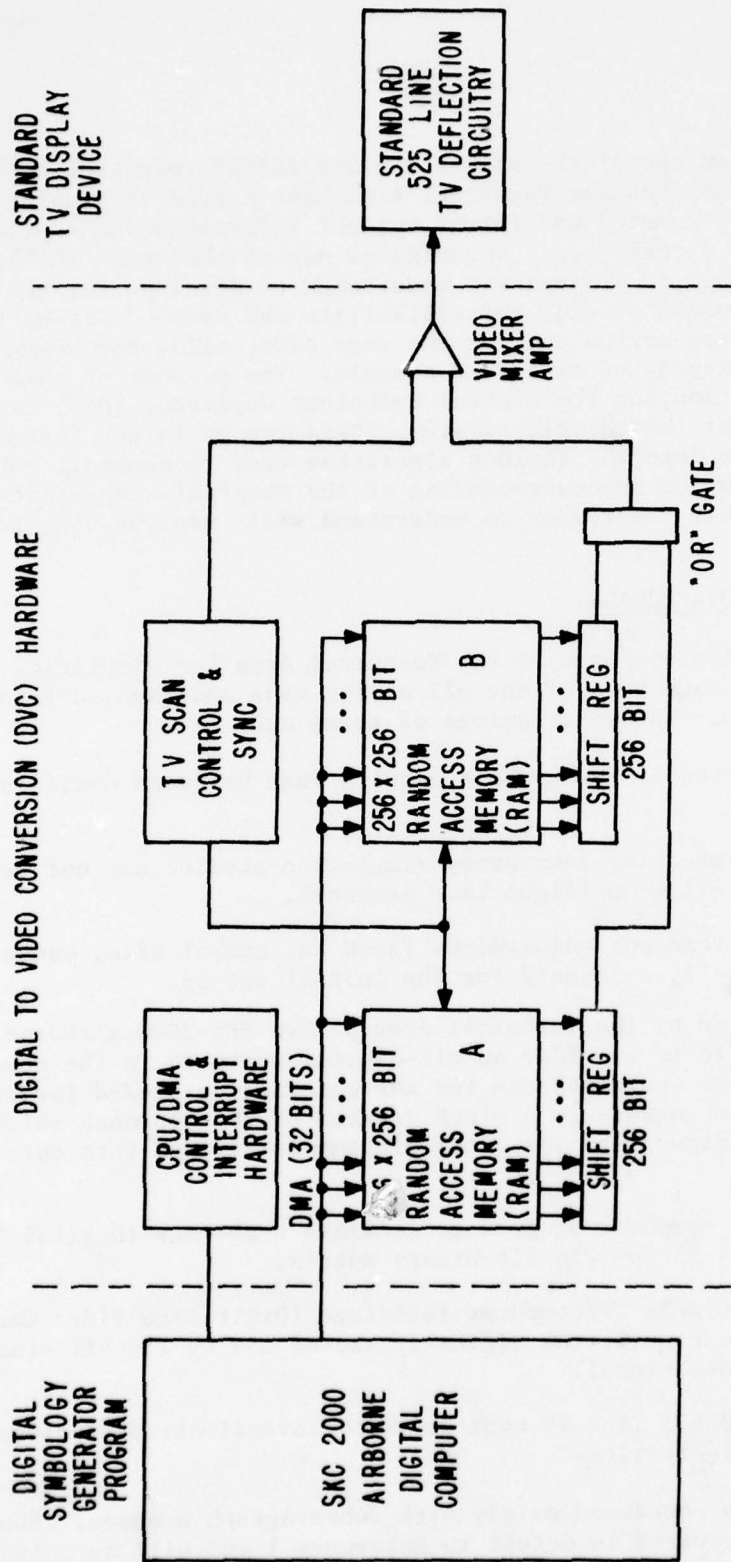


Figure 1. Digital symbology generator hardware block diagram

The DVC hardware shown in Figure 1, includes two semi-conductor random access memories (RAM), marked A and B in the block diagram, each representing a 256 by 256 bit binary matrix. The TV scan control and synchronization circuitry permits one memory (say, B) to be scanned at TV video rates while the other memory (A) is being asynchronously (i.e., not synchronized with the TV video scan rates) loaded through the direct memory access (DMA) with symbology previously generated within the SKC-2000 core memory. The scanning of B is accomplished by loading a full 256 bit line from B into a 256 bit shift register. This register is then shifted out serially at the horizontal scan rate of a standard TV through an OR gate where it is mixed with vertical and horizontal synchronization pulses to create a composite 2 level TV video signal. The B array is continually scanned on a line-by-line basis in this manner until the asynchronous loading of A is complete. Upon completion of the loading of A, and on the next vertical blanking pulse, a switchover occurs and A becomes the scanned matrix to be loaded with new data from the SKC-2000.

Using this "ping-pong" scheme of scanning one matrix at TV rates while the other matrix is being loaded, an update rate of the TV display can be accomplished at a maximum of 30 times per second. Although RAM's are being used in the scan conversion hardware, a true random access of the matrix must be accomplished sequentially through the DMA. This technique enables loading the RAM's with only a minimum CPU time required to set up the DMA.

3. INITIAL DSG INVESTIGATION AND PROGRAM ORGANIZATION

Some of the ground rules and program goals which were established for the development of the DSG program were as follows:

a. The DSG program should be written in assembly language for the SKC-2000 airborne computer. The SKC-2000 computer was developed by the Kearfott division of the Singer Company and is a 16K (32 bit/word) core memory machine with a floating point processor. Two of these machines were purchased - one for installation within the computer facility and one for installation in the EVAR (Experimental Vehicle for Avionics Research) flight test vehicle. The principal peripherals available for the airborne machine are two magnetic tape units, I/O typewriter with cassette mag tape read/write option, and paper tape punch and reader. The laboratory unit also has a card reader and an electrostatic printer/plotter in addition to the peripherals available on the airborne machine.

b. A family of symbol types should be developed that would include, as a minimum, the symbol set available on the all-analog TV displays (i.e., straight lines, vectors, boxes, crosses, circles, etc.).

c. The program should facilitate quick addition or deletion of the various symbol types.

d. Execution time of the program should be held to a minimum. As a program goal, the execution time should not be greater than 10-20 milliseconds.

Early in the investigation it became obvious that the program organization and the choice of symbol types would be greatly influenced by several factors. Some of the more significant factors and the particular aspects of the DSG that they affected will now be discussed.

The choice of symbol set was affected by the fact that the array in which the symbols would be generated was rectangular. This meant that, computationally, it would be simpler and also require less execution time to perform operations that are rectangular rather than polar in nature. For this reason, symbols such as lines and vectors that are free to rotate, and geometrically shaped symbols that are free to change size, should be kept to a minimum so as not to extend the program execution time beyond a tolerable limit. Because the attitude line and vector symbols are such familiar symbols on flight displays, both symbols are included in the selected symbol set (listed later), and, as expected, require the longest execution times. It is estimated that 75 percent of the coding time for the DSG was spent in developing fast execution algorithms that would allow the rotation and translation of these two symbols.

A factor which affected the total amount of SKC-2000 memory that the DSG required was the necessity to store the entire 256 by 256 bit (2048 full words) array in memory for generation of the symbols. This need to store the entire array rather than a smaller array, such as that for a single raster line, came about because of constraints by the DVC hardware. A raster line by raster line approach for the symbol generation would greatly extend the total execution time for the DSG, since each symbol could not be computed through to completion taking advantage of symbol symmetry. Also, the inability to "OR" and clear the DVC array made it impractical to transfer each symbol to the DVC as it is being generated.

Another factor which also affected the total amount of SKC-2000 memory required was the decision to store tables of trig functions for fast access rather than compute the functions through the library subroutine at execution time. This decision was made simply to reduce execution time at the expense of additional storage. A decision of this type is typical of the trade-off that must be continually made to reduce execution time in a time critical program. For this case, approximately 1,000 full words of additional storage was sacrificed to gain an estimated fifteen-fold increase in the speed of computing a trig function.

4. THE SYMBOL TYPES

Based on the initial DSG investigation, as well as the anticipated requirements of future laboratory and flight test experiments, several symbol types were selected for generation by the DSG. Each of these symbol types is discussed in the paragraphs that follow. The discussion of each symbol will include the following:

Commanded inputs and maximum range -- the real time symbol positioning command and the maximum range of variation of the symbol.

Reconfiguration parameters -- parameters which can be changed, but will normally be changed under non-real time control.

Number available -- the number of symbols of each type that is available for real time selection.

a. Artificial Horizon Line. This symbol consists of a sequence of points, approximating a straight line, that extends across the 256 by 256 bit array.

(1) Commanded inputs and range --

Roll angle, $\pm \pi/2$ radians

Pitch angle, ± 1 radian

(2) Reconfiguration parameters -- none

(3) Number available -- 1 each

This symbol will normally be used in conjunction with an attitude reference mark. An attitude reference mark symbol is included as one of the two degree-of-freedom fixed size symbols described later.

b. Vector. This symbol consists of a sequence of points representing a straight line segment which connects a base point and end point. The vector can be positioned anywhere within the array. Both the base and end point are free to move.

(1) Command inputs and maximum range --

Base point rectangular coordinates, total array area.

End point rectangular coordinates, total array area.

(2) Reconfiguration parameter -- range

(3) Number available -- 1 each

c. Airspeed Symbol. This symbol consists of a reference mark and a vertically movable scale or tape that is graduated and numbered to enable display of aircraft airspeed to within ± 1 knot. This symbol is generated by displaying a portion of a stored dot array. A portion of this stored array is shown in Figure 2.

(1) Command input and maximum range airspeed, 0 to 140 knots.

(2) Reconfiguration parameters --

Amount of the scale that is visible

Location of the scale within the raster

(3) Number available -- 1 each

d. Heading Symbol. This symbol consists of a reference mark and a horizontally movable scale that is graduated and numbered to enable display of aircraft heading to within ± 1 degree. This symbol is generated in a manner similar to the airspeed symbol by displaying a portion of a stored dot array. A portion of the heading tape is shown in Figure 3.

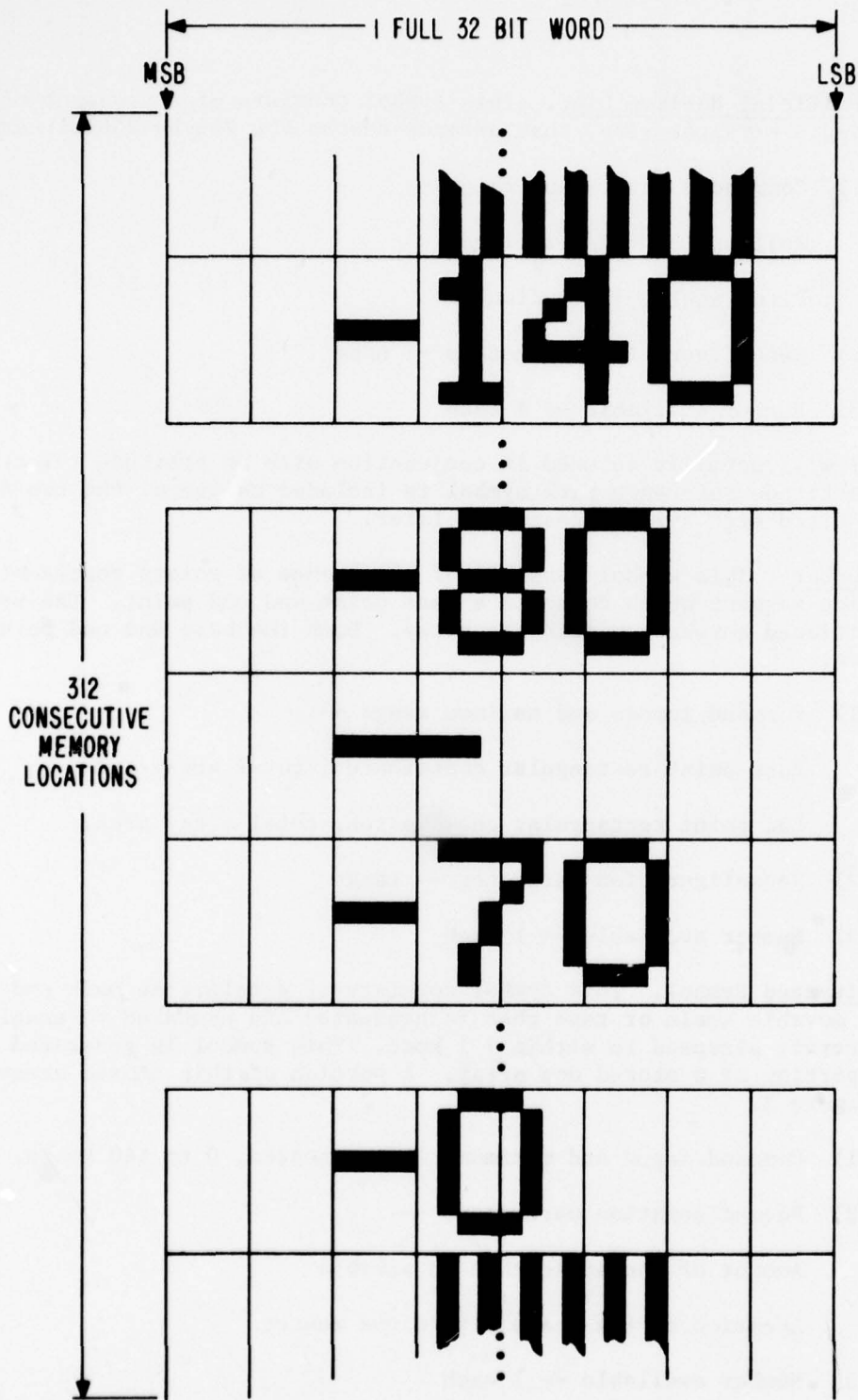


Figure 2. Airspeed tape dot array as stored in memory

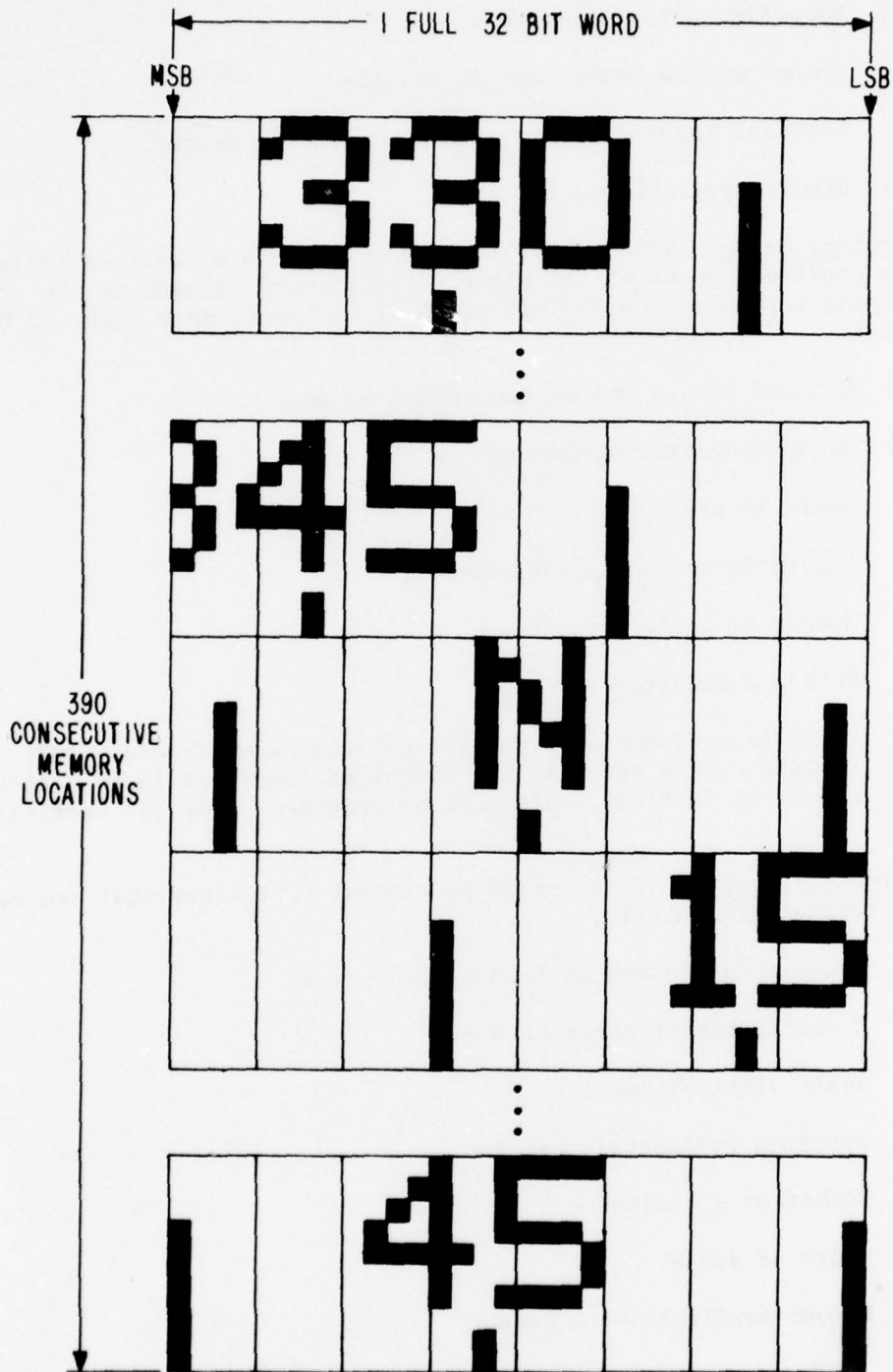


Figure 3. Heading tape dot array as stored in memory

- (1) Command inputs and maximum range --
Heading angle, \pm 360 degrees continuous
- (2) Reconfiguration parameters --
Amount of the scale that is visible
Vertical location of the scale within the raster.
- (3) Number available -- 1 each

e. Vertical Scale. This symbol is used to provide a vertical scale which can be centered on any of the eight vertical word columns in the array. (The DSG program separates the 256 bit width of the array into eight 32 bit word columns.)

- (1) Command inputs and maximum range -- none
- (2) Reconfiguration parameters --
Scale location
Separation of scale divisions
Number of scale divisions
- (3) Number available -- 2 each

This symbol is used in conjunction with vertical degree-of-freedom (DOF) symbols, such as, pointers or a vertical bar symbol as described later. Also, reference marks for the vertical scale must be provided from the vertical DOF symbol type.

f. Horizontal Scales. This symbol is similar to the vertical scale, except it is oriented horizontally.

- (1) Command inputs and maximum range -- none
- (2) Reconfiguration parameters --
Scale vertical location
Starting horizontal position
Number of divisions
Width of scale
- (3) Number available -- 2 each

g. Vertical Bar Symbol. This symbol consists of a narrow bar or ribbon similar to a thermometer which can be controlled to extend or shorten its length in either a positive or negative direction from a specified reference point. This symbol is normally used in conjunction with a vertical scale symbol.

(1) Commanded inputs and maximum range --

Bar length, total array length

(2) Reconfiguration parameters --

Bar sensitivity

Horizontal position

Upper and lower bar limits

(3) Number available -- 2 each

h. Vertical Degree-of-Freedom Symbol. This is a fixed size symbol type which can be controlled to translate in the vertical direction only. This symbol can be located in any of the eight selectable vertical word columns in the array. The symbol's shape is determined by a stored dot array. Examples of these stored arrays are shown in Figure 4.

(1) Commanded inputs and maximum range --

Vertical position, total array height

(2) Reconfiguration parameters --

Horizontal position

Symbol sensitivity

Upper and Lower symbol limits.

(3) Number available -- 8 each, as specified below

Right pointing indicator

Left pointing indicator

Left side reference mark

Right side reference mark

CRUISE alpha symbol

TRANS alpha symbol

HOVER alpha symbol

BOB-UP alpha symbol

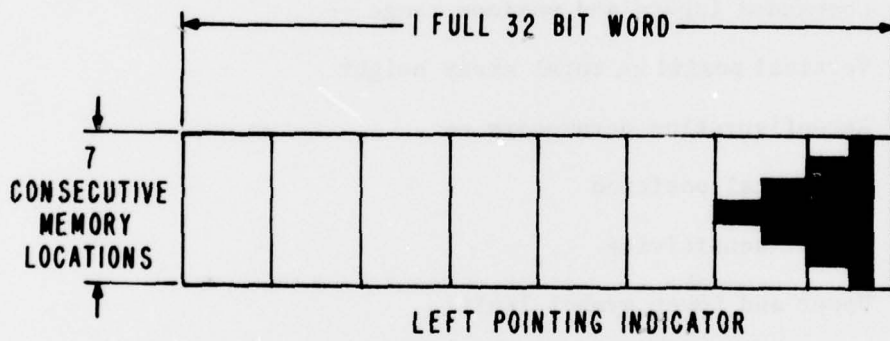
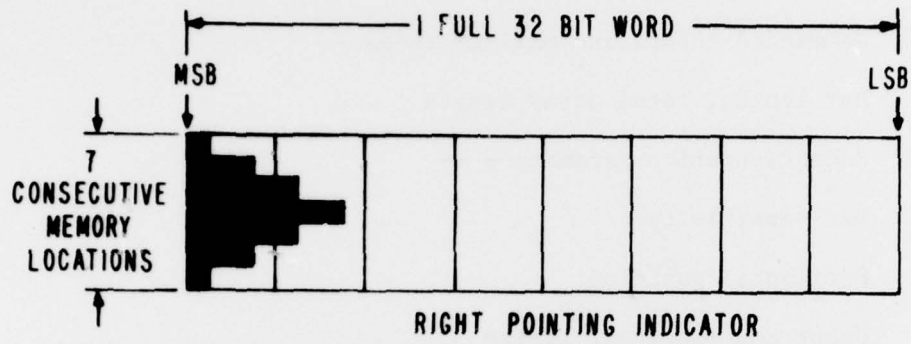


Figure 4. VDOF symbol dot array example as stored in memory

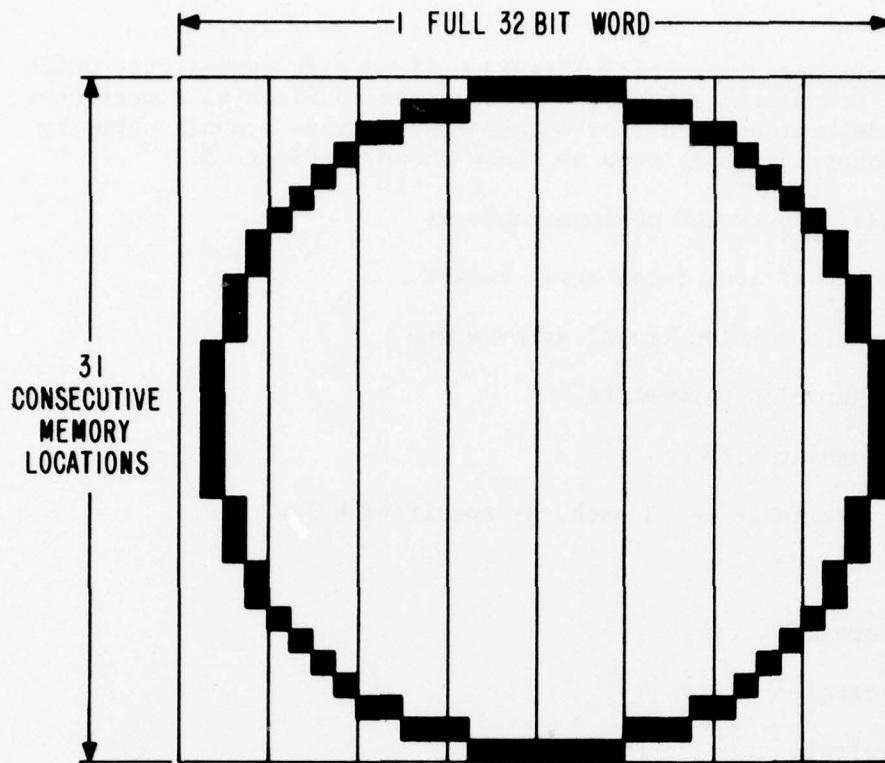
i. Two Degree-of-Freedom Symbol. This is a fixed size symbol type which can be controlled to translate in both the vertical and horizontal directions. The symbol shape is determined by a stored dot array. These symbols normally consist of simple geometric shapes such as those shown in Figure 5.

- (1) Commanded inputs and maximum range --
 - Vertical position, total array height
 - Horizontal position, total array width
- (2) Reconfiguration parameters --
 - Symbol sensitivity
- (3) Number available -- 13 each, as specified below
 - Large cross
 - Small cross
 - Large circle
 - Small circle
 - Small solid circle
 - Down pointer
 - Up pointer
 - Small solid diamond
 - Large broken circle
 - Large square
 - Attitude reference mark
 - Male symbol
 - Female symbol

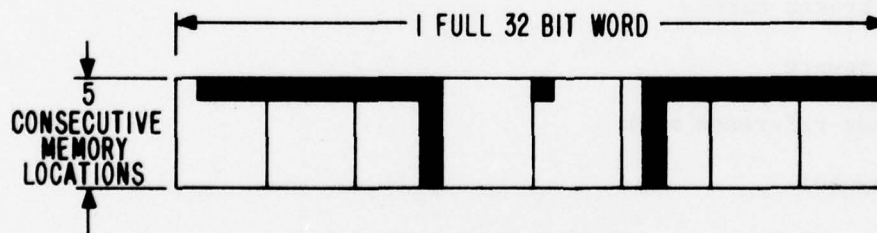
5. DISCUSSION OF THE OPERATION OF THE DSG PROGRAM

The explanation of the DSG program operation will be divided into three sections in which each section corresponds to a major subdivision of the DSG program. The three major subdivisions of the DSG program are as follows:

- a. The common storage area (LSICMN and CORECMN)
- b. The DSG main program (SYMGEN)



LARGE CIRCLE (FIXED SIZE) SYMBOL



ATTITUDE REFERENCE MARK SYMBOL

Figure 5. XYDOF symbol dot array example as stored in memory

c. The symbol subprograms (ATLINE, VECTOR, AIRSPD, COMPASS, VSCALE, HSCALE, VBAR, VDOF, XYDOF, and DRDOUT).

A memory map of the DSG program is shown in Figure 6. The complete DSG program listings and the assembly language mnemonics are included in Appendix A.

a. The Common Storage Area. The LSICMN and CORECMN sections of the program are memory storage areas that can be accessed by all DSG program routines. The LSICMN area is located in the fast RAM (random access memory) - a 256 full word area of volatile memory with a .5 μ s cycle time. Because the contents of this section of memory would be destroyed if the machine was powered down, the LSICMN area is used only for storage of temporary information. A total of 10 full words of storage is set aside for use as temporary storage of argument lists as they are transferred into a subprogram and 5 full words of storage are used as a general-purpose scratch-pad area. The CORECMN area is located in the slower (1.0 μ s cycle time) core memory section of the SKC-2000. The information stored in the CORECMN includes:

(1) The TVRSTR (the 256 by 256 bit array that requires 2048 full words) in which all symbols are generated before being output to the TV display.

(2) Bit masks (BMSK \emptyset and BMSKI) used by the symbol subprograms for "OR"ing in individual bit patterns during symbol generation.

(3) Trig table arrays (COSTBL and TANTBL each require 514 full words) for the storage of trig functions for fast access during execution time.

(4) Miscellaneous constants required by the subprograms.

b. The DSG Main Program. The DSG main program is called SYMGEN. SYMGEN has been written in subroutine form and must be called by a master main (or calling) program. Normally, the master main program will provide a real time clocked interrupt routine from which SYMGEN will be called. The calling program must provide a symbol select argument (described later) and symbol drive command to the SYMGEN program. The symbol select argument must be placed immediately after the call to the SYMGEN subroutine in the master main code as follows:

```
* MASTER MAIN PROGRAM
.
.
.
SYMGEN SETX  $\emptyset$ 7152
.
.
.
JS SYMGEN * CALL THE SYMGEN SUBROUTINE
HEX nnnnnnn* SYMBOL SELECT ARGUMENT
. *8 hexadecimal characters)
.
.
```

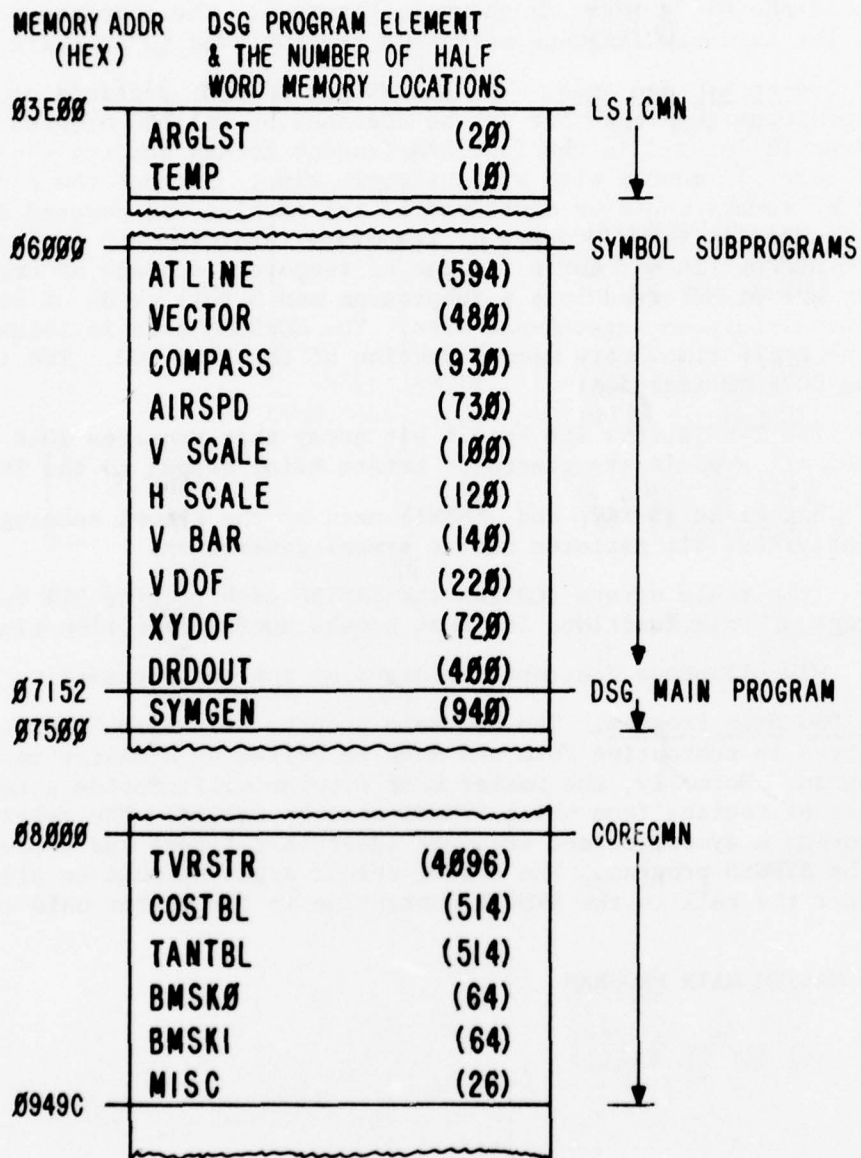


Figure 6. DSG program memory map

The symbol drive commands must be stored directly in the SYMGEN program by the master main program or by another routine which is also called by the master main program.

A flow chart of the operation of the SYMGEN is given in Figure 7, and will now be discussed.

The first operation performed on each pass through SYMGEN is to save the contents of all program and index registers that will be changed by SYMGEN or any subroutine called by SYMGEN. The final operation performed on each pass is to restore the original contents of these registers. These two operations are performed to allow SYMGEN to be called as part of an interrupt routine without having SYMGEN destroy the contents of registers needed by the routine being interrupted.

The next operation is a test to determine if this is the first time SYMGEN has been called. If it is, then the tables of trig functions are generated for use by the symbol subroutines during subsequent passes. If the calling program uses a real time clock interrupt routine, the SYMGEN program should be called at least once before enabling the clocked interrupt routine. This is necessary since the generation of the trig tables takes approximately 150 ms and could overrun the clocked interrupt frame.

Next, the symbol select argument is transferred from the master main program and stored in the SYMGEN in a location called SYMSEL. The SYMSEL argument is a coded word used by the SYMGEN program to determine which symbols are to be generated for the current pass through the program. Figure 8 shows the SYMSEL word and the particular symbol type that each of the 32 bit position corresponds to. The table also shows four examples of the SYMSEL hexadecimal code for the four symbol sets shown in Figures 9 through 12. These figures were generated by outputting the TVRSTR onto a Varian Electrostatic line printer. Appendix B contains a listing of this output program (PRNTSM).

Continuing the discussion of the SYMGEN flow chart, the next operation to be performed is to clear the TVRSTR. This operation removes all symbols generated on the previous pass before generating the updated symbols. This operation is not required, if the hardware clear option is selected when the DMA (direct memory access) output is initiated later in the frame. This option, a recent SKC-2000 interface hardware modification, results in a considerable time savings (on the order of 4 ms) on each pass through the program. The hardware clear is accomplished while the TVRSTR is being outputted to the DVC (see Figure 1).

After the clearing operation, the symbol generation begins. Each bit in the SYMSEL word is tested and the corresponding symbol is either generated or skipped if the bit is "1" or "0," respectively.

On completion of the last symbol, the DMA is initiated and the TVRSTR is transferred to the DVC to allow display of the symbols on the TV screen. The final operation, as mentioned earlier, is to restore all registers to their original contents and return to the master main program.

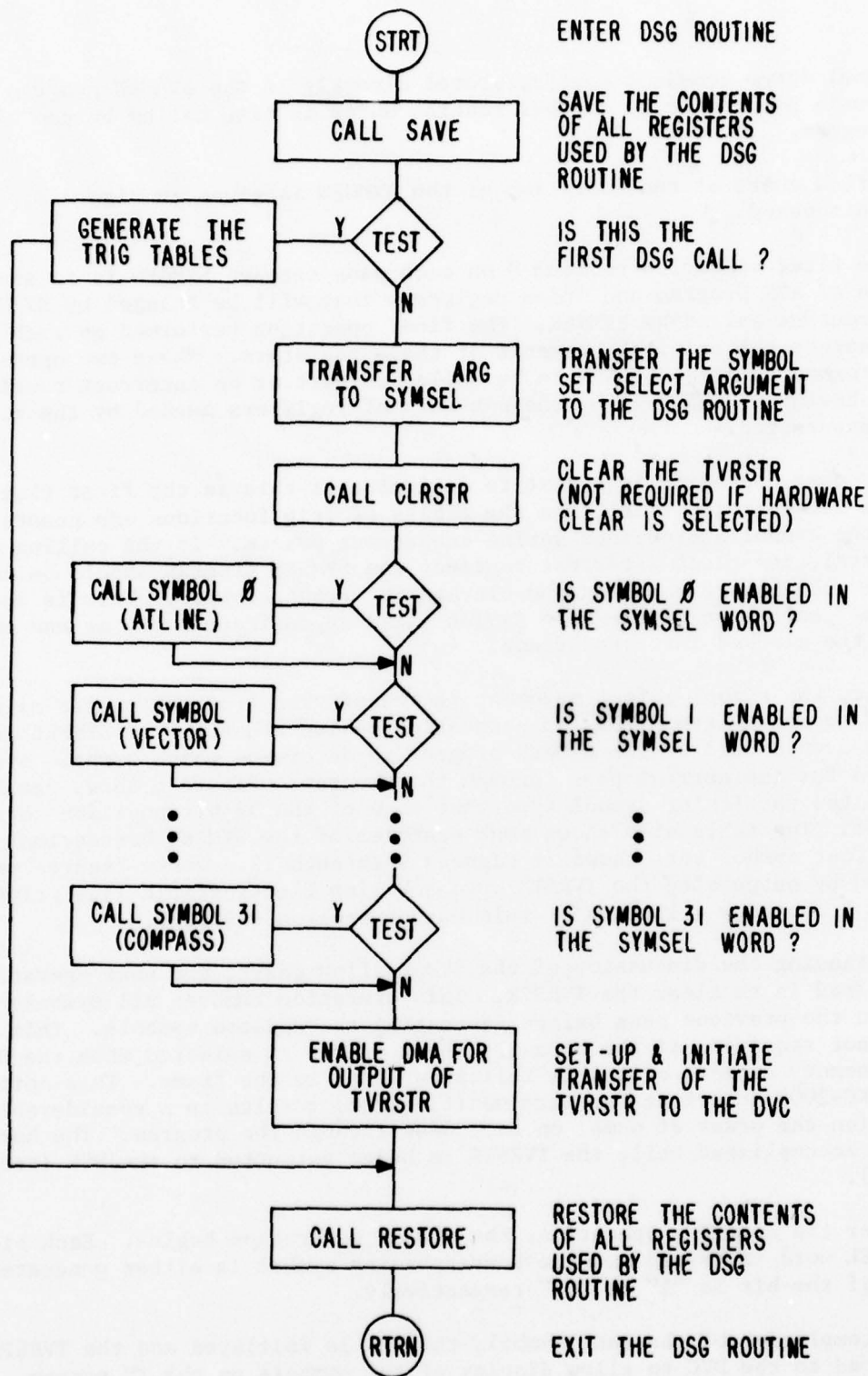


Figure 7. DSG main program (SYMGEN) flow chart

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ATLINE	VECTOR	VSCALE NO. 0	VSCALE NO. 1	HSCALE NO. 0	HSCALE NO. 1	V BAR NO. 0	V BAR NO. 1	VDOF NO. 0	VDOF NO. 1	AIRSPD	VDOF NO. 3	VDOF NO. 4	VDOF NO. 5	VDOF NO. 6	VDOF NO. 7	VDOF NO. 8	VDOF NO. 9	XDOF NO. 0	XDOF NO. 1	XDOF NO. 2	XDOF NO. 3	XDOF NO. 4	XDOF NO. 5	XDOF NO. 6	XDOF NO. 7	XDOF NO. 8	XDOF NO. 9	XDOF NO. 10	XDOF NO. 11	XDOF NO. 12	COMPASS

MSB

LSB

SYMSEL (SYMBOL SELECT WORD)

1 0 1 0 0 0 1 0 1 1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1

EXAMPLE 1
CRUISE MODE SYMBOL SET
(SEE FIGURE 9.)
HEX CODE - A2EE0069

0 1 1 0 0 0 1 0 1 1 0 1 1 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1

EXAMPLE 2
TRANS MODE SYMBOL SET
(SEE FIGURE 10.)
HEX CODE - 62ED0349

0 1 1 0 0 0 1 0 1 1 0 1 1 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 0 1

EXAMPLE 3
HOVER MODE SYMBOL SET
(SEE FIGURE 11.)
HEX CODE - 62EC834D

0 1 1 0 0 0 1 0 1 1 0 1 1 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 0 1

EXAMPLE 4
BOB-UP MODE SYMBOL SET
(SEE FIGURE 12.)
HEX CODE - 62EC4349

Figure 8. Symbol select code and examples

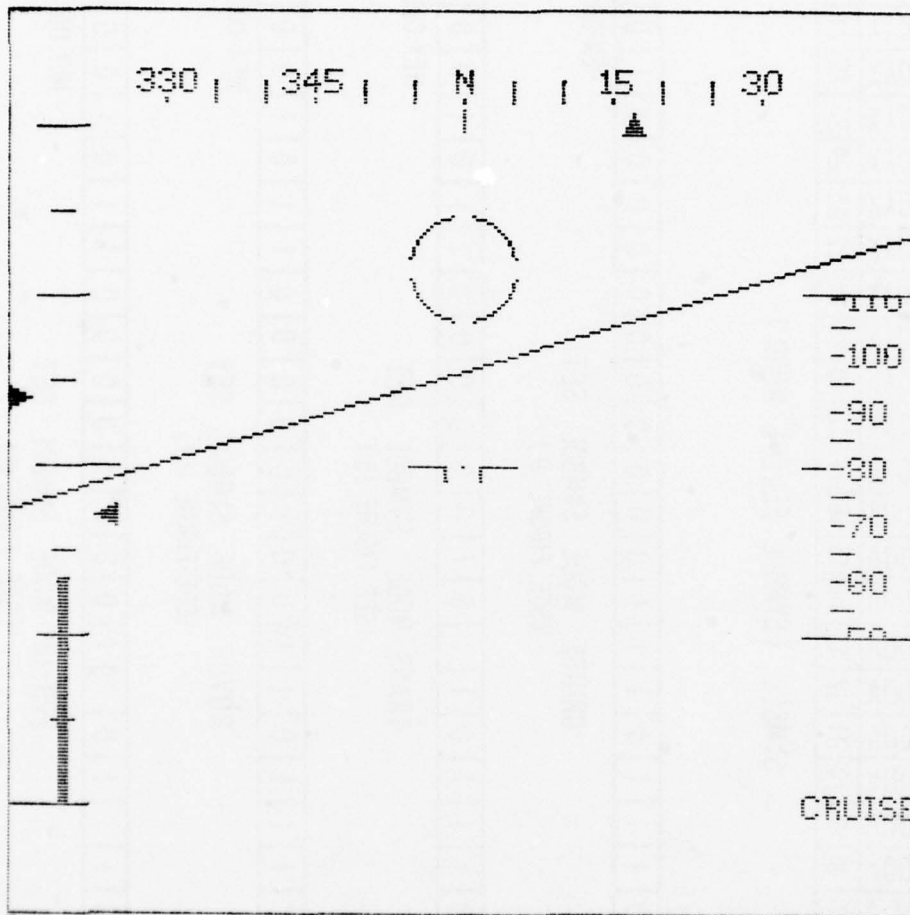


Figure 9. CRUISE mode symbology - example 1

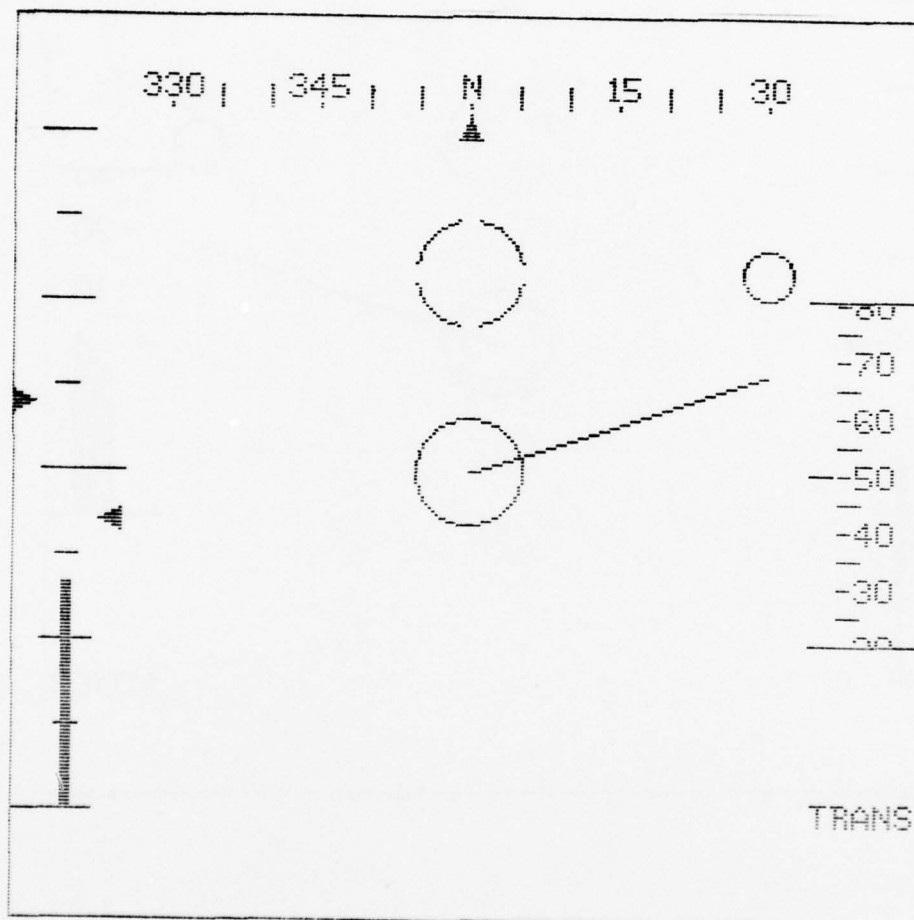


Figure 10. TRANSition mode symbology - example 2

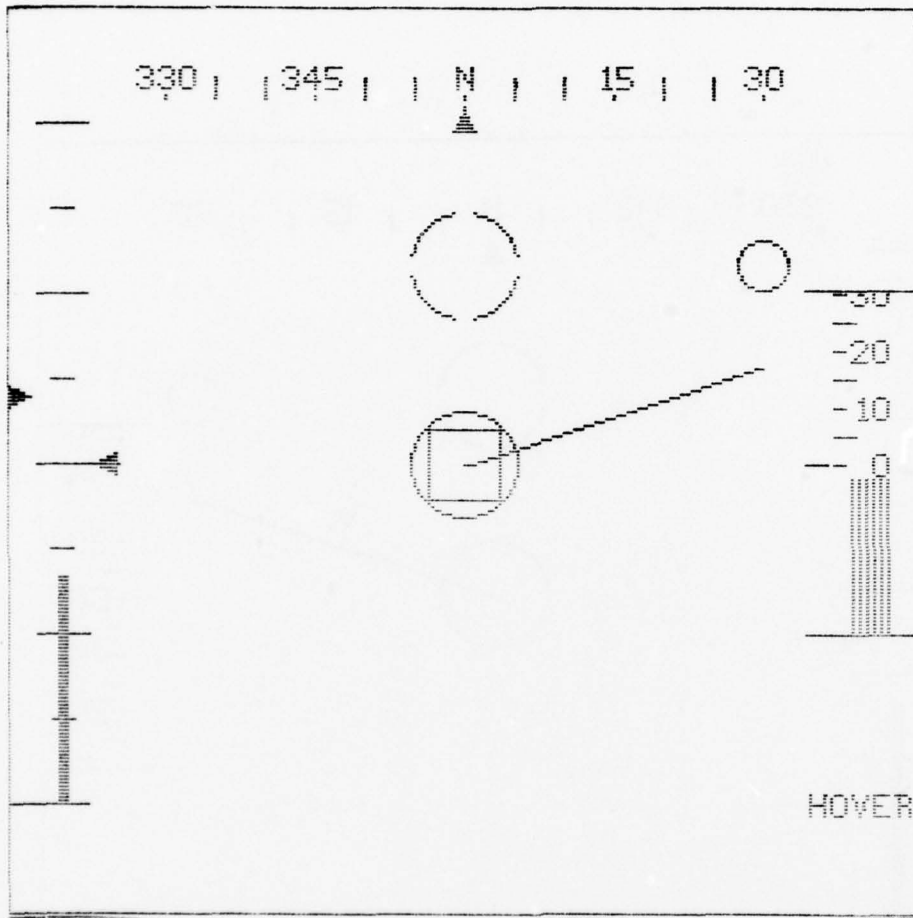


Figure 11. HOVER mode symbology - example 3

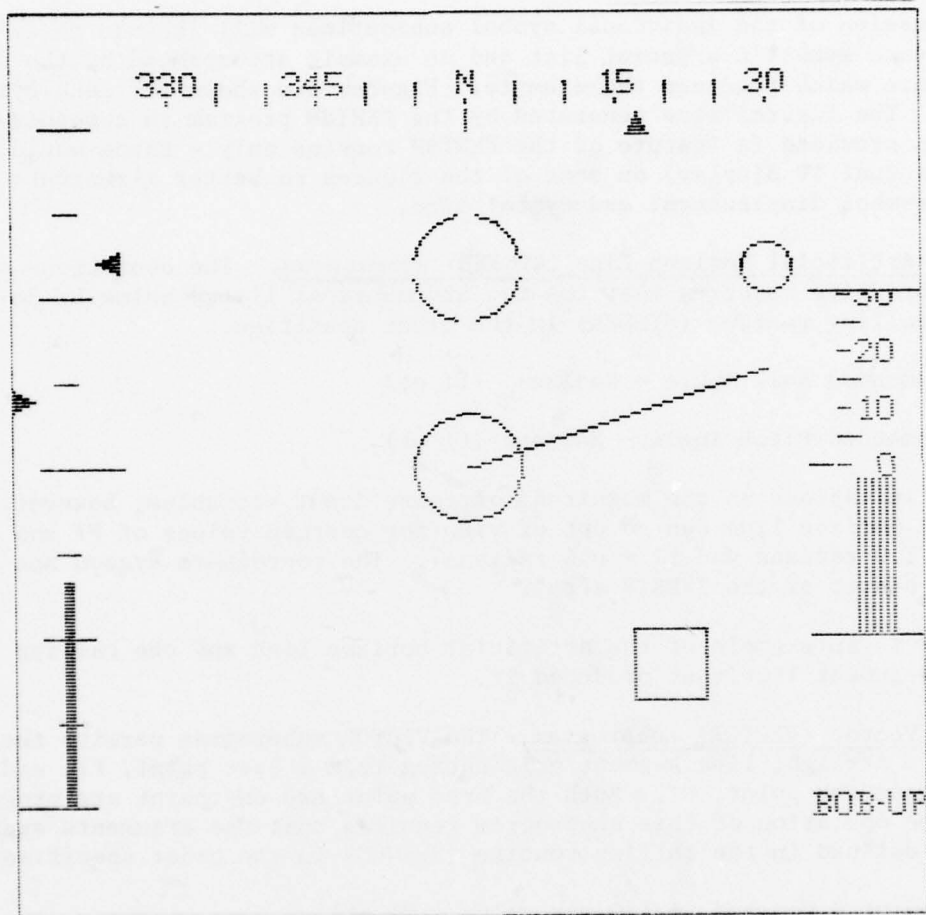


Figure 12. BOB-UP mode symbology - example 4

c. The Symbol Subprograms. Subroutines have been written to permit generation of each of the symbol types discussed in paragraph 4. It is possible to call the same subroutine more than once within the same frame if several of the same types of symbols are desired. However, a separate argument list is required for each call of a subroutine. The SYMGEN puts some restrictions on the maximum number of times a particular subroutine can be called. Should a symbol set be desired that exceeds any of these maximum numbers, the SYMGEN program would have to be reassembled to permit the new maximums. The current maximums for each symbol type is given in the discussion of the symbol types in paragraph 4.

The discussion of the individual symbol subroutines will include an explanation of each symbol's argument list and an example accompanied by the calling sequence which produced the example. Figures are shown for each symbol type example. The figures were generated by the PRNTSM program in Appendix B. Grid lines are provided (a feature of the PRNTSM routine only - these would not appear on an actual TV display) on some of the figures to better illustrate the magnitude of symbol displacement and symbol size.

(1) Artificial Horizon Line (ATLINE) subprogram. The operations of the ATLINE subroutine requires that the two arguments as listed below be defined in the calling routine (SYMGEN) in the order specified.

FI -- Commanded Roll Angle - Radians (fl pt)

TH -- Commanded Pitch Angle - Radians (fl pt)

There are no limitations on the magnitude of these input variables; however, the artificial horizon line can go out of view for certain values of FI and TH (e.g., TH = ± 1.0 radians and FI = 0.0 radians). The coordinate system has its origin at the center of the TVRSTR array.

Figure 13 is an example of the artificial horizon line and the calling sequence and argument list that produced it.

(2) Vector (VECTOR) subprogram. The VECTOR subprogram permits the generation of a straight line segment originating from a base point, P1, and terminating on an end point, P2. Both the base point and end point are program variables. The operation of this subprogram requires that the arguments specified below be defined in the calling routine (SYMGEN) in the order specified.

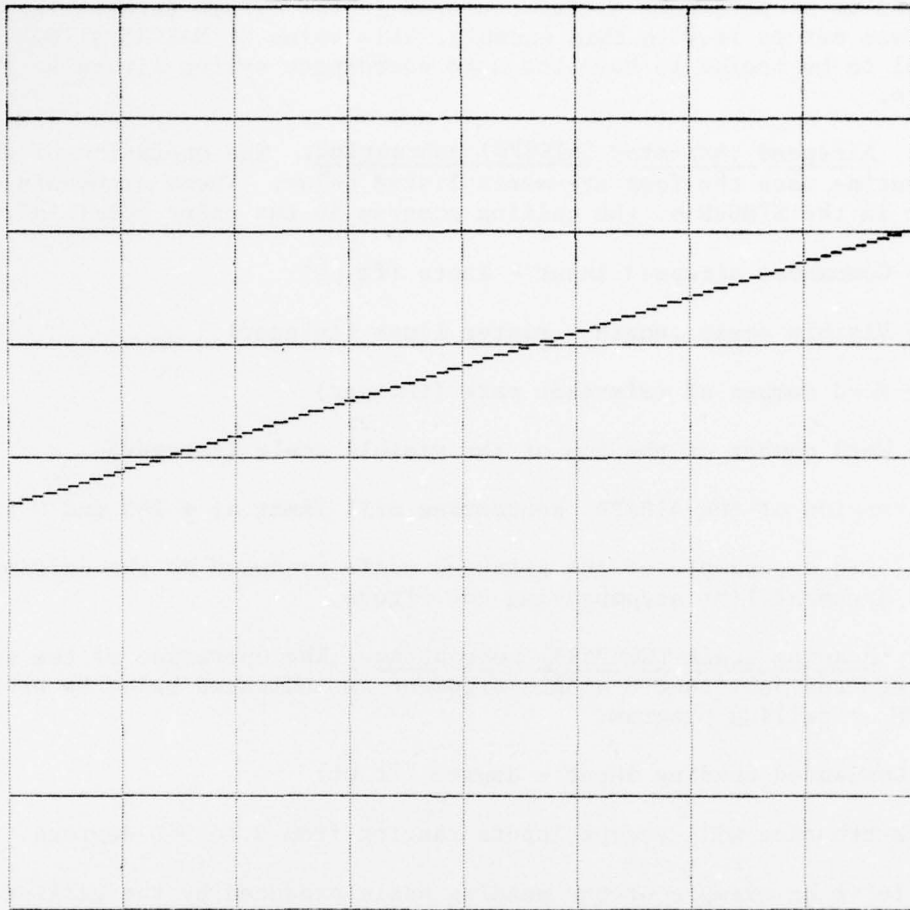
X1 Base point X Command (± 1.0 max value - fl pt)

Y1 Base point Y Command (± 1.0 max value - ft pt)

Y2 End point X Command (± 1.0 max value - fl pt)

Y2 End point Y Command (± 1.0 max value - fl pt)

MARGIN Width of the outer boundary (+ 128 max value - ft pt)



```

144
145
146
147 0A002 40962 3FCCCCC0 FI DEC 0.3 ROLL ANGLE
148 0A004 40964 BF199999 TH DEC -0.2 PITCH ANGLE
149
150
151
152 0A006 40966 64046000 JS ATLINE CALL THE ATLINE SUBROUTINE
153 0A008 40968 0400A002 PTR FI POINTER TO THE FIRST ARGUMENT
154
155
156

```

Figure 13. ATLINE symbol with argument list and calling sequence

Figure 14 is an example of a VECTOR symbol and the associated calling sequence and argument list. For this example the base point P1 (X1, Y1) = 0.0, -0.5) and end point P2 (X2, Y2) = (+ 0.75, + 0.25). The VECTOR coordinate points are referenced to a coordinate system centered in the TVRSTR array. The argument MARGIN was set to 16.0 in this example. This value of MARGIN allows the VECTOR symbol to be scaled to have the same coordinate system limits as the XYDOF symbols.

(3) Airspeed indicator (AIRSPD) subroutine. The operation of the AIRSPD subroutine uses the four arguments listed below. These arguments must be set aside in the SYMGEN or the calling program in the order specified.

ASPD -- Commanded airspeed input - knots (ft pt)
SCLGTH -- Visible scale length - raster lines (integer)
RFMSKA -- Word number of reference mark (integer)
SCLSA -- Word number of the top of the visible scale (integer)

The current version of the AIRSPD subroutine will limit at \pm 140 and 0 knots.

Figure 15 is an example of the airspeed scale produced by the calling sequence and argument list accompanying the figure.

(4) Heading scale (COMPASS) subroutine. The operation of the COMPASS subroutine requires only that a single argument as indicated below be provided in the SYMGEN or calling program.

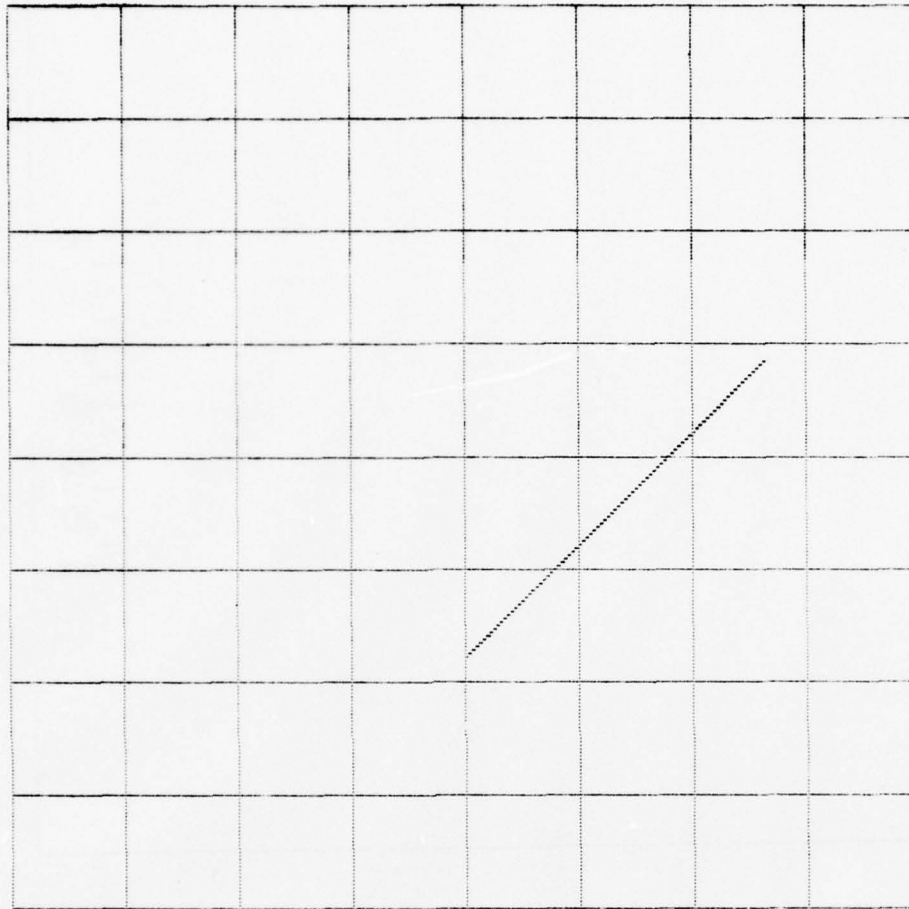
HDG -- Commanded heading input - degree (ft pt)

The COMPASS subroutine will accept inputs ranging from 0 to 360 degrees.

Figure 16 is an example of the heading scale produced by the calling sequence and argument included with the figure.

(5) Vertical Scale (Fixed) (VSCALE) subprogram. The VSCALE subprogram allows for the generation of fixed vertical scales located in any of the eight raster word columns. The set-up and location of this symbol type requires that the subroutine arguments as defined below be pre-set in the SYMGEN routine in the order specified. The suffix, small n, is a scale identification number. The present SYMGEN configuration allows two vertical scales in which n equals 0 or 1. Scale pointers and reference marks must be provided by the vertical degree-of-freedom (VDOF) symbol subprogram.

HPOSn -- Raster word column number (integer format) of the horizontal position of the scale.
VSCLCn -- Raster line number (integer format) of the scale center mark.
VSPCn -- Raster line spacing (integer format) between two scale divisions.
VMRKSn -- The total number of scale divisions (integer format), excluding the scale center.



```

162
163
164
165 0A014 40980 00000000 X1 DEC 0.0 BASE POINT X COORDINATE
166 0A016 40982 BF800000 Y1 DEC -0.5 BASE POINT Y COORDINATE
167 0A018 40984 40600000 X2 DEC 0.75 END POINT X COORDINATE
168 0A01A 40986 3FC00000 Y2 DEC 0.25 END POINT Y COORDINATE
169 0A01C 40988 42C00000 MARGIN DEC 16.0 WIDTH OF THE OUTER BOUNDARY
170
171
172
173 0A01E 40990 64046252 JS VECTOR CALL THE VECTOR SUBROUTINE
174 0A020 40992 0400A014 PTR X1 POINTER TO THE FIRST ARGUMENT
175
176
177

```

Figure 14. VECTOR symbol with argument list and calling sequence

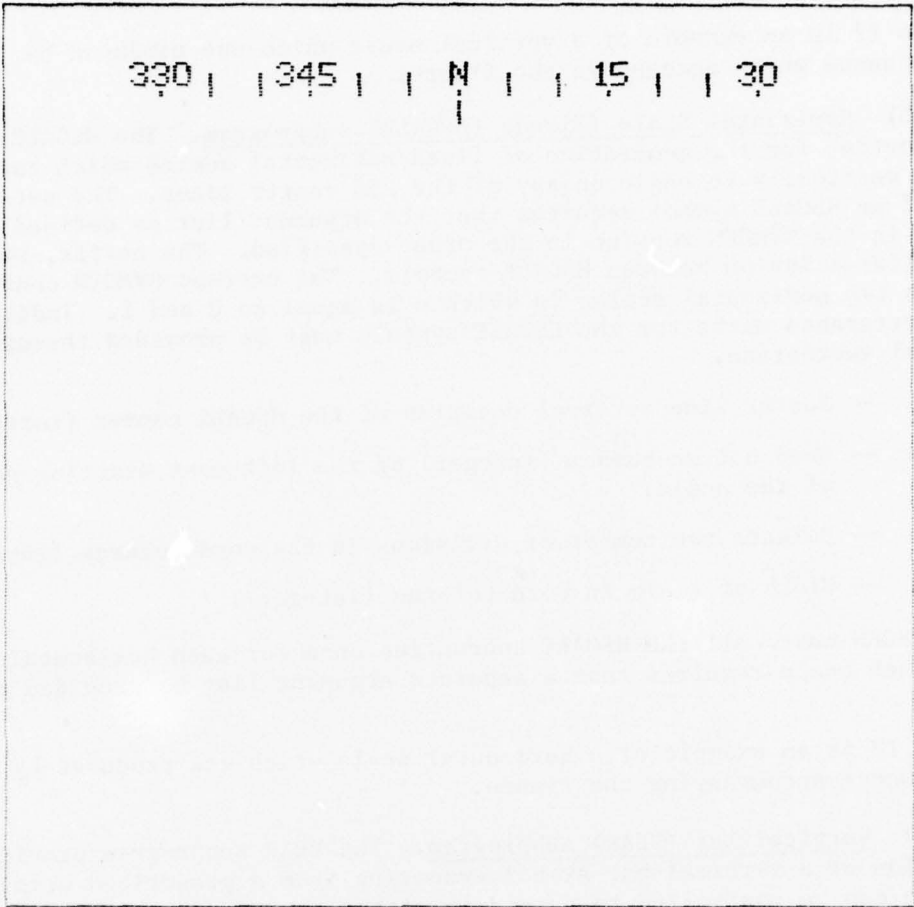


```

184
185
186 0A02C 41004 43500000 ASPD DEC 40.0 AIRSPEED INPUT
187 0A02E 41006 00000061 SCLGTH DEC 97 SCALE LENGTH IN RASTER LINES
188 0A030 41008 0000080E RFMKSA DEC 2062 REFERENCE MARK WORD LOCATION
189 0A032 41010 000004FE SCLSA DEC 1278 SCALE STARTING ADDRESS
190
191
192
193 0A034 41012 640467D4 JS AIRSPD CALL THE AIRSPD SUBROUTINE
194 0A036 41014 0400A02C PTR ASPD POINTER TO THE FIRST ARGUMENT
195
196
197

```

Figure 15. AIRSPD symbol with argument list and calling sequence



```

203
204
205
206 0A042 41026 00000000 HDG DEC 0.0 HEADING INPUT
207
208
209
210 0A044 41028 64046432 JS COMPASS CALL THE COMPASS SUBROUTINE
211 0A046 41030 0400A042 PTR HDG POINTER TO THE SUBROUTINE ARGUMENT
212
213
214

```

Figure 16. COMPASS symbol with argument list and calling sequence

The SYMGEN calls the VSCALE subroutine once for each vertical scale that is desired on the display. For each vertical scale, a corresponding argument list must exist in the storage area of the SYMGEN.

Figure 17 is an example of a vertical scale which was produced by the calling sequence which accompanies the figure.

(6) Horizontal Scale (Fixed) (HSCALE) subprogram. The HSCALE subprogram provides for the generation of fixed horizontal scales which can be positioned vertically to begin on any of the 256 raster lines. The set-up and location of an HSCALE symbol requires that the argument list as defined below be pre-set in the SYMGEN routine in the order specified. The suffix, small n, permits differentiation between HSCALE symbols. The current SYMGEN configuration allows two horizontal scales in which n is equal to 0 and 1. Indicator marks and reference marks for the HSCALE symbols must be provided through the XYDOF symbol subroutine.

- VPOSn -- Raster line vertical position of the HSCALE center (integer).
- HSTRn -- Word column number (integer) of the left most starting position of the scale.
- HMSKn -- Selects the number of divisions in the word columns (integer).
- HSIZEn -- Width of scale in word columns (integer).

The SYMGEN must call the HSCALE subroutine once for each horizontal scale desired. Each scale requires that a separate argument list be provided by the SYMGEN.

Figure 18 is an example of a horizontal scale which was produced by the calling sequence accompanying the figure.

(7) Vertical Bar (VBAR) subprogram. The VBAR subprogram provides for the generation of a vertical bar symbol emanating from a prescribed origin and whose length can be controlled to extend in either an upward or downward direction. The VBAR subroutine argument list, as defined below, must be pre-set in the SYMGEN routine in the order specified. The suffix, small n, is used to differentiate between two or more VBAR symbols. The present configuration of the SYMGEN permits two vertical bar symbols in which n equals 0 and 1.

- YBARn -- Symbol input drive variable (fl pt) maximum absolute value - 1.0
- KABARn -- Scaling parameter (fl pt)
- KBBARn -- Scaline parameter (fl pt)
- HPVBn -- Raster word column number of symbol horizontal position (integer)
- BARSLn -- Bar position select code within the word column (integer)
- VBULn -- VBAR symbol upper limit (fl pt)
- VBLLn -- VBAR symbol lower limit (fl pt)

Figure 19 shows an example of a vertical bar symbol used in conjunction with a vertical scale. The VBAR symbol was produced by the calling sequence accompanying the figure. For this example, the bar originates from raster line 224 and limits at raster line 32 in the upward direction.

Assignment of value of \emptyset (integer format) to HPVBO places the vertical bar in raster word column \emptyset (to coincide with the vertical scale). Assignment of any other value to this argument will place the bar in one of the other word columns and out of proximity of the scale.

The input variable YBAR \emptyset has been given an upper limit (VBULO = 1. \emptyset) and a lower limit (VBLL \emptyset = \emptyset . \emptyset).

Determination of KABAR \emptyset and KBBAR \emptyset can be accomplished using the linear relationship which exists between the scaled input YBAR \emptyset and the TV raster variable Y_R ($\emptyset \leq Y_R \leq 255$)

$$Y_R = \text{KABAR}\emptyset * \text{YBAR}\emptyset + \text{KBBAR}\emptyset$$

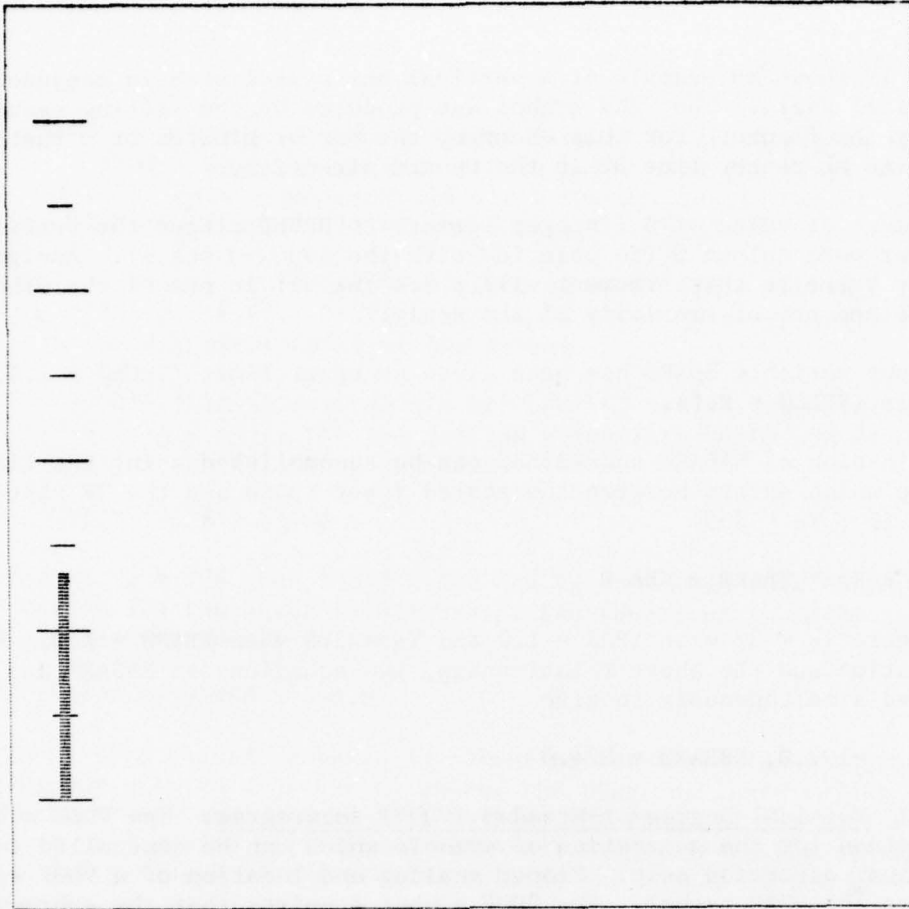
From the figure $Y_R = 32$ when $\text{YBAR} = 1.\emptyset$ and $Y_R = 224$ when $\text{YBAR} = \emptyset.\emptyset$. Using this information and the above relationship, two equations in KABAR \emptyset and KBBAR \emptyset can be solved simultaneously to give

$$\text{KABAR}\emptyset = -192.\emptyset, \text{KBBAR}\emptyset = 224.\emptyset$$

(8) Vertical Degree-of-Freedom (VDOF) subprogram. The VDOF subprogram provides for the generation of symbols which can be controlled to move in the vertical direction only. Proper scaling and location of a VDOF symbol is similar to the VBAR symbol. The VDOF symbol requires that the subrouting arguments, as defined below, be pre-set in the SYMGEN in the order specified. The suffix, small n, serves as a VDOF symbol identifier. The present configuration of the SYMGEN permits a total of nine VDOF symbols to be generated per frame.

YDOFn -- Symbol input device command (+ 1.0 max value, fl pt)
 KAVDn -- Scaling parameter (fl pt)
 KBVDn -- Scaling parameter (fl pt)
 HPVDn -- Raster word column number of symbol horizontal position (integer)
 VDSELn -- VDOF symbol selection code (integer)
 VDULn -- VDOF symbol upper limit (fl pt)
 VDLLn -- VDOF symbol lower limit (fl pt)

Figure 20 shows an example of a VDOF symbol (right pointing indicator) used in conjunction with a vertical scale. The VDOF symbol was produced by the calling sequence and argument list accompanying the figure. For this example, the pointer is free to move to raster line 32 in the upward direction and raster line 224 in the downward direction. The pointers' zero position is raster line 224.

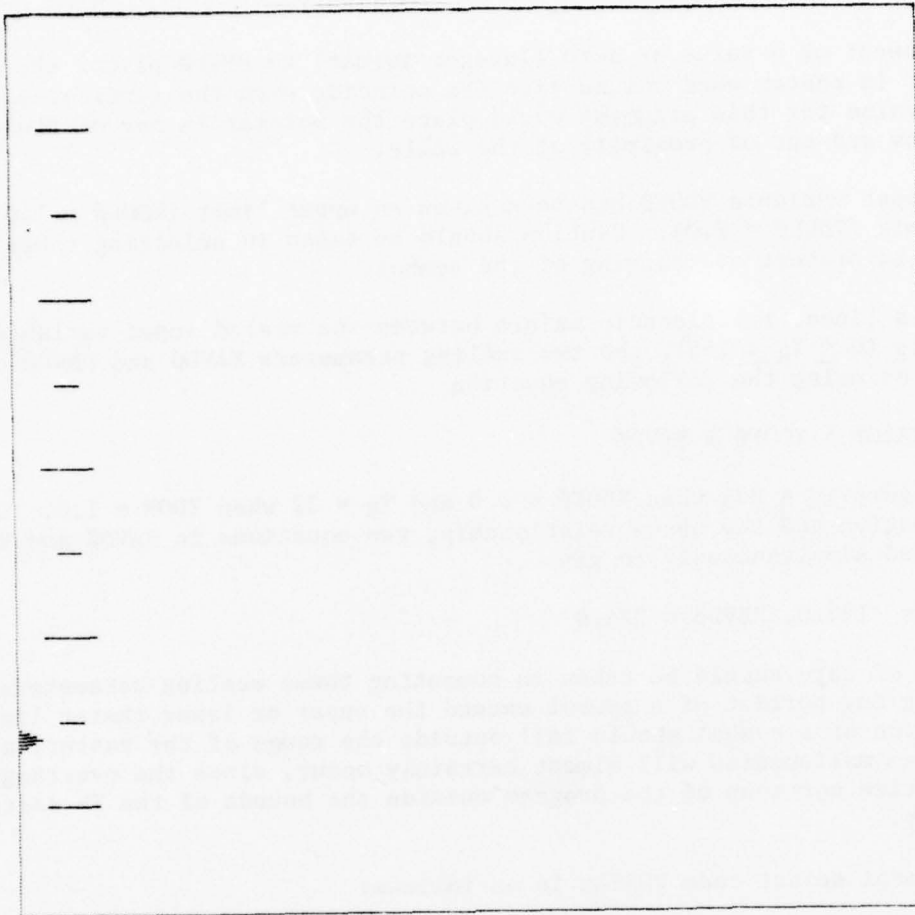


```

260
261
262
263 0A07E 41086 3FD55326 YBAR0 DEC 0.3333 COMMANDED BAR LENGTH
264 0A080 41088 04200000 KABAR0 DEC -192.0 SCALING PARAMETER
265 0A082 41090 44700000 KBBAR0 DEC 224.0 SCALING PARAMETER
266 0A084 41092 00000000 HPVB0 DEC 0 BAR WORD COLUMN POSITION
267 0A086 41094 00000002 BARSL0 DEC 2 BAR POSITION WITHIN THE WORD COLUMN
268 0A088 41096 40000000 VBUL0 DEC 1.0 BAR UPPER COMMAND LIMIT
269 0A08A 41098 00000000 VBLL0 DEC 0.0 BAR LOWER COMMAND LIMIT
270
271
272
273 0A08C 41100 64046AAE JS VSCALE GENERATE A VERTICAL
274 0A08E 41102 0400A052 PTR HPOS0 VSCALE ARGUMENT
275 0A090 41104 64046B8A JS VBAR CALL THE BAR SUBROUTINE
276 0A092 41106 0400A07E PTR YBAR0 PCINTER TO THE FIRST ARGUMENT
277
278
279

```

Figure 19. VBAR symbol with argument list and calling sequence



0A09E	41118	3EE66666	YDOF0	DEC	0.1	COMMANDED SYMBOL POSITION
0A0A0	41120	04200000	KAVD0	DEC	-192.0	SCALING PARAMETER
0A0A2	41122	44700000	KBVD0	DEC	224.0	SCALING PARAMETER
0A0A4	41124	00000000	HPVD0	DEC	0	HORIZONTAL WORD COLUMN POSITION
0A0A6	41126	00000001	VDSEL0	DEC	1	SYMBOL SELECT CODE - RT POINTING IND
0A0A8	41128	40000000	VDUL0	DEC	1.0	SYMBOL UPPER LIMIT
0A0AA	41130	00000000	VDLL0	DEC	0.0	SYMBOL LOWER LIMIT
0A0AC	41132	64040AAE		JS	VSCALE	GENERATE A VERTICAL SCALE
0A0AE	41134	0400A052		PTR	HPOS0	VSCALE ARGUMENT
0A0B0	41136	64046C16		JS	VDOF	CALL THE VDOF SUBROUTINE
0A0B2	41138	0400A09E		PTR	YDOF0	POINTER TO THE FIRST ARGUMENT

Figure 20. VDOF symbol with argument list and calling sequence

Assignment of the value of zero (integer format) to argument VDSELØ causes the VDOF routine to select a left pointing indicator. Assignment of the value of one to this argument would cause the VDOF to select a right pointing indicator.

Assignment of a value of zero (integer format) to HPVDØ places the selected pointer in raster word column zero (to coincide with the vertical scale). Any other value for this argument would place the pointer in one of the other word columns and out of proximity of the scale.

The input variable YDOFØ has been given an upper limit (VDULØ = 1.0) and a lower limit (VDLLØ = 0.0). Caution should be taken in selecting these limit parameters to prevent overranging of the symbol.

Since a linear relationship exists between the scaled input variable YDOFØ and Y_R ($0 \leq Y_R \leq 255$), the two scaling parameters KAVDØ and KBVDØ can be determined by using the following equation

$$Y_R = KAVDØ * YDOFØ + KBVDØ$$

From the figure Y_R = 224 when YDOFØ = 0.0 and Y_R = 32 when YDOF = 1.0. Using this information and the above relationship, two equations in KAVDØ and KBVDØ can be solved simultaneously to give

$$KAVDØ = -192.0, KBVDØ = 224.0$$

Some degree of care should be taken in computing these scaling parameters to avoid having any portion of a symbol exceed the upper or lower raster line. If any portion of a symbol should fall outside the range of the raster, a computer program malfunction will almost certainly occur, since the overranging will over-write portions of the program outside the bounds of the TV raster memory array.

The symbol select code VDSELn is as follows:

<u>n</u>	<u>Symbol</u>
0	Right pointing indicator
1	Left pointing indicator
2	Ref mark - right side of scale
3	Ref mark - left side of scale
4	CRUISE alpha symbol
5	TRANS alpha symbol
6	HOVER alpha symbol
7	BOB-UP alpha symbol

(9) Vertical and Horizontal Degree-of-Freedom (XYDOF) subprogram.

The XYDOF subprogram provides for the generation of fixed size symbols which can be controlled to move in the vertical and horizontal directions. Proper selection and scaling of an XYDOF symbol requires that the subroutine arguments, as defined below, be pre-set in the SYMGEN routine in the order specified. The suffix, small n, serves as an XYDOF symbol identifier. The present configuration of SYMGEN permits a total of 13 XYDOF symbols to be generated per frame.

- XFXn -- Symbol input horizontal drive (fl pt maximum absolute value = 1.0)
- YFXn -- Symbol input vertical drive variable (fl pt maximum absolute value = 1.0)
- KAFXn -- Scaling parameter - vertical input (fl pt format)
- KBFXn -- Scaling parameter - vertical input (fl pt)
- KCFXn -- Scaling parameter - horizontal input (fl pt)
- KDFXn -- Scaling parameter - horizontal input (fl pt)
- XYn -- XYDOF symbol selection code (integer)

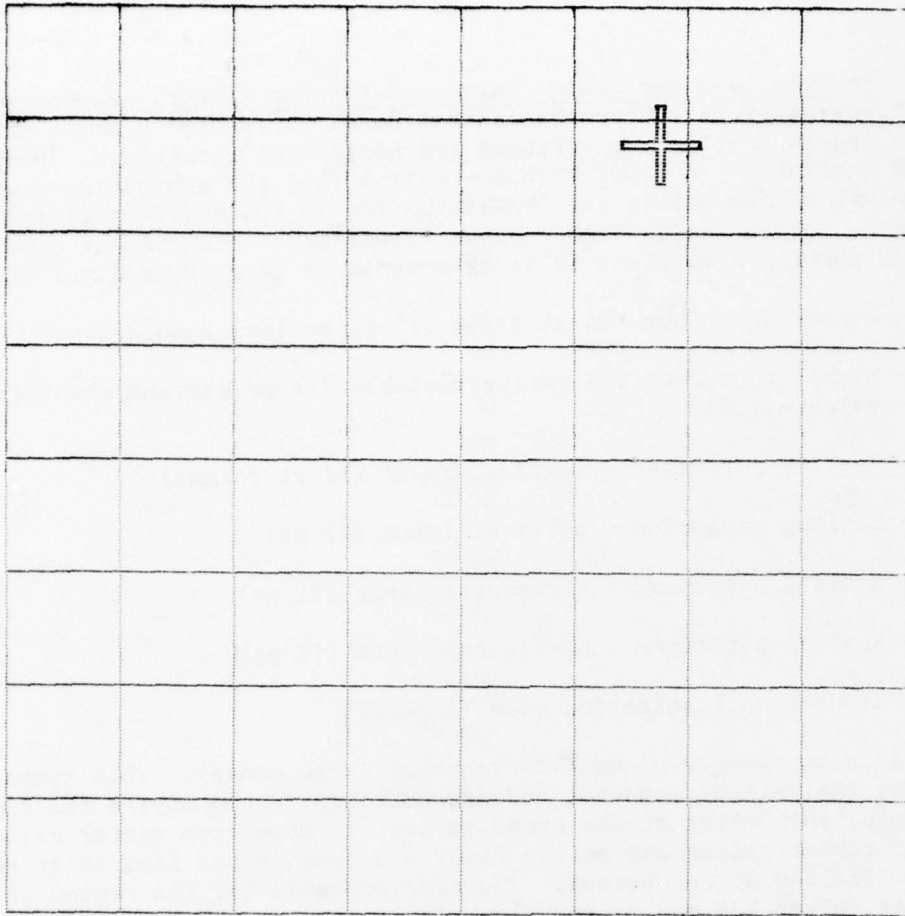
Figure 21 is an example of an XYDOF symbol (large cross). This symbol was produced by the calling sequence and argument list accompanying the figure. For this example, the center of the cross is free to move from raster column 16 on the left to raster column 240 on the right and from raster line 16 at the top to raster line 240 at the bottom. The zero position for the center of the cross is raster column 128 and raster line 128.

As in the case of all other symbols, when determining the pre-set values of the scaling parameters, care should be taken to prevent overranging of the symbols, since this will over-write portions of the program outside the bounds of the TV raster memory array and cause the program to "hang up" during execution. Since, for the XYDOF subprogram, the YFXn and XFXn variables are limited to ± 1.0 internal to the program and cannot be adjusted (as in the VDOF program), additional care must be taken when determining the scaling parameters to insure that the full range of these variables is allowed. A further consideration which must be made in preventing overranging is to include the overall size of the symbol when computing the scaling parameters. Even though the symbol sizes vary, each symbol should be assumed to 32 by 32 bits (no XYDOF symbol exceeds this size), and scaled to limit at least 16 bits from the outside edge of the raster array.

Determination of the scaling parameters for the example uses the linear relationship that exists between the raster coordinate system (X_R , Y_R) and the input coordinate system (X_{FX2} , Y_{FX2}).

$$Y_R = KAFX2 * Y_{FX2} + KBFX2$$

$$X_R = KCFX2 * X_{FX2} + KDFX2$$



```

310
311
312
313 0A0BE 41150 40400000 XFX2 DEC 0.5 COMMANDED SYMBOL HORIZONTAL POSITION
314 0A0C0 41152 40666666 YFX2 DEC 0.8 COMMANDED SYMBOL VERTICAL POSITION
315 0A0C2 41154 03900000 KAFX2 DEC -112.0 SCALING PARAMETER
316 0A0C4 41156 44400000 KBFX2 DEC 128.0 SCALING PARAMETER
317 0A0C6 41158 43F00000 KCFX2 DEC 112.0 SCALING PARAMETER
318 0A0C8 41160 44400000 KDFX2 DEC 128.0 SCALING PARAMETER
319 0A0CA 41162 00000002 XY2 DEC 2 SYMBOL SELECT CODE - LARGE CROSS
320
321
322
323 0A0C0 41164 64046CF2 JS XYDOF CALL THE XYDOF SUBROUTINE
324 0A0CE 41166 0400A0BE PTR XFX2 POINTER TO THE FIRST ARGUMENT
325
326
327

```

Figure 21. XYDOF symbol with argument list and calling sequence

From Figure 21, it can be seen that

$$Y_R = 16 \text{ when } YFX2 = 1.0$$

$$Y_R = 240 \text{ when } YFX2 = -1.0$$

$$X_R = 16 \text{ when } YFX2 = -1.0$$

$$X_R = 240 \text{ when } XFX2 = 1.0$$

Using this information, two equations in KAFX2 and KBFX2 are solved simultaneously to obtain

$$KAFX2 = -112.0 \text{ and } KBFX2 = 128.0$$

and two equations in KCFX2 and KDFX2 are solved to obtain

$$KCFX2 = +112.0 \text{ and } KDFX2 = 128.0$$

The symbol select code XYn is as follows:

<u>n</u>	<u>Symbol</u>
0	Male Symbol
1	Female Symbol
2	Large Cross
3	Small Cross
4	Large Circle
5	Small Circle
6	Small Solid Circle
7	Down Pointer
8	Up Pointer
9	Diamond
10	Large Segmented Circle
11	Large Square
12	Attitude Reference Mark

6. SUMMARY OF EXECUTION TIMES AND MEMORY REQUIREMENTS FOR THE DSG SUBROUTINES

To enable a user to estimate the memory requirements and execution time for a particular symbol set, the following table contains a summary of this information for each of the subroutines and the SYMGEN routine. Some of the

execution times for the individual symbol types may vary, depending on the symbol's size. For example, a short vertical bar will take less execution time than a long bar. For these cases, a range is specified.

<u>Routine</u>	<u>Memory Requirement (Full Words)</u>	<u>Execution Time (ms)</u>
SYMGEN	471	1
ATLINE	297	6
VECTOR	240	2-6
AIRSPD	365	2
COMPASS	465	3
VSCALE	50	.25
HSCALE	60	.75
VBAR	70	.1-1
VDOF	110	.25
XYDOF	360	1
DROUT	200	1-2

APPENDIX A

DIGITAL SYMBOLOGY GENERATOR COMPUTER LISTINGS

This appendix contains the SKC-2000 airborne computer assembly language instruction mnemonics (Table A1) and the complete SKC-2000 computer listings for the routines described in this report.

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

1				
2				* STARTING LOCATIONS FOR SUBPROGRAMS AND STORAGE
3	00436	1078	COSF SETX	0436
4	00444	1092	COSFA SETX	0444
5	006BA	1722	SINF SETX	06BA
6	006C6	1734	SINFA SETX	06C6
7	0070C	1804	TANF SETX	070C
8	00718	1816	TANFA SETX	0718
9	03E00	15872	LSICMN SETD	15872
10	07A00	31232	TODBUG SETX	7A00
11	06000	24576	ATLINE SETD	24576
12	06252	25170	VECTOR SETD	25170
13	06432	25650	COMPASS SETD	25650
14	067D4	26580	AIRSPD SETD	26580
15	06AAE	27310	VSCALE SETD	27310
16	06B12	27410	HSCALE SETD	27410
17	06B8A	27530	VBAR SETD	27530
18	06C16	27670	VDOF SETD	27670
19	06CF2	27890	XYDOF SETD	27890
20	06F02	28610	DRDOUT SETD	28610
21	07152	29010	SYMGEN SETD	29010
22	074D6	29910	DMAOUT SETD	29910
23	08000	32768	CORECMN SETD	32768
24	094D4	38100	ALFANU SETD	38100
25	04000	16384	MAIN SETX	4000
26	04100	16640	PRNTSM SETX	4100
27				*
28				*COMMON SET SYMBOLS
29	01000	4096	RSTRW SETD	4096 *NO. OF RASTER WORDS
30	00800	2048	HRSTRW SETD	2048 * RSTRW/2
31	00100	256	RL SETD	256 *NO. OF RASTER LINES
32	00200	512	RLX2 SETD	512 *2*(RL)
33	00008	8	LGRL SETD	8 *LOG2(RL)
34	00080	128	HRL SETD	128 *RL/2
35	00007	7	LGHRL SETD	7 *LOG2(HRL)
36	03008	8	WPL SETD	8 *NO. OF 32 BIT WORDS/LINE
37	00003	3	LGWPL SETD	3 *LOG2(WPL)
38	00010	16	WPLX2 SETD	16 *2*(WPL)
39	00100	256	BPL SETD	256 *NO. OF BITS/LINE
40	00008	8	LGBPL SETD	8 *LOG2(BPL)
41	00200	512	BPLX2 SETD	512 *2*(BPL)
42	00020	32	BPW SETD	32 *NO. OF BITS/WORD
43	00005	5	LGBPW SETD	5 *LOG2(BPW)
44	00040	64	BPWX2 SETD	64 *2*(BPW)
45				*
46	03E00	15872	ORG	LSICMN
47	03E00	15872	ARGLST BSS	20 STORAGE FOR ARGUMENT LISTS XFERED INTO EACH SUBROUTINE
48	03E14	15892	TEMP BSS	10
49				*
50	08000	32768	ORG	CORECMN
51	08000	32768	TVRSTR BSS	RSTRW

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

52	09000	36864		COSTBL	BSS	RLX2+2
53	09202	37378		TANTBL	BSS	RLX2+2
54	09404	37892	00000001	BMSK0	HEX	1
55	09406	37894	00000002		HEX	2
56	09408	37896	00000004		HEX	4
57	0940A	37898	00000008		HEX	8
58	0940C	37900	00000010		HEX	10
59	0940E	37902	00000020		HEX	20
60	09410	37904	00000040		HEX	40
61	09412	37906	00000080		HEX	80
62	09414	37908	00000100		HEX	100
63	09416	37910	00000200		HEX	200
64	09418	37912	00000400		HEX	400
65	0941A	37914	00000800		HEX	800
66	0941C	37916	00001000		HEX	1000
67	0941E	37918	00002000		HEX	2000
68	09420	37920	00004000		HEX	4000
69	09422	37922	00008000		HEX	8000
70	09424	37924	00010000		HEX	10000
71	09426	37926	00020000		HEX	20000
72	09428	37928	00040000		HEX	40000
73	0942A	37930	00080000		HEX	80000
74	0942C	37932	00100000		HEX	100000
75	0942E	37934	00200000		HEX	200000
76	09430	37936	00400000		HEX	400000
77	09432	37938	00800000		HEX	800000
78	09434	37940	01000000		HEX	1000000
79	09436	37942	02000000		HEX	2000000
80	09438	37944	04000000		HEX	4000000
81	0943A	37946	08000000		HEX	8000000
82	0943C	37948	10000000		HEX	10000000
83	0943E	37950	20000000		HEX	20000000
84	09440	37952	40000000		HEX	40000000
85	09442	37954	80000000		HEX	80000000
86	09444	37956	80000000	BMSK1	HEX	80000000
87	09446	37958	40000000		HEX	40000000
88	09448	37960	20000000		HEX	20000000
89	0944A	37962	10000000		HEX	10000000
90	0944C	37964	08000000		HEX	8000000
91	0944E	37966	04000000		HEX	4000000
92	09450	37968	02000000		HEX	2000000
93	09452	37970	01000000		HEX	1000000
94	09454	37972	00800000		HEX	800000
95	09456	37974	00400000		HEX	400000
96	09458	37976	00200000		HEX	200000
97	0945A	37978	00100000		HEX	100000
98	0945C	37980	00020000		HEX	80000
99	0945E	37982	00040000		HEX	40000
100	09460	37984	00020000		HEX	20000
101	09462	37986	00010000		HEX	10000
102	09464	37988	00008000		HEX	8000
103	09466	37990	00004000		HEX	4000
104	09468	37992	00002000		HEX	2000
105	0946A	37994	00001000		HEX	1000
106	0946C	37996	00000800		HEX	800
107	0946E	37998	00000400		HEX	400
108	09470	38000	00000200		HEX	200
109	09472	38002	00000100		HEX	100
110	09474	38004	00000080		HEX	80
111	09476	38006	00000040		HEX	40
112	09478	38008	00000020		HEX	20
113	0947A	38010	00000010		HEX	10
114	0947C	38012	00000008		HEX	8
115	0947E	38014	00000004		HEX	4
116	09480	38016	00000002		HEX	2
117	09482	38018	00000001		HEX	1
118	09484	38020	00000000	ZERO	HEX	0 = ZERO
119	09404	37892		IONE	EQU	BMSK0 = INTEGER ONE
120	09486	38022	FFFFFFFF	ONES	HEX	FFFFFFFF = ALL BITS SET
121	09446	37958		XHALF	EQU	BMSK1+2 = .500 FX. PT.
122	09488	38024	7FFFFFFF	PLUS1	HEX	7FFFFFFF = +1.000 FX. PT.
123	09444	37956		MINUS1	EQU	BMSK1 = -1.000 FX. PT.
124	09484	38020		FZERO	EQU	ZERO = FL. PT. 0.0
125	0948A	38026	40C00000	ONE	DEC	1.0 = FL. PT. ONE

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126 0948C 38028 00000000 MONE DEC -1.0 --1.0 FL. PT.
127 0948E 38030 40400000 FHALF DEC 0.5 --+0.5 FL. PT.
128 09490 38032 BF800000 FMHALF DEC -0.5 -- -0.5 FL. PT.
129 09492 38034 44400000 F128 DEC 128.0 --FL PT 128.0
130 09494 38036 416487ED PI DEC 3.1415927 = PI
131 09496 38038 40E487EB PIOV2 DEC 1.570796 = (PI/2)
132 09498 38040 406487ED PIOV4 DEC 0.7853982 = (PI/4)
133 0949A 38042 TANFNC BSS 2
134 0949C 38044 GLBRTN BSS 2
135
136
137 * SYMGEN -- MAIN ROUTINE FOR GENERATION OF SYMBOLS
138 *
139 07152 29010 ORG SYMGEN
140 07152 29010 040071A6 PTP RTAMN
141 07154 29012 DC01718E START STS SAVS SAVE THE STATUS REG ,MEMORY INTRPTS SHOULD BE ENABLED
142 07156 29014 3C007190 STA SAVA SAVE THE A REG
143 07158 29016 7C007192 STB SAVB SAVE THE B REG
144 0715A 29018 1C007194 STX 0,SAVX SAVE THE INDEX REG USED BY THE SYMGEN ROUTINES
145 0715C 29020 1C207196 STX 4,SAVX+2
146 0715E 29022 1C307198 STX 6,SAVX+4
147 07160 29024 1C40719A STX 8,SAVX+6
148 07162 29026 1C48719C STX 9,SAVX+8
149 07164 29028 1C60719E STX 12,SAVX+10
150 07166 29030 1C6871A0 STX 13,SAVX+12
151 07168 29032 1C1871A2 STX 3,SAVX+14
152 0716A 29034 1C5071A4 STX 10,SAVX+16
153 0716C 29036 64307346 STRT0 JGU STRT1
154 0716E 29038 9C01718E RETURN LDS SAVS RESTORE THE STATUS REG
155 07170 29040 5C2071A6 LDX 4,RTAMN
156 07172 29042 6C220002 IMP 4,2,M
157 07174 29044 1C2071A6 STX 4,RTAMN
158 07176 29046 14007190 LDA SAVA RESTORE THE A REG
159 07178 29048 54007192 LDB SAVB RESTORE THE B REG
160 0717A 29050 5C007194 LDX 0,SAVX RESTORE THE INDEX REG USED BY THE SYMGEN ROUTINES
161 0717C 29052 5C207196 LDX 4,SAVX+2
162 0717E 29054 5C307198 LDX 6,SAVX+4
163 07180 29056 5C40719A LDX 8,SAVX+6
164 07182 29058 5C48719C LDX 9,SAVX+8
165 07184 29060 5C60719E LDX 12,SAVX+10
166 07186 29062 5C6871A0 LDX 13,SAVX+12
167 07188 29064 5C1871A2 LDX 3,SAVX+14
168 0718A 29066 5C5071A4 LDX 10,SAVX+16
169 0718C 29068 740071A6 RTA RTAMN RETURN TO THE MAIN PROGRAM
170
171 * STORAGE FOR SAVING THE REGISTERS
172 0718E 29070 SAVS BSS 2
173 07190 29072 SAVA BSS 2
174 07192 29074 SAVB BSS 2
175 07194 29076 SAVX BSS 18
176 071A6 29094 00009CEC RTAMN HEX 9CEC SUBROUTINE RETURN ADDRESS
177
178 * SYMBOL DRIVE INPUT STORAGE AND ARGUMENT LISTS
179
180 * ATLINE ARGUMENT LIST
181 071A8 29096 3FC00000 FI DEC 0.3 COMMANDED POLL ANGLE - RADIANs
182 071AA 29098 BF199999 TH DEC -0.2 COMMANDED PITCH ANGLE - RADIANs
183
184 071AC 29100 00000000 X1 DEC 0.0 BASE POINT X COMMAND
185 071AE 29102 00000000 Y1 DEC 0.0 BASE POINT Y COMMAND
186 071B0 29104 40600000 X2 DEC 0.75 END POINT X COMMAND
187 071B2 29106 3FC00000 Y2 DEC 0.25 END POINT Y COMMAND
188 071B4 29108 42C00000 MARGIN DEC 16.0 WIDTH OF OUTER BOUNDARY
189
190 071B6 29110 00000000 * VSCALE NO. 0 ARGUMENT LIST
191 071B8 29112 00000000 HPOS0 DEC 0 SCALE POSITION
192 071BA 29114 00000018 VSCALE0 DEC 128 SCALE CENTER - RASTER LINE NO.
193 071BC 29116 00000008 VMRKS0 DEC 24 NO. OF RASTER LINES BETWEEN MARKS
194 071BE 29118 00000008 VMRKS0 DEC 8 NO. OF SCALE MARKS - EXCLUDING CENTER MARK

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194                                     * VSCALE NO. 1 ARGUMENT LIST
195 0718E 29118 00000007 HPOS1 DEC 7 SCALE POSITION
196 071C0 29120 00000020 VSCLC1 DEC 128 SCALE CENTER - RASTER LINE NO.
197 071C2 29122 00000008 VSPC1 DEC 8 NO. OF RASTER LINES BETWEEN MARKS
198 071C4 29124 00000018 VMFKS1 DEC 24 NO. OF SCALE MARKS - EXCLUDING CENTER MARK
199                                     * HSCALE NO. 0 ARGUMENT LIST
200 071C6 29126 000000E0 VPOS0 DEC 224 VERTICAL POSITION - RASTER LINE NO.
201 071C8 29128 00000003 HSTRTO DEC 3 STARTING WORD COLUMN NO. OF SCALE
202 071CA 29130 00000002 HMSK0 DEC 2 NO. OF DIVISIONS / WORD COLUMN
203 071CC 29132 00000002 HSIZE0 DEC 2 WIDTH OF SCALE IN WORD COLUMNS
204                                     * HSCALE NO. 1 ARGUMENT LIST
205 071CE 29134 00000020 VPOS1 DEC 32 VERTICAL POSITION - RASTER LINE NO.
206 071D0 29136 00000003 HSTR1 DEC 3 STARTING WORD COLUMN NO. OF SCALE
207 071D2 29138 00000002 HMSK1 DEC 2 NO. OF DIVISIONS / WORD COLUMN
208 071D4 29140 00000002 HSIZE1 DEC 2 WIDTH OF SCALE IN WORD COLUMNS
209                                     * VBAR NO. 0 ARGUMENT LIST
210 071D6 29142 3FD55326 YBAR0 DEC 0.3333 COMMANDED BAR LENGTH
211 071D8 29144 C4200000 KABAR0 DEC -192.0 SCALING PARAMETER
212 071DA 29146 44700000 KBBAR0 DEC 224.0 SCALING PARAMETER
213 071DC 29148 00000000 HPVB0 DEC 0 HORIZONTAL BAR POSITION - WORD COLUMN 1
214 071DE 29150 00000002 BARSL0 DEC 2 BAR POSITION WITHIN THE WORD COLUMN
215 071E0 29152 40C00000 VBUL0 DEC 1.0 BAR MAXIMUM COMMAND LIMIT
216 071E2 29154 00000000 VBLLO DEC 0.0 BAR LOWER COMMAND LIMIT
217                                     * VBAR NO. 1 ARGUMENT LIST
218 071E4 29156 BFAAACD9 YBAR1 DEC -0.3333 COMMANDED BAR LENGTH
219 071E6 29158 C3A00000 KABAR1 DEC -96.0 SCALING PARAMETER
220 071E8 29160 44400000 KBBAR1 DEC 128.0 SCALING PARAMETER
221 071EA 29162 00000000 HPVB1 DEC 0 HORIZONTAL BAR POSITION - WORD COLUMN
222 071EC 29164 00000000 BARSL1 DEC 0 BAR POSITION WITHIN THE WORD COLUMN
223 071EE 29166 40C00000 VBUL1 DEC 1.0 BAR MAXIMUM COMMAND LIMIT
224 071F0 29168 C0000000 VBLL1 DEC -1.0 BAR LOWER COMMAND LIMIT
225                                     * VDOF NO. 0 ARGUMENT LIST
226 071F2 29170 3FE66666 YDOF0 DEC 0.1 COMMANDED SYMBOL POSITION
227 071F4 29172 C4200000 KAVD0 DEC -192.0 SCALING PARAMETER
228 071F6 29174 44700000 KBVD0 DEC 224.0 SCALING PARAMETER
229 071F8 29176 00000000 HPVD0 DEC 0 HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
230 071FA 29178 00000001 VDSEL0 DEC 1 SYMBOL SELECT CODE - RT POINTING INDICATOR
231 071FC 29180 40C00000 VDUL0 DEC 1.0 SYMBOL MAXIMUM COMMAND LIMIT
232 071FE 29182 00000000 VDLL0 DEC 0.0 SYMBOL LOWER COMMAND LIMIT
233                                     * VDOF NO. 1 ARGUMENT LIST
234 07200 29184 404CC000 YDOF1 DEC 0.6 COMMANDED SYMBOL POSITION
235 07202 29186 C3A00000 KAVD1 DEC -96.0 SCALING PARAMETER
236 07204 29188 44400000 KBVD1 DEC 128.0 SCALING PARAMETER
237 07206 29190 00000000 HPVD1 DEC 0 HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
238 07208 29192 00000000 VDSEL1 DEC 0 SYMBOL SELECT CODE - LEFT POINTING INDICATOR
239 0720A 29194 40C00000 VDUL1 DEC 1.0 SYMBOL MAXIMUM COMMAND LIMIT
240 0720C 29196 C0000000 VDLL1 DEC -1.0 SYMBOL LOWER COMMAND LIMIT
241                                     * AIRSPEED ARGUMENT LIST
242 0720E 29198 00000000 ASPD DEC 0.0 AIRSPEED INPUT COMMAND
243 07210 29200 00000061 DEC 97
244 07212 29202 0000000E DEC 2062
245 07214 29204 000004FE DEC 1278
246 07216 29206 00000000 HEX 0
247 07218 29208 00000000 HEX 0
248 0721A 29210 00000000 HEX 0
249                                     * VDOF NO. 3 ARGUMENT LIST
250 0721C 29212 3FD55326 YDOF3 DEC 0.3333 COMMANDED SYMBOL POSITION
251 0721E 29214 C4200000 KAVD3 DEC -192.0 SCALING PARAMETER
252 07220 29216 44700000 KBVD3 DEC 224.0 SCALING PARAMETER
253 07222 29218 00000007 HPVD3 DEC 7 HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
254 07224 29220 00000001 VDSEL3 DEC 1 SYMBOL SELECT CODE - RT POINTING INDICATOR
255 07226 29222 40C00000 VDUL3 DEC 1.0 SYMBOL MAXIMUM COMMAND LIMIT
256 07228 29224 C0000000 VDLL3 DEC -1.0 SYMBOL LOWER COMMAND LIMIT
257                                     * VDOF NO. 4 ARGUMENT LIST
258 0722A 29226 00000000 YDOF4 DEC 0.0 COMMANDED SYMBOL POSITION
259 0722C 29228 C4200000 KAVD4 DEC -192.0 SCALING PARAMETER
260 0722E 29230 44700000 KBVD4 DEC 224.0 SCALING PARAMETER
261 07230 29232 00000000 HPVD4 DEC 0 HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
262 07232 29234 00000002 VDSEL4 DEC 2 SYMBOL SELECT CODE - LEFT SIDE REFERENCE MARK
263 07234 29236 40C00000 VDUL4 DEC 1.0 SYMBOL MAXIMUM COMMAND LIMIT
264 07236 29238 C0000000 VDLL4 DEC -1.0 SYMBOL LOWER COMMAND LIMIT
265                                     * VDOF NO. 5 ARGUMENT LIST

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266	07238	29240	00000000	YDOF5	DEC	0.0	COMMANDED SYMBOL POSITION
267	0723A	29242	C3A00000	KAVD5	DEC	-96.0	SCALING PARAMETER
268	0723C	29244	44400000	K3VD5	DEC	128.0	SCALING PARAMETER
269	0723E	29246	00000000	HPVD5	DEC	0	HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
270	07240	29248	00000003	VDSELS	DEC	3	SYMBOL SELECT CODE - RIGHT SIDE REFERENCE MARK
271	07242	29250	40C00000	VDUL5	DEC	1.0	SYMBOL MAXIMUM COMMAND LIMIT
272	07244	29252	C0000000	VDLL5	DEC	-1.0	SYMBOL LOWER COMMAND LIMIT
273				* VDOF NO. 6	ARGUMENT LIST		
274	07246	29254	00000000	YDOF6	DEC	0.0	COMMANDED SYMBOL POSITION
275	07248	29256	00000000	KAVD6	DEC	0.0	SCALING PARAMETER
276	0724A	29258	44700000	KBVD6	DEC	224.0	SCALING PARAMETER
277	0724C	29260	00000007	HPVD6	DEC	7	HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
278	0724E	29262	00000004	VDSEL6	DEC	4	SYMBOL SELECT CODE - FWD ALPHA CHAR
279	07250	29264	40C00000	VDUL6	DEC	1.0	SYMBOL MAXIMUM COMMAND LIMIT
280	07252	29266	C0000000	VDLL6	DEC	-1.0	SYMBOL LOWER COMMAND LIMIT
281				* VDOF NO. 7	ARGUMENT LIST		
282	07254	29268	00000000	YDOF7	DEC	0.0	COMMANDED SYMBOL POSITION
283	07256	29270	00000000	KAVD7	DEC	0.0	SCALING PARAMETER
284	07258	29272	44700000	KBVD7	DEC	224.0	SCALING PARAMETER
285	0725A	29274	00000007	HPVD7	DEC	7	HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
286	0725C	29276	00000005	VDSEL7	DEC	5	SYMBOL SELECT CODE - NOE ALPHA CHAR
287	0725E	29278	40C00000	VDUL7	DEC	1.0	SYMBOL MAXIMUM COMMAND LIMIT
288	07260	29280	C0000000	VDLL7	DEC	-1.0	SYMBOL LOWER COMMAND LIMIT
289				* VDOF NO. 8	ARGUMENT LIST		
290	07262	29282	00000000	YDOF8	DEC	0.0	COMMANDED SYMBOL POSITION
291	07264	29284	00000000	KAVD8	DEC	0.0	SCALING PARAMETER
292	07266	29286	44700000	KBVD8	DEC	224.0	SCALING PARAMETER
293	07268	29288	00000007	HPVD8	DEC	7	HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
294	0726A	29290	00000006	VDSEL8	DEC	6	SYMBOL SELECT CODE - HOV ALPHA CHAR
295	0726C	29292	40C00000	VDUL8	DEC	1.0	SYMBOL MAXIMUM COMMAND LIMIT
296	0726E	29294	C0000000	VDLL8	DEC	-1.0	SYMBOL LOWER COMMAND LIMIT
297				* VDOF NO. 9	ARGUMENT LIST		
298	07270	29296	00000000	YDOF9	DEC	0.0	COMMANDED SYMBOL POSITION
299	07272	29298	00000000	KAVD9	DEC	0.0	SCALING PARAMETER
300	07274	29300	44700000	KBVD9	DEC	224.0	SCALING PARAMETER
301	07276	29302	00000007	HPVD9	DEC	7	HORIZONTAL SYMBOL POSITION - WORD COLUMN NO.
302	07278	29304	00000007	VDSEL9	DEC	7	SYMBOL SELECT CODE - BOB ALPHA CHAR
303	0727A	29306	40C00000	VDUL9	DEC	1.0	SYMBOL MAXIMUM COMMAND LIMIT
304	0727C	29308	C0000000	VDLL9	DEC	-1.0	SYMBOL LOWER COMMAND LIMIT
305				* XYDOF NO. 0	ARGUMENT LIST		
306	0727E	29310	40400000	XFX0	DEC	0.5	COMMANDED HORIZONTAL SYMBOL POSITION
307	07280	29312	BF800000	YFX0	DEC	-0.5	COMMANDED VERTICAL SYMBOL POSITION
308	07282	29314	C3900000	KAFX0	DEC	-112.0	SCALING PARAMETER
309	07284	29316	44400000	KBFX0	DEC	128.0	SCALING PARAMETER
310	07286	29318	43F00000	KCFX0	DEC	112.0	SCALING PARAMETER
311	07288	29320	44400000	KDFX0	DEC	128.0	SCALING PARAMETER
312	0728A	29322	0000000B	XY0	DEC	11	SYMBOL SELECT CODE - LARGE BOX
313				* XYDOF NO. 1	ARGUMENT LIST		
314	0728C	29324	00000000	XFX1	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
315	0728E	29326	00000000	YFX1	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
316	07290	29328	00000000	KAFX1	DEC	0.0	SCALING PARAMETER
317	07292	29330	43440000	KBFX1	DEC	34.0	SCALING PARAMETER
318	07294	29332	43E00000	KCFX1	DEC	96.0	SCALING PARAMETER
319	07296	29334	44400000	KDFX1	DEC	128.0	SCALING PARAMETER
320	07298	29336	00000008	XY1	DEC	8	SYMBOL SELECT CODE - HEADING REF SYMBOL (UP POINTER)
321				* XYDOF NO. 2	ARGUMENT LIST		
322	0729A	29338	BF800000	XFX2	DEC	-0.5	COMMANDED HORIZONTAL SYMBOL POSITION
323	0729C	29340	40666666	YFX2	DEC	0.8	COMMANDED VERTICAL SYMBOL POSITION
324	0729E	29342	C3900000	KAFX2	DEC	-112.0	SCALING PARAMETER
325	072A0	29344	44400000	KBFX2	DEC	128.0	SCALING PARAMETER
326	072A2	29346	43F00000	KCFX2	DEC	112.0	SCALING PARAMETER
327	072A4	29348	44400000	KDFX2	DEC	128.0	SCALING PARAMETER
328	072A6	29350	00000002	XY2	DEC	2	SYMBOL SELECT CODE - LARGE CROSS
329				* XYDOF NO. 3	ARGUMENT LIST		
330	072A8	29352	C0199999	XFX3	DEC	-0.8	COMMANDED HORIZONTAL SYMBOL POSITION
331	072AA	29354	40400000	YFX3	DEC	0.5	COMMANDED VERTICAL SYMBOL POSITION
332	072AC	29356	C3900000	KAFX3	DEC	-112.0	SCALING PARAMETER
333	072AE	29358	44400000	KBFX3	DEC	128.0	SCALING PARAMETER
334	072B0	29360	43F00000	KCFX3	DEC	112.0	SCALING PARAMETER
335	072B2	29362	44400000	KDFX3	DEC	128.0	SCALING PARAMETER
336	072B4	29364	00000003	XY3	DEC	3	SYMBOL SELECT CODE - SMALL CROSS
337				* XYDOF NO. 4	ARGUMENT LIST		

338	072B6	29366	00000000	XFX4	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
339	072B8	29368	00000000	YFX4	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
340	072BA	29370	C3900000	KAFX4	DEC	-112.0	SCALING PARAMETER
341	072BC	29372	44400000	KBFX4	DEC	128.0	SCALING PARAMETER
342	072BE	29374	43F00000	KCFX4	DEC	112.0	SCALING PARAMETER
343	072C0	29376	44400000	KDFX4	DEC	128.0	SCALING PARAMETER
344	072C2	29378	00000004	XY4	DEC	4	SYMBOL SELECT CODE - LARGE CIRCLE
345				* XYDOF NO. 5 ARGUMENT LIST			
346	072C4	29380	40600000	XFX5	DEC	0.75	COMMANDED HORIZONTAL SYMBOL POSITION
347	072C6	29382	40400000	YFX5	DEC	0.5	COMMANDED VERTICAL SYMBOL POSITION
348	072C8	29384	C3900000	KAFX5	DEC	-112.0	SCALING PARAMETER
349	072CA	29386	44400000	KBFX5	DEC	128.0	SCALING PARAMETER
350	072CC	29388	43F00000	KCFX5	DEC	112.0	SCALING PARAMETER
351	072CE	29390	44400000	KDFX5	DEC	128.0	SCALING PARAMETER
352	072D0	29392	00000005	XY5	DEC	5	SYMBOL SELECT CODE - SMALL CIRCLE
353				* XYDOF NO. 6 ARGUMENT LIST			
354	072D2	29394	00000000	XFX6	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
355	072D4	29396	00000000	YFX6	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
356	072D6	29398	00000000	KAFX6	DEC	0.0	SCALING PARAMETER
357	072D8	29400	44700000	KBFX6	DEC	224.0	SCALING PARAMETER
358	072DA	29402	00000000	KCFX6	DEC	0.0	SCALING PARAMETER
359	072DC	29404	446E0000	KDFX6	DEC	220.0	SCALING PARAMETER
360	072DE	29406	00000006	XY6	DEC	6	SYMBOL SELECT CODE - SMALL SOLID CIRCLE
361				* XYDOF NO. 7 ARGUMENT LIST			
362	072E0	29408	00000000	XFX7	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
363	072E2	29410	00000000	YFX7	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
364	072E4	29412	00000000	KAFX7	DEC	0.0	SCALING PARAMETER
365	072E6	29414	43440000	KBFX7	DEC	34.0	SCALING PARAMETER
366	072E8	29416	43E00000	KCFX7	DEC	96.0	SCALING PARAMETER
367	072EA	29418	44400000	KDFX7	DEC	128.0	SCALING PARAMETER
368	072EC	29420	00000008	XY7	DEC	8	SYMBOL SELECT CODE - UP POINTER
369				* XYDOF NO. 8 ARGUMENT LIST			
370	072EE	29422	00000000	XFX8	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
371	072F0	29424	00000000	YFX8	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
372	072F2	29426	00000000	KAFX8	DEC	0.0	SCALING PARAMETER
373	072F4	29428	44400000	KBFX8	DEC	128.0	SCALING PARAMETER
374	072F6	29430	00000000	KCFX8	DEC	0.0	SCALING PARAMETER
375	072F8	29432	44400000	KDFX8	DEC	128.0	SCALING PARAMETER
376	072FA	29434	0000000C	XY8	DEC	12	SYMBOL SELECT CODE - ATTITUDE REF MARK
377				* XYDOF NO. 9 ARGUMENT LIST			
378	072FC	29436	BFA00000	XFX9	DEC	-0.375	COMMANDED HORIZONTAL SYMBOL POSITION
379	072FE	29438	00000000	YFX9	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
380	07300	29440	00000000	KAFX9	DEC	0.0	SCALING PARAMETER
381	07302	29442	44700000	KBFX9	DEC	224.0	SCALING PARAMETER
382	07304	29444	43400000	KCFX9	DEC	32.0	SCALING PARAMETER
383	07306	29446	44400000	KDFX9	DEC	128.0	SCALING PARAMETER
384	07308	29448	00000009	XY9	DEC	9	SYMBOL SELECT CODE - DIAMOND
385				* XYDOF NO. 10 ARGUMENT LIST			
386	0730A	29450	00000000	XFX10	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
387	0730C	29452	40400000	YFX10	DEC	0.5	COMMANDED VERTICAL SYMBOL POSITION
388	0730E	29454	C3900000	KAFX10	DEC	-112.0	SCALING PARAMETER
389	07310	29456	44400000	KBFX10	DEC	128.0	SCALING PARAMETER
390	07312	29458	43F00000	KCFX10	DEC	112.0	SCALING PARAMETER
391	07314	29460	44400000	KDFX10	DEC	128.0	SCALING PARAMETER
392	07316	29462	0000000A	XY10	DEC	10	SYMBOL SELECT CODE - BROKEN CIRCLE
393				* XYDOF NO. 11 ARGUMENT LIST			
394	07318	29464	00000000	XFX11	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
395	0731A	29466	00000000	YFX11	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
396	0731C	29468	C3900000	KAFX11	DEC	-112.0	SCALING PARAMETER
397	0731E	29470	44400000	KBFX11	DEC	128.0	SCALING PARAMETER
398	07320	29472	43F00000	KCFX11	DEC	112.0	SCALING PARAMETER
399	07322	29474	44400000	KDFX11	DEC	128.0	SCALING PARAMETER
400	07324	29476	0000000B	XY11	DEC	11	SYMBOL SELECT CODE - BOX
401				* XYDOF NO. 12 ARGUMENT LIST			
402	07326	29478	00000000	XFX12	DEC	0.0	COMMANDED HORIZONTAL SYMBOL POSITION
403	07328	29480	00000000	YFX12	DEC	0.0	COMMANDED VERTICAL SYMBOL POSITION
404	0732A	29482	00000000	KAFX12	DEC	0.0	SCALING PARAMETER
405	0732C	29484	44700000	KBFX12	DEC	224.0	SCALING PARAMETER
406	0732E	29486	43E00000	KCFX12	DEC	96.0	SCALING PARAMETER
407	07330	29488	44400000	KDFX12	DEC	128.0	SCALING PARAMETER
408	07332	29490	0000000C	XY12	DEC	12	SYMBOL SELECT CODE - SMALL SOLID BOX

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409 * COMPASS ARGUMENT LIST
410 07334 29492 00000000 HDG DEC 0.0 COMPASS INPUT COMMAND
411 * DRDOUT NO. 0 ARGUMENT LIST
412 07336 29494 44C38000 DGTIN0 DEC 270.0 COMMANDED INPUT DECIMAL NUMBER
413 07338 29496 00000003 NMB00 DEC 3 NUMBER OF ZEROS DISPLAYED FOR A ZERO INPUT
414 0733A 29498 00000010 STLNO DEC 16 STARTING RASTER LINE NUMBER
415 0733C 29500 00000008 STWCO DEC 8 STARTING WORD COLUMN NUMBER
416 0733E 29502 00000000 TITLE0 DEC 0 TITLE OF DECIMAL READOUT -- HDG
417 *
418 * LOCAL VARIABLES FOR THIS SUBROUTINE
419 07340 29504 00000000 SYMSEL DEC 0
420 07342 29506 64300000 JGUINS HEX 64300000 JUMP GLOBAL OPCODE
421 07344 29508 LOCRTN BSS 2
422 *
423 * THIS ROUTINE PERFORMS ONE TIME COMPUTATIONS AND SETS UP THE CODE TO ALLOW
424 * THIS SECTION TO BE SKIPPED ON SUBSEQUENT PASSES
425 07346 29510 6404749A STRT1 JS TRGTBL GENERATE THE TRIG TABLES
426 07348 29512 34007350 LAE STRT2
427 0734A 29514 A4007342 ADU JGUINS
428 0734C 29516 3C00716C STA STRT0
429 0734E 29518 6430716E JGU RETURN
430 *
431 * TRANSFER THE SYMBOL SELECT ARGUMENT
432 *
433 07350 29520 140471A6 STRT2 LDA RTAMN,I
434 07352 29522 3C007340 STA SYMSEL
435 *
436 07354 29524 0700 NOP CLEAR THE TVRSTR
437 * ROUTINE TO CALL THE SELECTED SYMBOL PROGRAMS
438 *
439 07355 29525 0700
439 07356 29526 14007340 LDA SYMSEL SYMSEL SPECIFIES WHICH SYMBOLS WERE SELECTED
440 07358 29528 8C009444 SAM BMSK1 CHECK IF SYMBOL 0 IS DESIRED
441 0735A 29530 6006 JU ++6
441 0735B 29531 0700
442 0735C 29532 64046000 JS ATLINE
443 0735E 29534 040071A8 PTR FI
444 07360 29536 14007340 LDA SYMSEL
445 07362 29538 8C009446 SAM BMSK1+2 CHECK IF SYMBOL 1 IS DESIRED
446 07364 29540 6006 JU ++6
446 07365 29541 0700
447 07366 29542 64046252 JS VECTOR
448 07368 29544 040071A0 PTR X1
449 0736A 29546 14007340 LDA SYMSEL
450 0736C 29548 8C009448 SAM BMSK1+4 CHECK IF SYMBOL 2 IS DESIRED
451 0736E 29550 6006 JU ++6
451 0736F 29551 0700
452 07370 29552 64046AAE JS VSCALE
453 07372 29554 040071B6 PTR HPOS0
454 07374 29556 14007340 LDA SYMSEL
455 07376 29558 8C00944A SAM BMSK1+6 CHECK IF SYMBOL 3 IS DESIRED
456 07378 29560 6006 JU ++6
456 07379 29561 0700
457 0737A 29562 64046AAE JS VSCALE
458 0737C 29564 040071BE PTR HPOS1
459 0737E 29566 14007340 LDA SYMSEL
460 07380 29568 8C00944C SAM BMSK1+8 CHECK IF SYMBOL 4 IS DESIRED
461 07382 29570 6006 JU ++6
461 07383 29571 0700
462 07384 29572 64046B12 JS HSCALE
463 07386 29574 040071C6 PTR VPOS0
464 07388 29576 14007340 LDA SYMSEL
465 0738A 29578 8C00944E SAM BMSK1+10 CHECK IF SYMBOL 5 IS DESIRED
466 0738C 29580 6006 JU ++6
466 0738D 29581 0700
467 0738E 29582 64046B12 JS HSCALE
468 07390 29584 040071CE PTR VPOS1
469 07392 29586 14007340 LDA SYMSEL
470 07394 29588 8C009450 SAM BMSK1+12 CHECK IF SYMBOL 6 IS DESIRED

```

471	07396	29590	6006	JU	*+6
471	07397	29591	0700		
472	07398	29592	6404688A	JS	VBAR
473	0739A	29594	040071D6	PTR	YBAR0
474	0739C	29596	14007340	LDA	SYMSEL
475	0739E	29598	8C009452	SAM	BMSK1+14 CHECK IF SYMBOL 7 IS DESIRED
476	073A0	29600	6006	JU	*+6
476	073A1	29601	0700		
477	073A2	29602	6404688A	JS	VBAR
478	073A4	29604	040071E4	PTR	YBAR1
479	073A6	29606	14007340	LDA	SYMSEL
480	073A8	29608	8C009454	SAM	BMSK1+16 CHECK IF SYMBOL 8 IS DESIRED
481	073AA	29610	6006	JU	*+6
481	073AB	29611	0700		
482	073AC	29612	64046C16	JS	VDOF
483	073AE	29614	040071F2	PTR	YDOF0
484	073B0	29616	14007340	LDA	SYMSEL
485	073B2	29618	8C009456	SAM	BMSK1+18 CHECK IF SYMBOL 9 IS DESIRED
486	073B4	29620	6006	JU	*+6
486	073B5	29621	0700		
487	073B6	29622	64046C16	JS	VDOF
488	073B8	29624	04007200	PTR	YDOF1
489	073BA	29626	14007340	LDA	SYMSEL
490	073BC	29628	8C009458	SAM	BMSK1+20 CHECK IF SYMBOL 10 IS DESIRED
491	073BE	29630	6006	JU	*+6
491	073BF	29631	0700		
492	073C0	29632	640467D4	JS	AIRSPD
493	073C2	29634	0400720E	PTR	ASP
494	073C4	29636	14007340	LDA	SYMSEL
495	073C6	29638	8C00945A	SAM	BMSK1+22 CHECK IF SYMBOL 11 IS DESIRED
496	073C8	29640	6006	JU	*+6
496	073C9	29641	0700		
497	073CA	29642	64046C16	JS	VDOF
498	073CC	29644	0400721C	PTR	YDOF3
499	073CE	29646	14007340	LDA	SYMSEL
500	073D0	29648	8C00945C	SAM	BMSK1+24 CHECK IF SYMBOL 12 IS DESIRED
501	073D2	29650	6006	JU	*+6
501	073D3	29651	0700		
502	073D4	29652	64046C16	JS	VDOF
503	073D6	29654	0400722A	PTR	YDOF4
504	073D8	29656	14007340	LDA	SYMSEL
505	073DA	29658	8C00945E	SAM	BMSK1+26 CHECK IF SYMBOL 13 IS DESIRED
506	073DC	29660	6006	JU	*+6
506	073DD	29661	0700		
507	073DE	29662	64046C16	JS	VDOF
508	073E0	29664	04007238	PTR	YDOF5
509	073E2	29666	14007340	LDA	SYMSEL
510	073E4	29668	8C009460	SAM	BMSK1+28 CHECK IF SYMBOL 14 IS DESIRED
511	073E6	29670	6006	JU	*+6
511	073E7	29671	0700		
512	073E8	29672	64046C16	JS	VDOF
513	073EA	29674	04007246	PTR	YDOF6
514	073EC	29676	14007340	LDA	SYMSEL
515	073EE	29678	8C009462	SAM	BMSK1+30 CHECK IF SYMBOL 15 IS DESIRED
516	073F0	29680	6006	JU	*+6
516	073F1	29681	0700		
517	073F2	29682	64046C16	JS	VDOF
518	073F4	29684	04007254	PTR	YDOF7
519	073F6	29686	14007340	LDA	SYMSEL
520	073F8	29688	8C009464	SAM	BMSK1+32 CHECK IF SYMBOL 16 IS DESIRED
521	073FA	29690	6006	JU	*+6
521	073FB	29691	0700		
522	073FC	29692	64046C16	JS	VDOF
523	073FE	29694	04007262	PTR	YDOF8
524	07400	29696	14007340	LDA	SYMSEL
525	07402	29698	8C009466	SAM	BMSK1+34 CHECK IF SYMBOL 17 IS DESIRED

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526	07404	29700	6006	JU	#+6
526	07405	29701	0700		
527	07406	29702	64046C16	JS	VDOF
528	07408	29704	04007270	PTR	VDOF9
529	0740A	29706	14007340	LDA	SYMSEL
530	0740C	29708	8C009468	SAM	BMSK1+36 CHECK IF SYMBOL 18 IS DESIRED
531	0740E	29710	6006	JU	#+6
531	0740F	29711	0700		
532	07410	29712	64046CF2	JS	XYDOF
533	07412	29714	0400727E	PTR	AFX0
534	07414	29716	14007340	LDA	SYMSEL
535	07416	29718	8C00946A	SAM	BMSK1+38 CHECK IF SYMBOL 19 IS DESIRED
536	07418	29720	6006	JU	#+6
536	07419	29721	0700		
537	0741A	29722	64046CF2	JS	XYDOF
538	0741C	29724	0400728C	PTR	AFX1
539	0741E	29726	14007340	LDA	SYMSEL
540	07420	29728	8C00946C	SAM	BMSK1+40 CHECK IF SYMBOL 20 IS DESIRED
541	07422	29730	6006	JU	#+6
541	07423	29731	0700		
542	07424	29732	64046CF2	JS	XYDOF
543	07426	29734	0400729A	PTR	AFX2
544	07428	29736	14007340	LDA	SYMSEL
545	0742A	29738	8C00946E	SAM	BMSK1+42 CHECK IF SYMBOL 21 IS DESIRED
546	0742C	29740	6006	JU	#+6
546	0742D	29741	0700		
547	0742E	29742	64046CF2	JS	XYDOF
548	07430	29744	040072A8	PTR	AFX3
549	07432	29746	14007340	LDA	SYMSEL
550	07434	29748	8C009470	SAM	BMSK1+44 CHECK IF SYMBOL 22 IS DESIRED
551	07436	29750	6006	JU	#+6
551	07437	29751	0700		
552	07438	29752	64046CF2	JS	XYDOF
553	0743A	29754	040072B6	PTR	AFX4
554	0743C	29756	14007340	LDA	SYMSEL
555	0743E	29758	8C009472	SAM	BMSK1+46 CHECK IF SYMBOL 23 IS DESIRED
556	07440	29760	6006	JU	#+6
556	07441	29761	0700		
557	07442	29762	64046CF2	JS	XYDOF
558	07444	29764	040072C4	PTR	AFX5
559	07446	29766	14007340	LDA	SYMSEL
560	07448	29768	8C009474	SAM	BMSK1+48 CHECK IF SYMBOL 24 IS DESIRED
561	0744A	29770	6006	JU	#+6
561	0744B	29771	0700		
562	0744C	29772	64046CF2	JS	XYDOF
563	0744E	29774	040072D2	PTR	AFX6
564	07450	29776	14007340	LDA	SYMSEL
565	07452	29778	8C009476	SAM	BMSK1+50 CHECK IF SYMBOL 25 IS DESIRED
566	07454	29780	6006	JU	#+6
566	07455	29781	0700		
567	07456	29782	64046CF2	JS	XYDOF
568	07458	29784	040072E0	PTR	AFX7
569	0745A	29786	14007340	LDA	SYMSEL
570	0745C	29788	8C009478	SAM	BMSK1+52 CHECK IF SYMBOL 26 IS DESIRED
571	0745E	29790	6006	JU	#+6
571	0745F	29791	0700		
572	07460	29792	64046CF2	JS	XYDOF
573	07462	29794	040072EE	PTR	AFX8
574	07464	29796	14007340	LDA	SYMSEL
575	07466	29798	8C00947A	SAM	BMSK1+54 CHECK IF SYMBOL 27 IS DESIRED
576	07468	29800	6006	JU	#+6
576	07469	29801	0700		
577	0746A	29802	64046CF2	JS	XYDOF
578	0746C	29804	040072FC	PTR	AFX9
579	0746E	29806	14007340	LDA	SYMSEL
580	07470	29808	8C00947C	SAM	BMSK1+56 CHECK IF SYMBOL 28 IS DESIRED
581	07472	29810	6006	JU	#+6
581	07473	29811	0700		
582	07474	29812	64046CF2	JS	XYDOF

LINE ABS. ADDRESS INPCODE SOURCE STATEMENT

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583 07476 29814 0400730A PTR XFX10
584 07478 29816 14007340 LDA SYMSEL
585 0747A 29818 8C00947E SAM BMSK1+58 CHECK IF SYMBOL 29 IS DESIRED
586 0747C 29820 6006 JU ++6
586 0747D 29821 0700
587 0747E 29822 64046CF2 JS XYDOF
588 07480 29824 04007318 PTR XFX11
589 07482 29826 14007340 LDA SYMSEL
590 07484 29828 8C009480 SAM BMSK1+60 CHECK IF SYMBOL 30 IS DESIRED
591 07486 29830 6006 JU ++6
591 07487 29831 0700
592 07488 29832 64046CF2 JS XYDOF
593 0748A 29834 04007326 PTR XFX12
594 0748C 29836 14007340 LDA SYMSEL
595 0748E 29838 8C009482 SAM BMSK1+62 CHECK IF SYMBOL 31 IS DESIRED
596 07490 29840 6006 JU ++6
596 07491 29841 0700
597 07492 29842 64046432 JS COMPASS
598 07494 29844 04007334 PTR HDG
599 07496 29846 640474D6 JS DMAOUT
600 07498 29848 6436716E JGU RETURN
601 *
602 *
603 * TRGTBL -- ROUTINE TO GENERATE TABLES OF TRIG FUNCTIONS FOR USE BY THE
604 * REAL TIME SUBROUTINES
605 03E16 15894 ANG EQU TEMP+2
606 03E18 15896 ANGINC EQU TEMP+4
607 03E00 15872 SUBSTK EQU ARG1ST TEMP STORAGE FOR THE ROM TRIG SUBROUTINES
608 *
609 0749A 29850 04007344 TRGTBL PTR LOCRTN
610 0749C 29852 5C323E12 LDX 6, SUBSTK+18, M
611 0749E 29854 14020100 LDA RL, M
612 074A0 29856 0420 CXF
613 074A1 29857 0700
613 074A2 29858 3C003E14 STA TEMP
614 074A4 29860 14009498 LDA PIOV4
615 074A6 29862 B4003E14 DVF TEMP
616 074A8 29864 3C003E18 STA ANGINC
617 *
618 074AA 29866 5C420000 LDX 8, 0, M
619 074AC 29868 14009484 LDA FZERO
620 074AE 29870 3C003E16 STA ANG
621 074B0 29872 3C409202 STA TANTBL, B
622 074B2 29874 1400948A LDA ONE
623 074B4 29876 3C409000 STA COSTBL, B
624 *
625 074B6 29878 6C420002 LOOPCN IMP 8, 2, M
626 074B8 29880 24430200 ICL 8, RLX2, M
627 074BA 29882 74007344 PTA LOCRTN
628 074BC 29884 14003E16 LDA ANG
629 074BE 29886 B0003E18 ADF ANGINC
630 074C0 29888 3C003E16 STA ANG
631 074C2 29890 64040444 JS COSFA
632 074C4 29892 3C409000 STA COSTBL, B
633 074C6 29894 14003E16 LDA ANG
634 074C8 29896 64040718 JS TANFA
635 074CA 29898 3C409202 STA TANTBL, B
636 074CC 29900 6096 JU LOOPCN
637 *
638 * ROUTINE TO OUTPUT THE TVRSTR TO THE DIGITAL TO VIDEO CONVERTER (DVC)
639 *
640 074CD 29901 0700
640 074DE 29910 ORG DMAOUT
641 074DE 29910 040074EA PTR DMARTH
642 074D8 29912 489B TSTWCZ DIA 19, K
643 074D9 29913 0700
643 074DA 29914 8C020001 SAM 1, M
644 074DC 29916 6084 JU TSTWCZ
644 074DD 29917 0700
645 074DE 29918 140074EB LDA UCCMP

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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646 074E0 29980 4890          DOA      19,K
647 074E1 29981      0700
647 074E2 29982 14020001      LDA      1,M      HARDWARE CLEAR THE TVRSTR
648 074E4 29984 4A99          DOA      10.0,K
649 074E5 29985      0700
649 074E6 29986 740074EA      RTA      DMARTN
650 074E8 29988 8CF080D0 WCCMP  HEX      8CF080D0  = 1'B COMPLEMENT OF 1840 AND THE HALF WRD STRTING ADDR
651 074EA 29990          DMARTN  BSS      2
652
653          *
653          * CLRSTR -- ROUTINE TO CLEAR THE TVRSTR
654 074E0 29992 04007344 CLRSTR  BTP      LOCRTN
655 074EE 29994 34007FFE      LAE      TVRSTR-2
656 074F0 29996 0500          EAB
657 074F1 29997      0700
657 074F2 29998 14020000      LDA      0,M
658 074F4 29940 0680          LXA      0
659 074F5 29941      0700
659 074F6 29942 5C42000F      LDX      2,WPLX2-1,M
660 074F8 29944 5C220080      LDX      4,HPL,M
661 074FA 29946 2A00      LOOP1  MFM      0.4 *XFERS (WPLX2*HRL) FULL WRDS
662 074FB 29947      0700
662 074FC 29948 6C430001      IMN      8.1,M
663 074FE 29950 643074FA      JGU      LOOP1
664 07500 29952 74007344      PTA      LOCRTN
665

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0 ERRORS

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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139 * ATLINE -- ATTITUDE LINE ROLLED AN ANGLE FIIN AND PITCHED AN ANGLE PTCH
140 *
141 06000 24576 ORC ATLINE
142 06000 24576 0400949C PTR GLBRTH
143 06002 24578 64306006 JGU STRIPT
144 * STORAGE FOR ARGUMENTS XFERED INTO THIS ROUTINE
145 03E00 15872 FIIN EQU ARGST
146 03E02 15874 THIN EQU ARGST+2
147 03E02 15874 PTCH EQU ARGST+2
148 06004 24580 LOOPTN BSS 2
149 06006 24582 5060949C STRIPT LDX 12, GLBRTH
150 06002 24584 34640000 LAE 0, 12, I
151 0600A 24586 06ER LXA 13
152 0600B 24587 0700
152 0600C 24588 60620002 IMP 12, 2, M
153 0600E 24590 1060949C STX 12, GLBRTH
154 06010 24592 14680000 LDA 0, 13
155 06012 24594 30003E00 STA FIIN
156 06014 24596 14680002 LDA 2, 13 A REG CONTAINS THIN
157 * MAKE THE POSITIVE SENSE OF A PITCH CHANGE DEFLECT THE ATLINE DOWN
158 06016 24598 9400948C HLF NONE
159 06018 24600 30003E02 STA THIN
160 * SCALE FIIN OVER (PI/2) AND CONVERT IT TO A FX PT NUMBER (B0)
161 0601A 24602 14003E00 LDA FIIN
162 0601C 24604 84009496 DVF PIOV2
163 0601E 24606 54020000 LDB 0, M
164 06020 24608 0400 CFX
165 06021 24609 0C01 SRAD 1
166 06022 24610 70003E00 STB FIIN
167 *
168 06024 24612 506A000E LDX 13, MPLX2-2, M INITIALIZE WORD COLUMN REG
169 06026 24614 5062003E LDX 12, BPWX2-2, M INITIALIZE BIT MASK REG
170 06028 24616 14003E00 LDA FIIN (B0, FX PT)
171 0602A 24618 54020000 LDB 0, M
172 0602C 24620 6620604C JG FIPOS
173 *
174 0602E 24622 00009486 FINEG EXO ONES CONV FIIN TO A (+) FX PT NO.
175 06030 24624 04009404 ABU IONE
176 06032 24626 30003E00 STA FIIN
177 06034 24628 80009446 SAM XHALF
178 06036 24630 64306044 JU CASE3 FIIN > (-PI/4)
179 06038 24632 14009488 CASE4 LDA PLUS1 FIIN < (-PI/4)
180 0603A 24634 14003E00 SBU FIIN
181 0603C 24636 84046064 JS TANFX COMP TRIG TBL INDEX AND FX PT TAN
182 0603E 24638 14003E02 LDA PTCH
183 06040 24640 662061A0 JG CASE4A PTCH > 0
184 06042 24642 6430621E JGU CASE4B PTCH < 0
185 *
186 06044 24644 64046064 CASE3 JS TANFX COMP TRIG TBL INDEX AND FX PT TAN
187 06046 24646 14003E02 LDA PTCH
188 06048 24648 662060F2 JG CASE3A PTCH > 0
189 0604A 24650 6430614E JGU CASE3B PTCH < 0
190 *
191 0604C 24652 80009446 FIPOS SAM XHALF
192 0604E 24654 600E JU CASE1 FIIN < (PI/4)
192 0604F 24655 0700
193 06050 24656 14009488 CASE2 LDA PLUS1 (PI/2 - FIIN)
194 06052 24658 14003E00 SBU FIIN -(PI/2 - FIIN)
195 06054 24660 64046064 JS TANFX COMP TRIG TBL INDEX AND FX PT TAN
196 06056 24662 14003E02 LDA PTCH
197 06058 24664 6620617A JG CASE2A PTCH > 0
198 0605A 24666 643061E4 JGU CASE2B PTCH < 0
199 *
200 0605C 24668 84046064 CASE1 JS TANFX COMP TRIG TBL INDEX AND FX PT TAN
201 0605E 24670 14003E02 LDA PTCH
202 06060 24672 6266 JG CASE1A PTCH > 0
203 06061 24673 0700
203 06062 24674 64306120 JGU CASE1B PTCH < 0
204 *
205 *
206 *
207 * ROUTINE TO COMPUTE AND LOAD THE TRIG TABLE INDEX INTO XR4 AND ALSO TO
208 * COMPUTE THE FX PT (B0) TAN( ). THE ROUTINE ASSUMES THAT THE ARGUMENT (B0) FOR
209 * THE TAN IS IN THE A REG. THE FX PT TANGENT IS STORED IN TANFNC.

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210 06064 24676 04006004 TANFX PTR LOCRTN
211 06066 24678 0500 EAB
212 06067 24679 080A SLLD LGRL+2
213 06068 24680 0841 SLL 1
214 06069 24681 06A0 LXA 4 XR4 = TRIG TABLE INDEX
215 0606A 24682 16009202 LDA TANTBL,4
216 0606C 24684 54020000 LDB 0,M
217 0606E 24686 0400 CFX
218 0606F 24687 0C01 SRAD 1
219 06070 24688 7C00949A STB TANFNC
220 06072 24690 74006004 RTA LOCRTN
221
222 *
223 * D1 -- 1.0 + TAN( ) - PTCH/COS( )
224 * THIS ROUTINE ASSUMES PTCH IS IN THE A REG AND XR4 CONTAINS THE TRIG TBL INDEX
225 * THE ROUTINE RETURNS WITH THE FX PT (B31) VALUE IN THE B REG.
225 06074 24692 04006004 D1 PTR LOCRTN
226 06076 24694 B6009000 DVF COSTBL,4
227 06078 24696 3C003E14 STA TEMP
228 0607A 24698 1400948A LDA ONE =1.0
229 0607C 24700 BE009202 ADF TANTBL,4 =1.0 + TAN( )
230 0607E 24702 FC003E14 SBF TEMP =1.0 + TAN( ) -PTCH/COS( )
231 06080 24704 54020000 LDB 0,M
232 06082 24706 0400 CFX
233 06083 24707 0C01 SRAD 1 =(1.0 + TAN( ) -PTCH/COS( ))/2.0 FX PT
234 06084 24708 67206088 JL OVRNG TEST FOR OVERRANGE
235 06086 24710 74006004 RTA LOCRTN
236 06088 24712 7400949C OVRNG RTA GLBRTN
237
238 *
239 * D2 -- 1.0 - TAN( ) - PTCH/COS( )
240 * THIS ROUTINE ASSUMES PTCH IS IN THE A REG AND XR4 CONTAINS THE TRIG TBL INDEX
241 * THE ROUTINE RETURNS WITH THE FX PT (B31) VALUE IN THE B REG.
241 0608A 24714 04006004 D2 PTR LOCRTN
242 0608C 24716 B6009000 DVF COSTBL,4
243 0608E 24718 3C003E14 STA TEMP
244 06090 24720 1400948A LDA ONE =1.0
245 06092 24722 FE009202 SBF TANTBL,4 =1.0 - TAN( )
246 06094 24724 FC003E14 SBF TEMP =1.0 - TAN( ) -PTCH/COS( )
247 06096 24726 54020000 LDB 0,M
248 06098 24728 0400 CFX
249 06099 24729 0C01 SRAD 1 =(1.0 - TAN( ) -PTCH/COS( ))/2.0 FX PT
250 0609A 24730 65206088 JN OVRNG TEST FOR OVERRANGE
251 0609C 24732 74006004 RTA LOCRTN
252
253 *
254 * D3 -- 1.0 - TAN( ) + PTCH/COS( )
255 * THIS ROUTINE ASSUMES PTCH IS IN THE A REG AND XR4 CONTAINS THE TRIG TBL INDEX
256 * THE ROUTINE RETURNS WITH THE FX PT (B31) VALUE IN THE B REG.
256 0609E 24734 04006004 D3 PTR LOCRTN
257 060A0 24736 B6009000 DVF COSTBL,4
258 060A2 24738 3C003E14 STA TEMP
259 060A4 24740 1400948A LDA ONE =1.0
260 060A6 24742 FE009202 SBF TANTBL,4 =1.0 - TAN( )
261 060A8 24744 BC003E14 ADF TEMP =1.0 - TAN( ) +PTCH/COS( )
262 060AA 24746 54020000 LDB 0,M
263 060AC 24748 0400 CFX
264 060AD 24749 0C01 SRAD 1 =(1.0 - TAN( ) +PTCH/COS( ))/2.0 FX PT
265 060AE 24750 65206088 JN OVRNG TEST FOR OVERRANGE
266 060B0 24752 74006004 RTA LOCRTN
267
268 *
269 * D4 -- 1.0 + TAN( ) + PTCH/COS( )
270 * THIS ROUTINE ASSUMES PTCH IS IN THE A REG AND XR4 CONTAINS THE TRIG TBL INDEX
271 * THE ROUTINE RETURNS WITH THE FX PT (B31) VALUE IN THE B REG.
271 060B2 24754 04006004 D4 PTR LOCRTN
272 060B4 24756 B6009000 DVF COSTBL,4
273 060B6 24758 3C003E14 STA TEMP
274 060B8 24760 1400948A LDA ONE =1.0
275 060BA 24762 BE009202 ADF TANTBL,4 =1.0 + TAN( )
276 060BC 24764 BC003E14 ADF TEMP =1.0 + TAN( ) +PTCH/COS( )
277 060BE 24766 54020000 LDB 0,M
278 060C0 24768 0400 CFX
279 060C1 24769 0C01 SRAD 1 =(1.0 + TAN( ) +PTCH/COS( ))/2.0 FX PT
280 060C2 24770 67206088 JL OVRNG TEST FOR OVERRANGE

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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281 060C4 24772 74006004 RTA LOCRTN
282
283 060C6 24774 64046074 CASE1A JS D1
284 060C8 24776 0808 SLLD LGRL
285 060C9 24777 0844 SLL LGWPL+1
286 060CA 24778 06C0 LXA 8 XRB CONTAINS STRTING RASTER WRD NO.
287 060CB 24779 0700
287 060CC 24780 14020000 LDA 0,M
288 060CE 24782 0500 LINE1A EAB
289 060CF 24783 0700
289 060D0 24784 14408000 LDA TVRSTR,8
290 060D2 24786 C4609404 LOR BMSK0,12
291 060D4 24788 3C408000 STA TVRSTR,8
292 060D6 24790 0500 EAB
293 060D7 24791 0700
293 060D8 24792 A400949A ADU TANFNC
294 060DA 24794 662060E4 JG LOC1A
295 060DC 24796 84009488 AND PLUS1
296 060DE 24798 6C430010 IMN 8,WPLX2,M
297 060E0 24800 643060E4 JU LOC1A
298 060E2 24802 7400949C RTA GLBRTN
299 060E4 24804 6C630002 LOC1A IMN 12,2,M
300 060E6 24806 643060CE JU LINE1A
301 060E8 24808 5C62003E TST1A LDX 12,BPWX2-2,M
302 060EA 24810 6C420002 IMP 8,2,M
303 060EC 24812 6C6B0002 IMN 13,2,M
304 060EE 24814 643060CE JU LINE1A
305 060F0 24816 7400949C RTA GLBRTN
306
307 *
308 * CASE3A -- (-PI/4) < FIIN < 0 , PTCH > 0
309 060F2 24818 64046074 CASE3A JS D1
310 060F4 24820 0808 SLLD LGRL
311 060F5 24821 0844 SLL LGWPL+1
312 060F6 24822 06C0 LXA 8 XRB CONTAINS STRTING RASTER WRD NO.
313 060F7 24823 0700
313 060F8 24824 6C42000E IMP 8,WPLX2-2,M
314 060FA 24826 14020000 LDA 0,M
315 060FC 24828 0500 LINE3A EAB
316 060FD 24829 0700
316 060FE 24830 14408000 LDA TVRSTR,8
317 06100 24832 C4609444 LOR BMSK1,12
318 06102 24834 3C408000 STA TVRSTR,8
319 06104 24836 0500 EAB
320 06105 24837 0700
320 06106 24838 A400949A ADU TANFNC
321 06108 24840 66206112 JG LOC3A
322 0610A 24842 84009488 AND PLUS1
323 0610C 24844 6C430010 IMN 8,WPLX2,M
324 0610E 24846 64306112 JU LOC3A
325 06110 24848 7400949C RTA GLBRTN
326 06112 24850 6C630002 LOC3A IMN 12,2,M
327 06114 24852 643060FC JU LINE3A
328 06116 24854 5C62003E TST3A LDX 12,BPWX2-2,M
329 06118 24856 6C430002 IMN 8,2,M
330 0611A 24858 6C6B0002 IMN 13,2,M
331 0611C 24860 643060FC JU LINE3A
332 0611E 24862 7400949C RTA GLBRTN
333
334 *
335 * CASE1B -- 0 < FIIN < PI/4 , PTCH< 0
336 06120 24864 6404608A CASE1B JS D2
337 06122 24866 0808 SLLD LGRL
338 06123 24867 0844 SLL LGWPL+1
339 06124 24868 06C0 LXA 8 XRB CONTAINS STRTING RASTER WRD NO.
340 06125 24869 0700
340 06126 24870 6C42000E IMP 8,WPLX2-2,M
341 06128 24872 14020000 LDA 0,M
342 0612A 24874 0500 LINE1B EAB

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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343 0612B 24875 0700
343 0612C 24876 14408000 LDA TVRSTR,8
344 0612E 24878 04609444 LOR BMSK1,12
345 06130 24880 30408000 STA TVRSTR,8
346 06132 24882 0500 EAB
347 06133 24883 0700
347 06134 24884 A400949A ADU TANFNC
348 06136 24886 66206140 JG LOC1B
349 06138 24888 84009488 AND PLUS1
350 0613A 24890 60420010 IMP 8,WPLX2,M
351 0613C 24892 24431000 ICL 8,RSTRW,M
352 0613E 24894 7400949C RTA GLBRTH
353 06140 24896 60630002 LOC1B IMN 12,2,M
354 06142 24898 6430612A JU LINE1B
355 06144 24900 5062003E TST1B LDX 12,BPW2-2,M
356 06146 24902 60430002 IMN 8,2,M
357 06148 24904 606B0002 IMN 13,2,M
358 0614A 24906 6430612A JU LINE1B
359 0614C 24908 7400949C RTA GLBRTH
360
361 *
362 * CASE3B -- (-PI/4) < FIIN < 0 , PTCH < 0
363 0614E 24910 6404608A CASE3B JS D2
364 06150 24912 0808 SLLD LGPL
365 06151 24913 0844 SLL LGWPL+1
366 06152 24914 06C0 LXA 8 XRB CONTAINS STRTING RASTER WRD NO.
367 06153 24915 0700
367 06154 24916 14020000 LDA 0,M
368 06156 24918 0500 LINE3B EAB
369 06157 24919 0700
369 06158 24920 14408000 LDA TVRSTR,8
370 0615A 24922 04609404 LOR BMSK0,12
371 0615C 24924 30408000 STA TVRSTR,8
372 0615E 24926 0500 EAB
373 0615F 24927 0700
373 06160 24928 A400949A ADU TANFNC
374 06162 24930 6620616C JG LOC3B
375 06164 24932 84009488 AND PLUS1
376 06166 24934 60420010 IMP 8,WPLX2,M
377 06168 24936 24431000 ICL 8,RSTRW,M
378 0616A 24938 7400949C RTA GLBRTH
379 0616C 24940 60630002 LOC3B IMN 12,2,M
380 0616E 24942 64306156 JU LINE3B
381 06170 24944 5062003E TST3B LDX 12,BPW2-2,M
382 06172 24946 60420002 IMP 8,2,M
383 06174 24948 606B0002 IMN 13,2,M
384 06176 24950 64306156 JU LINE3B
385 06178 24952 7400949C RTA GLBRTH
386
387 *
388 * CASE2A -- (PI/4) < FIIN < (PI/2) , PTCH > 0
389 0617A 24954 64046074 CASE2A JS D1
390 0617C 24956 0803 SLLD LGWPL
391 0617D 24957 0841 SLL 1
392 0617E 24958 06E8 LXA 13 XR13 CONTAINS STRING WRD COLUMN
393 0617F 24959 06C0 LXA 8 XRB CONTAINS STRTING RASTER WRD NO.
394 06180 24960 14020000 LDA 0,M
395 06182 24962 0805 SLLD LGBPW
396 06183 24963 0841 SLL 1
397 06184 24964 06E0 LXA 12 XR12 CONTAINS STRTING BIT MSK NO.
398 06185 24965 0700
398 06186 24966 14020000 LDA 0,M
399 06188 24968 0500 LINE2A EAB
400 06189 24969 0700
400 0618A 24970 14408000 LDA TVRSTR,8
401 0618C 24972 04609444 LOR BMSK1,12
402 0618E 24974 30408000 STA TVRSTR,8
403 06190 24976 0500 EAB
404 06191 24977 0700
404 06192 24978 60420010 IMP 8,WPLX2,M
405 06194 24980 24431000 ICL 8,RSTRW,M

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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406 06196 24982 7400949C RTA GLBRTH
407 06198 24984 A400949A ADU TANFNC
408 0619A 24986 66206188 JG LINE2A
409 0619C 24988 84009488 AND PLUS1
410 0619E 24990 60630002 IMN 12,2,M
411 061A0 24992 64306188 JU LINE2A
412 061A2 24994 5062003E LOC2A LDX 12,BPW2-2,M
413 061A4 24996 60430002 IMN 8,2,M
414 061A6 24998 60680002 IMN 13,2,M
415 061A8 25000 64306188 JU LINE2A
416 061AA 25002 7400949C RTA GLBRTH
417 *
418 * CASE4A -- (-PI/2) < FIIN < (-PI/4) , PTCH > 0
419 *
420 061AC 25004 6404609E CASE4A JS D3
421 061AE 25006 0803 SLLD LGWPL
422 061AF 25007 0841 SLL 1
423 061B0 25008 30003E14 STA TEMP
424 061B2 25010 60693E14 IMN 13,TEMP XR13 CONTAINS STRING WRD COLUMN
425 061B4 25012 06C0 LXA 8 XR8 CONTAINS STRING RASTER WRD NO.
426 061B6 25013 0700
427 061B8 25014 14020000 LDA 0,M
428 061B9 25016 0805 SLLD LGBPW
429 061BA 25017 0841 SLL 1
430 061BB 25018 30003E14 STA TEMP
431 061BC 25020 60613E14 IMN 12,TEMP XR12 CONTAINS THE STRING BIT MSK NO.
432 061BE 25022 14020000 LDA 0,M
433 061C0 25024 0500 LINE4A EAB
434 061C1 25025 0700
435 061C2 25026 14408000 LDA TVRSTR,8
436 061C4 25028 C4609404 LOR BMSK0,12
437 061C6 25030 30408000 STA TVRSTR,8
438 061C8 25032 0500 EAB
439 061C9 25033 0700
440 061CA 25034 60420010 IMP 8,WPLX2,M
441 061CC 25036 24431000 ICL 8,RSTRU,M
442 061CE 25038 7400949C RTA GLBRTH
443 061D0 25040 A400949A ADU TANFNC
444 061D2 25042 662061C0 JG LINE4A
445 061D4 25044 84009488 AND PLUS1
446 061D6 25046 60630002 IMN 12,2,M
447 061D8 25048 643061C0 JU LINE4A
448 061DA 25050 5062003E LOC4A LDX 12,BPW2-2,M
449 061DC 25052 60420002 IMP 8,2,M
450 061DE 25054 60680002 IMN 13,2,M
451 061E0 25056 643061C0 JU LINE4A
452 061E2 25058 7400949C RTA GLBRTH
453 *
454 * CASE2B -- (PI/4) < FIIN < (PI/2) , PTCH < 0
455 *
456 061E4 25060 6404608A CASE2B JS D2
457 061E6 25062 0803 SLLD LGWPL
458 061E7 25063 0841 SLL 1
459 061E8 25064 30003E14 STA TEMP
460 061EA 25066 60693E14 IMN 13,TEMP XR13 CONTAINS STRING WRD COLUMN
461 061EC 25068 06C0 LXA 8 XR8 CONTAINS STRING RASTER WRD NO.
462 061ED 25069 0700
463 061EE 25070 60420FF0 IMP 8,RSTRU-WPLX2,M
464 061F0 25072 14020000 LDA 0,M
465 061F2 25074 0805 SLLD LGBPW
466 061F3 25075 0841 SLL 1
467 061F4 25076 30003E14 STA TEMP
468 061F6 25078 60613E14 IMN 12,TEMP
469 061F8 25080 14020000 LDA 0,M
470 061FA 25082 0500 LINE2B EAB
471 061FB 25083 0700
472 061FC 25084 14408000 LDA TVRSTR,8
473 061FE 25086 C4609404 LOR BMSK0,12
474 06200 25088 30408000 STA TVRSTR,8
475 06202 25090 0500 EAB
476 06203 25091 0700
477 06204 25092 60430010 IMN 8,WPLX2,M

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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472 06206 25094 6430620A      JU      LOC2B
473 06208 25096 7400949C      RTA     GLBRTN
474 0620A 25098 A400949A LOC2B  ADU     TANFNC
475 0620C 25100 662061FA      JG      LINE2B
476 0620E 25102 84009488      AND     PLUS1
477 06210 25104 60630002      IMN     12,2,M
478 06212 25106 643061FA      JU      LINE2B
479 06214 25108 5062003E TST2B  LDY     12,BPW2-2,M
480 06216 25110 60420002      IMP     8,2,M
481 06218 25112 606B0002      IMN     13,2,M
482 0621A 25114 643061FA      JU      LINE2B
483 0621C 25116 7400949C      RTA     GLBRTN
484
485 *
486 * CASE4B -- (-PI/2) < FIIN (-PI/4) , PTCH < 0
487 0621E 25118 640460B2 CASE4B  JS      D4
488 06220 25120 0803          SLLD    LGWPL
489 06221 25121      0841          SLL     1
490 06222 25122 06E8          LXA     13      XR13 CONTAINS STRING WRD COLUMN
491 06223 25123 06C0          LXA     8
492 06224 25124 60420FF0      IMP     8,RSTRW-UPLX2,M
493 06226 25126 14020000      LDA     0,M
494 06228 25128 0805          SLLD    LGBPW
495 06229 25129      0841          SLL     1
496 0622A 25130 06E0          LXA     12
497 0622B 25131      0700
498 0622C 25132 14020000      LDA     0,M
499 0622E 25134 0500          LINE4B  EAB
500 0622F 25135      0700
501 06230 25136 14403000      LDA     TVRSTR,8
502 06232 25138 C4609444      LOR     BMSK1,12
503 06234 25140 30403000      STA     TVPSTR,8
504 06236 25142 0500          EAB
505 06237 25143      0700
506 06238 25144 60430010      IMN     8,UPLX2,M
507 0623A 25146 6004          JU      LOC4B
508 0623B 25147      0700
509 0623C 25148 7400949C      RTA     GLBRTN
510 0623E 25150 A400949A LOC4B  ADU     TANFNC
511 06240 25152 6292          JG      LINE4B
512 06241 25153      0700
513 06242 25154 84009488      AND     PLUS1
514 06244 25156 60630002      IMN     12,2,M
515 06246 25158 6098          JU      LINE4B
516 06247 25159      0700
517 06248 25160 5062003E TST4B  LDY     12,BPW2-2,M
518 0624A 25162 60430002      IMN     8,2,M
519 0624C 25164 606B0002      IMN     13,2,M
520 0624E 25166 6000          JU      LINE4B
521 0624F 25167      0700
522 06250 25168 7400949C      RTA     GLBRTN
523

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0 ERRORS

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139 * VECTOR SYMBOL -- PROVIDES A STRAIGHT LINE SEGMENT BEGINNING AT P1(X1,Y1) AND
140 * TERMINATING ON P2(X2,Y2). THE COORDINATES OF BOTH
141 * POINTS ARE ASSUMED TO BE SCALED TO A MAXIMUM OF 1.0
142 06252 25170 ORG VECTOR
143 06252 25170 0400949C PTR GLBRTN
144 06254 25172 6430625C JGU STRTPT
145 * STORAGE FOR ARGUMENTS XFERED INTO THIS ROUTINE
146 0000A 10 NARGX2 SETD 10 THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
147 03E00 15872 X1 EQU ARG1ST
148 03E02 15874 Y1 EQU ARG1ST+2
149 03E04 15876 X2 EQU ARG1ST+4
150 03E06 15878 Y2 EQU ARG1ST+6
151 03E08 15880 MARGIN EQU ARG1ST+8
152 03E0A 15882 XI EQU ARG1ST+10
153 03E0C 15884 YI EQU ARG1ST+12
154 06256 25174 LOCRTN BSS 2
155 06258 25176 6C430010 VINST IMN 8,WPLX2,M
156 0625A 25178 6C420010 IMP 8,WPLX2,M
157 *
158 0625C 25180 5060949C STRTPT LDX 12,GLBR1N
159 0625E 25182 34640000 LAE 0,12,I
160 06260 25184 06E8 LYA 13
161 06261 25185 0700
162 06262 25186 60620002 INP 12,2,M
163 06264 25188 1060949C STX 12,GLBR1N
164 * TRANSFER THE ARGUMENTS
164 06266 25190 50220002 LDX 4,NARGX2-2,M
165 06268 25192 16680000 XFER LDA 0,4,13
166 0626A 25194 3E003E00 STA ARG1ST,4
167 0626C 25196 60230002 IMN 4,2,M
168 0626E 25198 6036 JU XFER
169 0626F 25199 0700
170 *
171 *
171 * LIMIT THE INPUT POINT COORDINATES X1,Y1, X2, Y2, TO A MAXIMUM ABS VALUE OF 1.
172 06270 25200 50220002 LDX 4,6,M
173 06272 25202 16003E00 LMNT LDA ARG1ST,4
174 06274 25204 64046372 JS LIMIT
175 06276 25206 3E003E00 STA ARG1ST,4
176 06278 25208 60230002 IMN 4,2,M
177 0627A 25210 6032 JU LMNT
178 0627B 25211 0700
179 *
179 * FORM Y2-Y1 = YI AND Y2-X1 = XI AND DETERMINE THE QUADRANT, WITH RESPECT
180 * TO P1(X1,Y1), THAT THE VECTOR IS TO BE PLACED.
181 0627C 25212 14003E06 LDA Y2
182 0627E 25214 F0003E02 SBF Y1
183 06280 25216 30003E00 STA YI
184 06282 25218 14003E04 LDA X2
185 06284 25220 F0003E00 SBF X1
186 06286 25222 30003E04 STA XI
187 06288 25224 54003E0C LDB YI A REG = X2-X1 ,B REG = Y2-Y1
188 *
189 0628A 25226 630A JL XINEG
190 0628B 25227 0500 EAB YI IN A
191 0628C 25228 6720630C JL QUAD4
192 0628E 25230 0500 EAB XI IN A
193 0628F 25231 6109 JN QUAD1
194 06290 25232 0500 EAB YI IN A
195 06291 25233 6107 JN QUAD1
196 06292 25234 7400949C RTA GLBRTN XI = 0 ,YI = 0, (SPECIAL CASE)
197 06294 25236 0500 XINEG EAB YI IN A
198 06295 25237 6345 JL QUAD3
199 06296 25238 6020 JU QUAD2
200 *
201 * QUADRANT 1 -- XI >= 0, YI >= 0
202 06297 25239 0700
202 06298 25240 14003E0A QUAD1 LDA XI
203 0629A 25242 F0003E0C SBF YI
204 0629C 25244 630E JL CASE2
205 * CASE 1 -- XI >= 0, YI >= 0

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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206 0629D 25245 0700
206 0629E 25246 54003E0A CASE1 LDB XI PUT DENOMINATOR IN B
207 062A0 25248 14003E0C LDA VI PUT NUMERATOR IN A
208 062A2 25250 64046334 JS MISCAL COMPUTE TANFNC, PERFORM LIMITING, SET UP INDEX RIG
209 062A4 25252 14006258 LDA VINST
210 062A6 25254 300063AC STA VINST1 CHANGE INST IN VECTR1 ROUTINE
211 062A8 25256 64306390 JGU VECTR1
212 * CASE2 -- XI < VI
213 062AA 25258 54003E0C CASE2 LDB VI PUT DENOMINATOR IN B
214 062AC 25260 14003E0A LDA XI PUT NUMERATOR IN A
215 062AE 25262 64046334 JS MISCAL
216 062B0 25264 14006258 LDA VINST
217 062B2 25266 300063AC STA VINST2 CHANGE INST IN VECTR2 ROUTINE
218 062B4 25268 64306388 JGU VECTR2
219 *
220 * QUADRANT 2 -- XI < 0, VI >= 0
221 062B6 25270 14003E0C QUAD2 LDA VI
222 062B8 25272 B0003E0A ADF XI
223 062BA 25274 6310 JL CASE4
224 * CASE3 -- MAG(XI) < VI
225 062BB 25275 0700
225 062BC 25276 14003E0A CASE3 LDA XI
226 062BE 25278 9400948C MLF NONE NUMERATOR IN A
227 062C0 25280 54003E0C LDB VI DENOMINATOR IN B
228 062C2 25282 64046334 JS MISCAL
229 062C4 25284 14006258 LDA VINST
230 062C6 25286 300063EC STA VINST3 CHANGE INST IN VECTR3 ROUTINE
231 062C8 25288 643063E0 JGU VECTR3
232 * CASE4 -- MAG(XI) > VI
233 062CA 25290 14003E0A CASE4 LDA XI
234 062CC 25292 9400948C MLF NONE
235 062CE 25294 0500 EAB DENOMINATOR IN B
236 062CF 25295 0700
236 062D0 25296 14003E0C LDA VI NUMERATOR IN A
237 062D2 25298 64046334 JS MISCAL
238 062D4 25300 14006258 LDA VINST
239 062D6 25302 30006420 STA VINST4 CHANGE INST IN VECTR4 ROUTINE
240 062D8 25304 64306406 JGU VECTR4
241 *
242 * QUADRANT 3 -- XI < 0, VI < 0
243 062DA 25306 14003E0C QUAD3 LDA VI
244 062DC 25308 F0003E0A SBF XI
245 062DE 25310 6318 JL CASE6
246 * CASE5 -- MAG(XI) > MAG(VI)
247 062DF 25311 0700
247 062E0 25312 14003E0C CASE5 LDA VI
248 062E2 25314 9400948C MLF NONE
249 062E4 25316 300063E14 STA TEMP
250 062E6 25318 14003E0A LDA XI
251 062E8 25320 9400948C MLF NONE
252 062EA 25322 0500 EAB DENOMINATOR IN B
253 062EB 25323 0700
253 062EC 25324 14003E14 LDA TEMP NUMERATOR IN A
254 062EE 25326 64046334 JS MISCAL
255 062F0 25328 1400625A LDA VINST+2
256 062F2 25330 30006420 STA VINST4 CHANGE INST IN VECTR4 ROUTINE
257 062F4 25332 64306406 JGU VECTR4
258 * CASE6 -- MAG(XI) < MAG(VI)
259 062F6 25334 14003E0A CASE6 LDA XI
260 062F8 25336 9400948C MLF NONE
261 062FA 25338 300063E14 STA TEMP
262 062FC 25340 14003E0C LDA VI
263 062FE 25342 9400948C MLF NONE
264 06300 25344 0500 EAB DENOMINATOR IN B
265 06301 25345 0700
265 06302 25346 14003E14 LDA TEMP NUMERATOR IN A
266 06304 25348 64046334 JS MISCAL
267 06306 25350 1400625A LDA VINST+2
268 06308 25352 300063E0 STA VINST3 CHANGE INST IN VECTR3 ROUTINE
269 0630A 25354 643063E0 JGU VECTR3
270 *

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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271
272 * QUADRANT 4 -- XI >= 0, VI < 0
273 06300 25356 14003E00 QUAD4 LDA Y1
274 06300 25358 8C009E00 ADF XI
275 06310 25360 6314 JL CASE7
276 * CASE8 -- XI > MAG(VI)
277 06311 25361 0700
277 06312 25362 14003E00 CASE8 LDA Y1
278 06314 25364 94009480 MLF NONE
279 06316 25366 0500 ERB
280 06317 25367 0700
280 06318 25368 14003E00 LDA XI
281 0631A 25370 0500 ERB DENOMINATOR IN B, NUMERATOR IN A
282 0631B 25371 0700
282 0631C 25372 64046334 JS MISCAL
283 0631E 25374 14006256 LDA VINST12
284 06320 25376 3C00636C STA VINST1 CHANGE INST IN VECTR1 ROUTINE
285 06322 25378 64306390 JGU VECTR1
286 * CASE 7 -- XI < MAG(VI)
287 06324 25380 14003E00 CASE7 LDA Y1
288 06326 25382 94009480 MLF NONE
289 06328 25384 0500 ERB DENOMINATOR IN B
290 06329 25385 0700
290 0632A 25386 14003E00 LDA XI NUMERATOR IN A
291 0632E 25388 64046334 JS MISCAL
292 0632E 25390 14006256 LDA VINST12
293 06330 25392 3C00636C STA VINST2 CHANGE INST IN VECTR2 ROUTINE
294 06332 25394 643063B8 JGU VECTR2
295
296 * MISCAL -- MISCELLANEOUS CALCULATIONS THAT PERFORM THE FOLLOWING:
297 * (1) COMPUTES THE TANENC
298 * (2) INITIALIZES XR9 TO THE INTEGER LENGTH OF THE VECTOR
299 * (3) INITIALIZES XR8 TO THE STARTING WORD WITHIN THE TVRSTR
300 * (4) STORES THE STARTING BIT WITHIN THE TVRSTR WORD IN TEMP+4
301 * THIS ROUTINE ASSUMES THAT THE B REG = DENOMINATOR AND THE
302 * A REG = NUMERATOR.
303 06334 25396 04006256 MISCAL PTR LDCRTH
304 06336 25398 7C003E14 STB TEMP
305 06338 25400 54020000 LDB 0,M
306 0633A 25402 84003E14 DVE TEMP
307 0633C 25404 0400 CFX
308 0633D 25405 0C01 SRAD 1
309 0633E 25406 7C00949A STB TANENC
310 06340 25408 14009492 LDA F128
311 06342 25410 54020000 LDB 0,M
312 06344 25412 FC003E00 SDB MREGIN
313 06346 25414 3C003E16 STA TEMP+2
314 06348 25416 94003E14 MLF TEMP
315 0634A 25418 54020000 LDB 0,M
316 0634C 25420 0400 CFX
317 0634D 25421 06C8 LXA 9
318 0634E 25422 14003E16 LDA TEMP+2
319 06350 25424 94003E02 MLF Y1
320 06352 25426 94009480 MLF NONE
321 06354 25428 8C009492 ADF F128
322 06356 25430 0400 CFX
323 06357 25431 0844 SLL 4
324 06358 25432 06C0 LXA 2 XR8 = STARTING RASTER LINE
325 06359 25433 0700
325 0635A 25434 14003E16 LDA TEMP+2
326 0635C 25436 94003E00 MLF XI
327 0635E 25438 8C009492 ADF F128
328 06360 25440 0400 CFX
329 06361 25441 0700
329 06362 25442 54020000 LDB 0,M
330 06364 25444 0C05 SRAD 5
331 06365 25445 0841 SLL 1
332 06366 25446 3C003E14 STA TEMP
333 06368 25448 6C403E14 IMP 8,TEMP XR8 = STARTING WORD NO.
334 0636A 25450 14020000 LDA 0,M
335 0636C 25452 0805 SLLD 5
  
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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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336 0636D 25453 0700 0BVI
336 0636E 25454 3C003E18 STA TEMP+4 TEMP+4 * STARTING BIT NO. COUNTING FROM MSB
337 06370 25456 74006256 RTA LOCRTN
338
339 *
340 * LIMIT -- LIMITING ROUTINE, ASSUMES A REG CONTAINS FLOATING POINT VARIABLE
341 06372 25458 04006256 LIMIT PTR LOCRTN
342 06374 25460 3C003E14 STA TEMP
343 06376 25462 620E JG PLOC
344 06377 25463 0700
344 06378 25464 FC00948C SBF NONE
345 0637A 25466 6306 JL NEGLIM
346 0637B 25467 0700
346 0637C 25468 14003E14 LDA TEMP
347 0637E 25470 74006256 RTA LOCRTN
348 06380 25472 1400948C NEGLIM LDA NONE
349 06382 25474 74006256 RTA LOCRTN
350 06384 25476 FC00948C PLOC SBF ONE
351 06386 25478 6206 JG POSLIM
352 06387 25479 0700
352 06388 25480 14003E14 LDA TEMP
353 0638A 25482 74006256 RTA LOCRTN
354 0638C 25484 1400948C POSLIM LDA ONE
355 0638E 25486 74006256 RTA LOCRTN
356
357 *
358 06390 25488 5C62003E VECTR1 -- VECTOR ROUTINE 1, USED FOR CASE1 AND CASE2.
359 06392 25490 6C613E18 VECTR1 LDX 12,BPWX2-2,M INITIALIZE BIT MASK CTR
360 06394 25492 14020000 INH 12,TEMP+4
361 06396 25494 0500 LDA 0,M
362 06397 25495 0700
362 06398 25496 14408000 VIL00P EAB
363 0639A 25498 04609404 LDA TVRSTR,8
364 0639C 25500 3C408000 LOP BMSK0,12
365 0639E 25502 6C4B0001 STA TVRSTR,8
366 063A0 25504 6004 INH 9,1,M
366 063A1 25505 0700 JU LOC1
367 063A2 25506 7400949C RTA GLBRTH
368 063A4 25508 0500 LOC1 EAB
369 063A5 25509 0700
369 063A6 25510 0400949A ADU TANFNC
370 063A8 25512 6206 JG LOC1A
371 063A9 25513 0700
371 063AA 25514 84009488 AND PLUS1
372 063AC 25516 6C430010 VINST1 INH 3,WPLX2,M
373 063AE 25518 6C630002 LOC1A INH 12,2,M
374 063B0 25520 609A JU VIL00P
374 063B1 25521 0700
375 063B2 25522 5C62003E LDY 12,BPWX2-2,M
376 063B4 25524 6C430002 INP 8,2,M
377 063B6 25526 6000 JU VIL00P
378
379 *
380 063B7 25527 0700 * VECTR2 -- VECTOR ROUTINE 2, USED FOR CASE2 AND CASE7.
380 063B8 25528 5C62003E VECTR2 LDX 12,BPWX2-2,M
381 063BA 25530 6C613E18 INH 12,TEMP+4
382 063BC 25532 14020000 LDA 0,M
383 063BE 25534 0500 V2L00P EAB
384 063BF 25535 0700
384 063C0 25536 14408000 LDA TVRSTR,8
385 063C2 25538 04609404 LOP BMSK0,12
386 063C4 25540 3C408000 STA TVRSTR,8
387 063C6 25542 6C430010 VINST2 INH 8,WPLX2,M
388 063C8 25544 6C4B0001 INH 9,1,M
389 063CA 25546 6004 JU LOC2
389 063CB 25547 0700
390 063CC 25548 7400949C RTA GLBRTH
391 063CE 25550 0500 LOC2 EAB
392 063CF 25551 0700
392 063D0 25552 0400949A ADU TANFNC
393 063D2 25554 6294 JG V2L00P
394 063D3 25555 0700
394 063D4 25556 84009488 AND PLUS1
395 063D6 25558 6C630002 INH 12,2,M

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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396 063E3 25560 6090      JU      V2LOOP
396 063E9 25561      0700
397 063DA 25562 5062003E      LDX     12,BPW2-2,M
398 063DC 25564 60480002      INP     8,2,M
399 063DE 25566 6000      JU      V2LOOP
400
401 *
402 063DF 25567      0700 * VECTR3 -- VECTOR ROUTINE 3, USED FOR CASE3 AND CASE6.
402 063E0 25568 50603E18 VECTR3 LDX 12,TEMP+4
403 063E2 25570 14020000      LDA     0,M
404 063E4 25572 0500      V3LOOP EMB
405 063E5 25573      0700
405 063E6 25574 14400000      LDA     TVRSTR,8
406 063E8 25576 04609444      LOR     BMSK1,12
407 063EA 25578 30408000      STA     TVRSTR,8
408 063EC 25580 60420010 VINST3 INP 8,MPLX2,M
409 063EE 25582 60480001      INH     9,1,M
410 063F0 25584 6004      JU      LOC3
410 063F1 25585      0700
411 063F2 25586 7400949C      RTA     GLBRTH
412 063F4 25588 0500      LOC3   EMB
413 063F5 25589      0700
413 063F6 25590 0400949A      ADU     TANFNC
414 063F8 25592 6294      JG     V3LOOP
415 063F9 25593      0700
415 063FA 25594 84009488      AND     PLUS1
416 063FC 25596 60630002      INH     12,2,M
417 063FE 25598 6090      JU      V3LOOP
417 063FF 25599      0700
418 06400 25600 5062003E      LDX     12,BPW2-2,M
419 06402 25602 60430002      INH     8,2,M
420 06404 25604 6000      JU      V3LOOP
420 06405 25605      0700
421
422 *
423 06406 25606 50603E18 VECTR4 LDX 12,TEMP+4
424 06408 25608 14020000      LDA     0,M
425 0640A 25610 0500      V4LOOP EMB
426 0640B 25611      0700
426 0640C 25612 14400000      LDA     TVRSTR,8
427 0640E 25614 04609444      LOR     BMSK1,12
428 06410 25616 30408000      STA     TVRSTR,8
429 06412 25618 604B0001      INH     9,1,M
430 06414 25620 6004      JU      LOC4
430 06415 25621      0700
431 06416 25622 7400949C      RTA     GLBRTH
432 06418 25624 0500      LOC4   EMB
433 06419 25625      0700
433 0641A 25626 0400949A      ADU     TANFNC
434 0641C 25628 6296      JG     LOC4A
435 0641D 25629      0700
435 0641E 25630 84009488      AND     PLUS1
436 06420 25632 60430010 VINST4 INH 8,MPLX2,M
437 06422 25634 60630002 LOC4A  INH 12,2,M
438 06424 25636 6090      JU      V4LOOP
438 06425 25637      0700
439 06426 25638 5062003E      LDX     12,BPW2-2,M
440 06428 25640 60430002      INH     8,2,M
441 0642A 25642 6000      JU      V4LOOP
441 0642B 25643      0700
442
442      END

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0 ERRORS

LINE	ABS.	ADDRESS	INSTCODE	SOURCE	STATEMENT
139				*	AIRSPD -- ROUTINE TO GENERATE A VERTICALLY MOVING AIRSPEED TAPE
140				*	
141	0000R	R		NARGX2	SETD R THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142	067D4	26580		ORG	AIRSPD
143	067D4	26580	0400949C	PTR	GLBRTN
144	067D6	26582	64306A50	JGU	STRTPY
145				*	STORAGE FOR XFER OF ARGUMENTS INTO THE ROUTINE
146	03E00	15872		ASPD	EQU ARGST
147	03E02	15874		SCLGTH	EQU ARGST+2
148	03E04	15876		RFMKS	A EQU ARGST+4
149	03E06	15878		SCLSA	EQU ARGST+6
150	067D8	26584	00000000	ASPDIN	DEC 0
151	067DA	26586	40E66666	RLPKT	DEC 1.6 NO. OF RASTER LINES PER KNOT
152	067DC	26588	20000000	MSB	HEX 20000000
153				*	STORAGE AREA FOR THE REFERENCE MARK DOT ARRAY
154	067DE	26590	FE000000	ASRFMK	HEX FE000000
155				*	STORAGE AREA FOR THE AIRSPEED TAPE DOT ARRAY
156	067E0	26592	00055550	HEX	00055550
157	067E2	26594	00055550	HEX	00055550
158	067E4	26596	00055550	HEX	00055550
159	067E6	26598	00055550	HEX	00055550
160	067E8	26600	00055550	HEX	00055550
161	067EA	26602	00055550	HEX	00055550
162	067EC	26604	00055550	HEX	00055550
163	067EE	26606	00055550	HEX	00055550
164	067F0	26608	00055550	HEX	00055550
165	067F2	26610	00055550	HEX	00055550
166	067F4	26612	00055550	HEX	00055550
167	067F6	26614	00055550	HEX	00055550
168	067F8	26616	00055550	HEX	00055550
169	067FA	26618	00055550	HEX	00055550
170	067FC	26620	00055550	HEX	00055550
171	067FE	26622	00055550	HEX	00055550
172	06800	26624	00055550	HEX	00055550
173	06802	26626	000208E0	HEX	000208E0
174	06804	26628	00061910	HEX	00061910
175	06806	26630	00022910	HEX	00022910
176	06808	26632	00F24910	HEX	00F24910
177	0680A	26634	00027D10	HEX	00027D10
178	0680C	26636	00020910	HEX	00020910
179	0680E	26638	000708E0	HEX	000708E0
180	06810	26640	00000000	HEX	0
181	06812	26642	00000000	HEX	0
182	06814	26644	00000000	HEX	0
183	06816	26646	00000000	HEX	0
184	06818	26648	00FE0000	HEX	00FE0000
185	0681A	26650	00000000	HEX	0
186	0681C	26652	00000000	HEX	0
187	0681E	26654	00000000	HEX	0
188	06820	26656	00000000	HEX	0
189	06822	26658	000238E0	HEX	000238E0
190	06824	26660	00064510	HEX	00064510
191	06826	26662	00020510	HEX	00020510
192	06828	26664	00F21910	HEX	00F21910
193	0682A	26666	00020510	HEX	00020510
194	0682C	26668	00024510	HEX	00024510
195	0682E	26670	000738E0	HEX	000738E0
196	06830	26672	00000000	HEX	0
197	06832	26674	00000000	HEX	0
198	06834	26676	00000000	HEX	0
199	06836	26678	00000000	HEX	0
200	06838	26680	00FE0000	HEX	00FE0000
201	0683A	26682	00000000	HEX	0
202	0683C	26684	00000000	HEX	0
203	0683E	26686	00000000	HEX	0
204	06840	26688	00000000	HEX	0
205	06842	26690	000238E0	HEX	000238E0
206	06844	26692	00064510	HEX	00064510
207	06846	26694	00020510	HEX	00020510
208	06848	26696	00F20910	HEX	00F20910
209	0684A	26698	00021110	HEX	00021110
210	0684C	26700	00022110	HEX	00022110

LINE	ABS.	ADDRESS	INSTCODE	SOURCE	STATEMENT
211	0684E	26702	00077CE0	HEX	00077CE0
212	06850	26704	00000000	HEX	0
213	06852	26706	00000000	HEX	0
214	06854	26708	00000000	HEX	0
215	06856	26710	00000000	HEX	0
216	06858	26712	00FE0000	HEX	00FE0000
217	0685A	26714	00000000	HEX	0
218	0685C	26716	00000000	HEX	0
219	0685E	26718	00000000	HEX	0
220	06860	26720	00000000	HEX	0
221	06862	26722	000210E0	HEX	000210E0
222	06864	26724	00063110	HEX	00063110
223	06866	26726	00021110	HEX	00021110
224	06868	26728	00F21110	HEX	00F21110
225	0686A	26730	00021110	HEX	00021110
226	0686C	26732	00021110	HEX	00021110
227	0686E	26734	000738E0	HEX	000738E0
228	06870	26736	00000000	HEX	0
229	06872	26738	00000000	HEX	0
230	06874	26740	00000000	HEX	0
231	06876	26742	00000000	HEX	0
232	06878	26744	00FE0000	HEX	00FE0000
233	0687A	26746	00000000	HEX	0
234	0687C	26748	00000000	HEX	0
235	0687E	26750	00000000	HEX	0
236	06880	26752	00000000	HEX	0
237	06882	26754	000238E0	HEX	000238E0
238	06884	26756	00064510	HEX	00064510
239	06886	26758	00024510	HEX	00024510
240	06888	26760	00F24510	HEX	00F24510
241	0688A	26762	00024510	HEX	00024510
242	0688C	26764	00024510	HEX	00024510
243	0688E	26766	000738E0	HEX	000738E0
244	06890	26768	00000000	HEX	0
245	06892	26770	00000000	HEX	0
246	06894	26772	00000000	HEX	0
247	06896	26774	00000000	HEX	0
248	06898	26776	00FE0000	HEX	00FE0000
249	0689A	26778	00000000	HEX	0
250	0689C	26780	00000000	HEX	0
251	0689E	26782	00000000	HEX	0
252	068A0	26784	00000000	HEX	0
253	068A2	26786	00038E00	HEX	00038E00
254	068A4	26788	00045100	HEX	00045100
255	068A6	26790	00045100	HEX	00045100
256	068A8	26792	00F3D100	HEX	00F3D100
257	068AA	26794	00005100	HEX	00005100
258	068AC	26796	00045100	HEX	00045100
259	068AE	26798	00038E00	HEX	00038E00
260	068B0	26800	00000000	HEX	0
261	068B2	26802	00000000	HEX	0
262	068B4	26804	00000000	HEX	0
263	068B6	26806	00000000	HEX	0
264	068B8	26808	00FE0000	HEX	00FE0000
265	068BA	26810	00000000	HEX	0
266	068BC	26812	00000000	HEX	0
267	068BE	26814	00000000	HEX	0
268	068C0	26816	00000000	HEX	0
269	068C2	26818	00038E00	HEX	00038E00
270	068C4	26820	00045100	HEX	00045100
271	068C6	26822	00045100	HEX	00045100
272	068C8	26824	00F39100	HEX	00F39100
273	068CA	26826	00045100	HEX	00045100
274	068CC	26828	00045100	HEX	00045100
275	068CE	26830	00038E00	HEX	00038E00
276	068D0	26832	00000000	HEX	0
277	068D2	26834	00000000	HEX	0
278	068D4	26836	00000000	HEX	0
279	068D6	26838	00000000	HEX	0
280	068D8	26840	00FE0000	HEX	00FE0000

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

281	068DA	26842	00000000	HEX	0
282	068DC	26844	00000000	HEX	0
283	068DE	26846	00000000	HEX	0
284	068E0	26848	00000000	HEX	0
285	068E2	26850	0007CE00	HEX	0007CE00
286	068E4	26852	00005100	HEX	00005100
287	068E6	26854	00009100	HEX	00009100
288	068E8	26856	00F11100	HEX	00F11100
289	068EA	26858	00011100	HEX	00011100
290	068EC	26860	00021100	HEX	00021100
291	068EE	26862	00020E00	HEX	00020E00
292	068F0	26864	00000000	HEX	0
293	068F2	26866	00000000	HEX	0
294	068F4	26868	00000000	HEX	0
295	068F6	26870	00000000	HEX	0
296	068F8	26872	00FE0000	HEX	00FE0000
297	068FA	26874	00000000	HEX	0
298	068FC	26876	00000000	HEX	0
299	068FE	26878	00000000	HEX	0
300	06900	26880	00000000	HEX	0
301	06902	26882	00038E00	HEX	00038E00
302	06904	26884	00045100	HEX	00045100
303	06906	26886	00041100	HEX	00041100
304	06908	26888	00F59100	HEX	00F59100
305	0690A	26890	00065100	HEX	00065100
306	0690C	26892	00045100	HEX	00045100
307	0690E	26894	00038E00	HEX	00038E00
308	06910	26896	00000000	HEX	0
309	06912	26898	00000000	HEX	0
310	06914	26900	00000000	HEX	0
311	06916	26902	00000000	HEX	0
312	06918	26904	00FE0000	HEX	00FE0000
313	0691A	26906	00000000	HEX	0
314	0691C	26908	00000000	HEX	0
315	0691E	26910	00000000	HEX	0
316	06920	26912	00000000	HEX	0
317	06922	26914	0007CE00	HEX	0007CE00
318	06924	26916	00041100	HEX	00041100
319	06926	26918	00041100	HEX	00041100
320	06928	26920	00F79100	HEX	00F79100
321	0692A	26922	00005100	HEX	00005100
322	0692C	26924	00005100	HEX	00005100
323	0692E	26926	00078E00	HEX	00078E00
324	06930	26928	00000000	HEX	0
325	06932	26930	00000000	HEX	0
326	06934	26932	00000000	HEX	0
327	06936	26934	00000000	HEX	0
328	06938	26936	00FE0000	HEX	00FE0000
329	0693A	26938	00000000	HEX	0
330	0693C	26940	00000000	HEX	0
331	0693E	26942	00000000	HEX	0
332	06940	26944	00000000	HEX	0
333	06942	26946	00008E00	HEX	00008E00
334	06944	26948	00019100	HEX	00019100
335	06946	26950	00029100	HEX	00029100
336	06948	26952	00F49100	HEX	00F49100
337	0694A	26954	0007D100	HEX	0007D100
338	0694C	26956	00009100	HEX	00009100
339	0694E	26958	00008E00	HEX	00008E00
340	06950	26960	00000000	HEX	0
341	06952	26962	00000000	HEX	0
342	06954	26964	00000000	HEX	0
343	06956	26966	00000000	HEX	0
344	06958	26968	00FE0000	HEX	00FE0000
345	0695A	26970	00000000	HEX	0
346	0695C	26972	00000000	HEX	0
347	0695E	26974	00000000	HEX	0
348	06960	26976	00000000	HEX	0
349	06962	26978	00038E00	HEX	00038E00
350	06964	26980	00045100	HEX	00045100

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

351	06966	26982	00005100	HEX	00005100
352	06968	26984	00F19100	HEX	00F19100
353	0696A	26986	00005100	HEX	00005100
354	0696C	26988	00045100	HEX	00045100
355	0696E	26990	00038E00	HEX	00038E00
356	06970	26992	00000000	HEX	0
357	06972	26994	00000000	HEX	0
358	06974	26996	00000000	HEX	0
359	06976	26998	00000000	HEX	0
360	06978	27000	00FE0000	HEX	00FE0000
361	0697A	27002	00000000	HEX	0
362	0697C	27004	00000000	HEX	0
363	0697E	27006	00000000	HEX	0
364	06980	27008	00000000	HEX	0
365	06982	27010	00038E00	HEX	00038E00
366	06984	27012	00045100	HEX	00045100
367	06986	27014	00005100	HEX	00005100
368	06988	27016	00F09100	HEX	00F09100
369	0698A	27018	00011100	HEX	00011100
370	0698C	27020	00021100	HEX	00021100
371	0698E	27022	0007CE00	HEX	0007CE00
372	06990	27024	00000000	HEX	0
373	06992	27026	00000000	HEX	0
374	06994	27028	00000000	HEX	0
375	06996	27030	00000000	HEX	0
376	06998	27032	00FE0000	HEX	00FE0000
377	0699A	27034	00000000	HEX	0
378	0699C	27036	00000000	HEX	0
379	0699E	27038	00000000	HEX	0
380	069A0	27040	00000000	HEX	0
381	069A2	27042	00002E00	HEX	00002E00
382	069A4	27044	00019100	HEX	00019100
383	069A6	27046	00009100	HEX	00009100
384	069A8	27048	00F09100	HEX	00F09100
385	069AA	27050	00009100	HEX	00009100
386	069AC	27052	00009100	HEX	00009100
387	069AE	27054	0001CE00	HEX	0001CE00
388	069B0	27056	00000000	HEX	0
389	069B2	27058	00000000	HEX	0
390	069B4	27060	00000000	HEX	0
391	069B6	27062	00000000	HEX	0
392	069B8	27064	00FE0000	HEX	00FE0000
393	069BA	27066	00000000	HEX	0
394	069BC	27068	00000000	HEX	0
395	069BE	27070	00000000	HEX	0
396	069C0	27072	00000000	HEX	0
397	069C2	27074	00000E00	HEX	00000E00
398	069C4	27076	00001100	HEX	00001100
399	069C6	27078	00001100	HEX	00001100
400	069C8	27080	00F01100	ASSCL HEX	00F01100
401	069CA	27082	00001100	HEX	00001100
402	069CC	27084	00001100	HEX	00001100
403	069CE	27086	00000E00	HEX	00000E00
404					
405	069D0	27088	00055500	HEX	00055500
406	069D2	27090	00055500	HEX	00055500
407	069D4	27092	00055500	HEX	00055500
408	069D6	27094	00055500	HEX	00055500
409	069D8	27096	00055500	HEX	00055500
410	069DA	27098	00055500	HEX	00055500
411	069DC	27100	00055500	HEX	00055500
412	069DE	27102	00055500	HEX	00055500
413	069E0	27104	00055500	HEX	00055500
414	069E2	27106	00055500	HEX	00055500
415	069E4	27108	00055500	HEX	00055500
416	069E6	27110	00055500	HEX	00055500
417	069E8	27112	00055500	HEX	00055500
418	069EA	27114	00055500	HEX	00055500
419	069EC	27116	00055500	HEX	00055500
420	069EE	27118	00055500	HEX	00055500

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

LINE	ABS.	ADDRESS	INSTCODE	SOURCE	STATEMENT
421	069F0	27120	00055500	HEX	00055500
422	069F2	27122	00055500	HEX	00055500
423	069F4	27124	00055500	HEX	00055500
424	069F6	27126	00055500	HEX	00055500
425	069F8	27128	00055500	HEX	00055500
426	069FA	27130	00055500	HEX	00055500
427	069FC	27132	00055500	HEX	00055500
428	069FE	27134	00055500	HEX	00055500
429	06A00	27136	00055500	HEX	00055500
430	06A02	27138	00055500	HEX	00055500
431	06A04	27140	00055500	HEX	00055500
432	06A06	27142	00055500	HEX	00055500
433	06A08	27144	00055500	HEX	00055500
434	06A0A	27146	00055500	HEX	00055500
435	06A0C	27148	00055500	HEX	00055500
436	06A0E	27150	00055500	HEX	00055500
437	06A10	27152	00055500	HEX	00055500
438	06A12	27154	00055500	HEX	00055500
439	06A14	27156	00055500	HEX	00055500
440	06A16	27158	00055500	HEX	00055500
441	06A18	27160	00055500	HEX	00055500
442	06A1A	27162	00055500	HEX	00055500
443	06A1C	27164	00055500	HEX	00055500
444	06A1E	27166	00055500	HEX	00055500
445	06A20	27168	00055500	HEX	00055500
446	06A22	27170	00055500	HEX	00055500
447	06A24	27172	00055500	HEX	00055500
448	06A26	27174	00055500	HEX	00055500
449	06A28	27176	00055500	HEX	00055500
450	06A2A	27178	00055500	HEX	00055500
451	06A2C	27180	00055500	HEX	00055500
452	06A2E	27182	00055500	HEX	00055500
453	06A30	27184	00055500	HEX	00055500
454	06A32	27186	00055500	HEX	00055500
455	06A34	27188	00055500	HEX	00055500
456	06A36	27190	00055500	HEX	00055500
457	06A38	27192	00055500	HEX	00055500
458	06A3A	27194	00055500	HEX	00055500
459	06A3C	27196	00055500	HEX	00055500
460	06A3E	27198	00055500	HEX	00055500
461	06A40	27200	00055500	HEX	00055500
462	06A42	27202	00055500	HEX	00055500
463	06A44	27204	00055500	HEX	00055500
464	06A46	27206	00055500	HEX	00055500
465	06A48	27208	00055500	HEX	00055500
466	06A4A	27210	00055500	HEX	00055500
467	06A4C	27212	00055500	HEX	00055500
468	06A4E	27214	00055500	HEX	00055500
469			*		
470	06A50	27216	5060949C	STRTP	LDX 12, GLBRTN PUT ADDR OF JS+2 INTO XR12
471	06A52	27218	34640000	LAE	0, 12, I OBTAIN STRTING LOC OF THE ARGUMENT LIST
472	06A54	27220	06E8	LXA	13
473	06A55	27221	0700		
473	06A56	27222	60620002	IMP	12, 2, M
474	06A58	27224	1060949C	STX	12, GLBRTN MODIFY THE RETURN ADDR
475			*	TRANSFER THE	ARGUMENTS
476	06A5A	27226	50220006	LDX	4, NARGX2-2, M
477	06A5C	27228	16680000	XFER	0, 4, 13
478	06A5E	27230	3E003E00	STA	ARGLST, 4
479	06A60	27232	60230002	IMN	4, 2, M
480	06A62	27234	64306A5C	JU	XFER
481			*		
482	06A64	27236	14003E00	STR	LDA ASPD
483	06A66	27238	6304	JL	1+4
484	06A67	27239	0700		
484	06A68	27240	300067D8	STA	ASPDIN
485	06A6A	27242	140067D8	LDA	ASPDIN

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

486	06A6C	27244	940067DA	MLF	RLPKT
487	06A6E	27246	0400	CFX	
488	06A6F	27247	0700		
488	06A70	27248	AC0067DC	ADL	MSB
489	06A72	27250	A4020000	ADU	0,M
490	06A74	27252	0841	SLL	1
491	06A75	27253	0700		
491	06A76	27254	A4001E02	ADU	SCLGTH
492	06A78	27256	3C003E14	STA	TEMP
493	06A7A	27258	34006908	LAE	ASSCL
494	06A7C	27260	0608	LXA	9
495	06A7D	27261	0700		
495	06A7E	27262	6C493E14	IMN	9,TEMP XR9 - ABS STRTING ADDR WITHIN ASSCL
496	06A80	27264	34008000	LAE	TVRSTR
497	06A82	27266	06C0	LXA	8
498	06A83	27267	0700		
498	06A84	27268	6C403E06	IMP	8,SCLSA INCREMENT TO THE SCALE STARTING ADDR
499	06A86	27270	5C003E02	LDX	4,BOLQTH
500	06A88	27272	6C230001	IMN	4,1,M
501	06A8A	27274	14009486	LDA	ONES
502	06A8C	27276	3C400000	STA	0,8
503	06A8E	27278	14480000	ASPDLP LDA	0,9
504	06A90	27280	04400000	LOR	0,8
505	06A92	27282	3C400000	STA	0,8
506	06A94	27284	6C4A0002	IMP	2,2,M
507	06A96	27286	6C420010	IMP	8,16,M
508	06A98	27288	6C230001	IMN	4,1,M
509	06A9A	27290	64306A8E	JU	ASPDLP
510	06A9C	27292	14009486	LDA	ONES
511	06A9E	27294	3C400000	STA	0,8
512	06AA0	27296	34008000	LAE	TVRSTR
513	06AA2	27298	06C0	LXA	8
514	06AA3	27299	0700		
514	06AA4	27300	6C403E04	IMP	8,REFMKA
515	06AA6	27302	140067DE	REFMK LDA	ASREFMK
516	06AA8	27304	04400000	LOR	0,8
517	06AAA	27306	3C400000	STA	0,8
518	06AAC	27308	7400949C	RTA	GLBRTN
519				END	

0 ERRORS

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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139 * COMPASS -- SUBROUTINE TO GENERATE A HORIZONTALLY MOVING COMPASS TAPE
140 *
141 00002 2 NARGX2 SETD 2 THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142 06432 25650 ORG COMPASS
143 06432 25650 0400949C PTR GLBRTH
144 06434 25652 64306740 JGU STRTPT
145 * STORAGE FOR XFER OF ARGUMENTS INTO THE ROUTINE
146 03E00 15872 HDG EQU ARGST SYMBOL INPUT (FL. PT. MAX ABS VALUE = 360.0)
147 03E14 15892 DSPL EQU TEMP
148 03E16 15894 BDSPL EQU TEMP+2
149 08100 33024 SCLPOS EQU TVRSTR+256
150 06436 25654 00000000 HDGIN DEC 0 STORAGE LOCATION FOR THE INPUT HEADING
151 06438 25656 43400000 THRTV2 DEC 32.0
152 0643A 25658 41599999 K1 DEC 2.8 NO. OF BITS/DEGREE
153 0643C 25660 80000000 MSB HEX 80000000
154 *
155 *
156 *
157 0643E 25662 07107000 HDGSCL HEX 07107000
158 06440 25664 08A28800 HEX 08A28800
159 06442 25666 00228800 HEX 00228800
160 06444 25668 030C8820 HEX 030C8820
161 06446 25670 00328820 HEX 00328820
162 06448 25672 08A28820 HEX 08A28820
163 0644A 25674 07107020 HEX 07107020
164 0644C 25676 00000020 HEX 00000020
165 0644E 25678 00080020 HEX 00080020
166 06450 25680 00080020 HEX 00080020
167 *
168 06452 25682 0003827C HEX 0003827C
169 06454 25684 00044640 HEX 00044640
170 06456 25686 00004A40 HEX 00004A40
171 06458 25688 00819278 HEX 00819278
172 0645A 25690 00205F04 HEX 00205F04
173 0645C 25692 00244204 HEX 00244204
174 0645E 25694 00238278 HEX 00238278
175 06460 25696 00200000 HEX 00200000
176 06462 25698 00200200 HEX 00200200
177 06464 25700 00200200 HEX 00200200
178 *
179 06466 25702 00000002 HEX 00000002
180 06468 25704 00000003 HEX 00000003
181 0646A 25706 00000002 HEX 00000002
182 0646C 25708 02002002 HEX 02002002
183 0646E 25710 02002002 HEX 02002002
184 06470 25712 02002002 HEX 02002002
185 06472 25714 02002002 HEX 02002002
186 06474 25716 02002000 HEX 02002000
187 06476 25718 02002000 HEX 02002000
188 06478 25720 02002000 HEX 02002000
189 *
190 0647A 25722 20000000 HEX 20000000
191 0647C 25724 20000000 HEX 20000000
192 0647E 25726 A0000000 HEX A0000000
193 06480 25728 A0020008 HEX A0020008
194 06482 25730 60020008 HEX 60020008
195 06484 25732 20020008 HEX 20020008
196 06486 25734 20020008 HEX 20020008
197 06488 25736 00020008 HEX 00020008
198 0648A 25738 80020008 HEX 80020008
199 0648C 25740 80020008 HEX 80020008
200 *
201 0648E 25742 009F0000 HEX 009F0000
202 06490 25744 01900000 HEX 01900000
203 06492 25746 00900000 HEX 00900000
204 06494 25748 009E0080 HEX 009E0080
205 06496 25750 00810080 HEX 00810080
206 06498 25752 00810080 HEX 00810080
207 0649A 25754 01DE0080 HEX 01DE0080
208 0649C 25756 00000080 HEX 00000080
209 0649E 25758 00200080 HEX 00200080
210 064A0 25760 00200080 HEX 00200080

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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211
212 064A2 25762 0000E380      *      HEX      0000E380
213 064A4 25764 00011440      HEX      00011440
214 064A6 25766 00001440      HEX      00001440
215 064A8 25768 02006440      HEX      02006440
216 064AA 25770 02001440      HEX      02001440
217 064AC 25772 02011440      HEX      02011440
218 064AE 25774 0200E380      HEX      0200E380
219 064B0 25776 02000000      HEX      02000000
220 064B2 25778 02000800      HEX      02000800
221 064B4 25780 02000800      HEX      02000800
222
223 064B6 25782 00000009      *      HEX      00000009
224 064B8 25784 00000019      HEX      00000019
225 064BA 25786 00000029      HEX      00000029
226 064BC 25788 20008049      HEX      20008049
227 064BE 25790 2000807C      HEX      2000807C
228 064C0 25792 20008008      HEX      20008008
229 064C2 25794 20008009      HEX      20008009
230 064C4 25796 20008000      HEX      20008000
231 064C6 25798 20008002      HEX      20008002
232 064C8 25800 20008002      HEX      20008002
233
234 064CA 25802 F0000000      *      HEX      F0000000
235 064CC 25804 00000000      HEX      00000000
236 064CE 25806 00000000      HEX      00000000
237 064D0 25808 E0080020      HEX      E0080020
238 064D2 25810 10080020      HEX      10080020
239 064D4 25812 10080020      HEX      10080020
240 064D6 25814 E0080020      HEX      F0080020
241 064D8 25816 00080020      HEX      00080020
242 064DA 25818 00080020      HEX      00080020
243 064DC 25820 00080020      HEX      00080020
244
245 064DE 25822 0E380000      *      HEX      0E380000
246 064E0 25824 11440000      HEX      11440000
247 064E2 25826 10440000      HEX      10440000
248 064E4 25828 16440200      HEX      16440200
249 064E6 25830 19440200      HEX      19440200
250 064E8 25832 11440200      HEX      11440200
251 064EA 25834 0E380200      HEX      0E380200
252 064EC 25836 00000200      HEX      00000200
253 064EE 25838 00800200      HEX      00800200
254 064F0 25840 00800200      HEX      00800200
255
256 064F2 25842 0007DF00      *      HEX      0007DF00
257 064F4 25844 00005000      HEX      00005000
258 064F6 25846 00009000      HEX      00009000
259 064F8 25848 08011E00      HEX      08011E00
260 064FA 25850 08010100      HEX      08010100
261 064FC 25852 08020100      HEX      08020100
262 064FE 25854 08021E00      HEX      08021E00
263 06500 25856 08000000      HEX      08000000
264 06502 25858 08002000      HEX      08002000
265 06504 25860 08002000      HEX      08002000
266
267 06506 25862 0000003E      *      HEX      0000003E
268 06508 25864 00000020      HEX      00000020
269 0650A 25866 00000020      HEX      00000020
270 0650C 25868 80020038      HEX      80020038
271 0650E 25870 80020020      HEX      80020020
272 06510 25872 80020020      HEX      80020020
273 06512 25874 8002003E      HEX      8002003E
274 06514 25876 80020000      HEX      80020000
275 06516 25878 80020008      HEX      80020008
276 06518 25880 80020008      HEX      80020008
277
278 0651A 25882 00000000      *      HEX      00000000
279 0651C 25884 00000000      HEX      00000000
280 0651E 25886 00000000      HEX      00000000

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

LINE	ABS.	ADDRESS	INSTCODE	SOURCE	STATEMENT
281	06520	25888	00200080	HEX	00200080
282	06522	25890	00200080	HEX	00200080
283	06524	25892	00200080	HEX	00200080
284	06526	25894	00200080	HEX	00200080
285	06528	25896	00200080	HEX	00200080
286	0652A	25898	00200080	HEX	00200080
287	0652C	25900	00200080	HEX	00200080
288				*	
289	0652E	25902	473E0000	HEX	473E0000
290	06530	25904	C8A00000	HEX	C8A00000
291	06532	25906	48A00000	HEX	48A00000
292	06534	25908	48BC0800	HEX	48BC0800
293	06536	25910	48820800	HEX	48820800
294	06538	25912	48820800	HEX	48820800
295	0653A	25914	E73C0800	HEX	E73C0800
296	0653C	25916	00000800	HEX	00000800
297	0653E	25918	02000800	HEX	02000800
298	06540	25920	02000800	HEX	02000800
299				*	
300	06542	25922	0011C700	HEX	0011C700
301	06544	25924	00322880	HEX	00322880
302	06546	25926	00102880	HEX	00102880
303	06548	25928	20104882	HEX	20104882
304	0654A	25930	20108882	HEX	20108882
305	0654C	25932	20110882	HEX	20110882
306	0654E	25934	203BE702	HEX	203BE702
307	06550	25936	20000002	HEX	20000002
308	06552	25938	20003002	HEX	20003002
309	06554	25940	20008002	HEX	20008002
310				*	
311	06556	25942	00000473	HEX	00000473
312	06558	25944	00000C8A	HEX	00000C8A
313	0655A	25946	0000040A	HEX	0000040A
314	0655C	25948	00080433	HEX	00080433
315	0655E	25950	00080408	HEX	00080408
316	06560	25952	00080488	HEX	00080488
317	06562	25954	00080E73	HEX	00080E73
318	06564	25956	00080000	HEX	00080000
319	06566	25958	00080020	HEX	00080020
320	06568	25960	00080020	HEX	00080020
321				*	
322	0656A	25962	E0000001	HEX	E0000001
323	0656C	25964	00000003	HEX	00000003
324	0656E	25966	00000001	HEX	00000001
325	06570	25968	C0200201	HEX	C0200201
326	06572	25970	20800201	HEX	20800201
327	06574	25972	20800201	HEX	20800201
328	06576	25974	C0200203	HEX	C0200203
329	06578	25976	00800200	HEX	00800200
330	0657A	25978	00800200	HEX	00800200
331	0657C	25980	00800200	HEX	00800200
332				*	
333	0657E	25982	3E700000	HEX	3E700000
334	06580	25984	20880000	HEX	20880000
335	06582	25986	20880000	HEX	20880000
336	06584	25988	3C882000	HEX	3C882000
337	06586	25990	02882000	HEX	02882000
338	06588	25992	02882000	HEX	02882000
339	0658A	25994	BC702000	HEX	BC702000
340	0658C	25996	00002000	HEX	00002000
341	0658E	25998	08002000	HEX	08002000
342	06590	26000	08002000	HEX	08002000
343				*	
344	06592	26002	00473E00	HEX	00473E00
345	06594	26004	00C8A000	HEX	00C8A000
346	06596	26006	00482000	HEX	00482000
347	06598	26008	804B3C08	HEX	804B3C08
348	0659A	26010	804C8208	HEX	804C8208
349	0659C	26012	80488208	HEX	80488208
350	0659E	26014	80E73C08	HEX	80E73C08

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

351	065A0	26016	80000008	HEX	80000008
352	065A2	26018	80020008	HEX	80020008
353	065A4	26020	80020008	HEX	80020008
354				*	
355	065A6	26022	00000100	HEX	00000100
356	065A8	26024	00000220	HEX	00000220
357	065AA	26026	00000200	HEX	00000200
358	065AC	26028	00200100	HEX	00200100
359	065AE	26030	00200020	HEX	00200020
360	065B0	26032	00200220	HEX	00200220
361	065B2	26034	00200100	HEX	00200100
362	065B4	26036	00200000	HEX	00200000
363	065B6	26038	00200080	HEX	00200080
364	065B8	26040	00200080	HEX	00200080
365				*	
366	065BA	26042	00000004	HEX	00000004
367	065BC	26044	00000000	HEX	00000000
368	065BE	26046	00000004	HEX	00000004
369	065C0	26048	02000804	HEX	02000804
370	065C2	26050	02000804	HEX	02000804
371	065C4	26052	02000804	HEX	02000804
372	065C6	26054	0200080E	HEX	0200080E
373	065C8	26056	02000800	HEX	02000800
374	065CA	26058	02000800	HEX	02000800
375	065CC	26060	02000800	HEX	02000800
376				*	
377	065CE	26062	73E00000	HEX	73E00000
378	065D0	26064	8A000000	HEX	8A000000
379	065D2	26066	8A000000	HEX	8A000000
380	065D4	26068	7BC08002	HEX	7BC08002
381	065D6	26070	08208002	HEX	08208002
382	065D8	26072	88208002	HEX	88208002
383	065DA	26074	73C08002	HEX	73C08002
384	065DC	26076	00008002	HEX	00008002
385	065DE	26078	20008002	HEX	20008002
386	065E0	26080	20008002	HEX	20008002
387				*	
388	065E2	26082	0388E000	HEX	0388E000
389	065E4	26084	04591000	HEX	04591000
390	065E6	26086	00491000	HEX	00491000
391	065E8	26088	00891020	HEX	00891020
392	065EA	26090	01091020	HEX	01091020
393	065EC	26092	02091020	HEX	02091020
394	065EE	26094	07DCE020	HEX	07DCE020
395	065F0	26096	00000020	HEX	00000020
396	065F2	26098	00080020	HEX	00080020
397	065F4	26100	00080020	HEX	00080020
398				*	
399	065F6	26102	0001C73E	HEX	0001C73E
400	065F8	26104	000228A0	HEX	000228A0
401	065FA	26106	000020A0	HEX	000020A0
402	065FC	26108	0080413C	HEX	0080413C
403	065FE	26110	00808202	HEX	00808202
404	06600	26112	00810402	HEX	00810402
405	06602	26114	0083EFBC	HEX	0083EFBC
406	06604	26116	00800000	HEX	00800000
407	06606	26118	00800200	HEX	00800200
408	06608	26120	00800200	HEX	00800200
409				*	
410	0660A	26122	000000E0	HEX	000000E0
411	0660C	26124	00000111	HEX	00000111
412	0660E	26126	00000012	HEX	00000012
413	06610	26128	08002024	HEX	08002024
414	06612	26130	08002047	HEX	08002047
415	06614	26132	08002080	HEX	08002080
416	06616	26134	080021F0	HEX	080021F0
417	06618	26136	08002000	HEX	08002000
418	0661A	26138	08002000	HEX	08002000
419	0661C	26140	08002000	HEX	08002000
420				*	

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

421	0661E	26142	8E000000	HEX	8E000000
422	06620	26144	91000000	HEX	91000000
423	06622	26146	91000000	HEX	91000000
424	06624	26148	91020008	HEX	91020008
425	06626	26150	D1020008	HEX	D1020008
426	06628	26152	91020008	HEX	91020008
427	0662A	26154	8E020008	HEX	8E020008
428	0662C	26156	00020008	HEX	00020008
429	0662E	26158	80020008	HEX	80020008
430	06630	26160	80020008	HEX	80020008
431				*	
432	06632	26162	1CFBE000	HEX	1CFBE000
433	06634	26164	22820000	HEX	22820000
434	06636	26166	02820000	HEX	02820000
435	06638	26168	04F3C080	HEX	04F3C080
436	0663A	26170	08082080	HEX	08082080
437	0663C	26172	10082080	HEX	10082080
438	0663E	26174	3EF3C080	HEX	3EF3C080
439	06640	26176	00000080	HEX	00000080
440	06642	26178	00200080	HEX	00200080
441	06644	26180	00200080	HEX	00200080
442				*	
443	06646	26182	00002200	HEX	00002200
444	06648	26184	00002200	HEX	00002200
445	0664A	26186	00002200	HEX	00002200
446	0664C	26188	02002A00	HEX	02002A00
447	0664E	26190	02002A00	HEX	02002A00
448	06650	26192	02003600	HEX	02003600
449	06652	26194	02001400	HEX	02001400
450	06654	26196	02000000	HEX	02000000
451	06656	26198	02000800	HEX	02000800
452	06658	26200	02000800	HEX	02000800
453				*	
454	0665A	26202	000001C7	HEX	000001C7
455	0665C	26204	00000228	HEX	00000228
456	0665E	26206	00000028	HEX	00000028
457	06660	26208	20008047	HEX	20008047
458	06662	26210	20008088	HEX	20008088
459	06664	26212	20008108	HEX	20008108
460	06666	26214	200083E7	HEX	200083E7
461	06668	26216	20008000	HEX	20008000
462	0666A	26218	20008002	HEX	20008002
463	0666C	26220	20008002	HEX	20008002
464				*	
465	0666E	26222	3E000000	HEX	3E000000
466	06670	26224	A0000000	HEX	A0000000
467	06672	26226	A0000000	HEX	A0000000
468	06674	26228	3C080020	HEX	3C080020
469	06676	26230	82080020	HEX	82080020
470	06678	26232	82080020	HEX	82080020
471	0667A	26234	3C080020	HEX	3C080020
472	0667C	26236	00080020	HEX	00080020
473	0667E	26238	00080020	HEX	00080020
474	06680	26240	00080020	HEX	00080020
475				*	
476	06682	26242	71C70000	HEX	71C70000
477	06684	26244	8A288000	HEX	8A288000
478	06686	26246	0A288000	HEX	0A288000
479	06688	26248	32288200	HEX	32288200
480	0668A	26250	0A288200	HEX	0A288200
481	0668C	26252	8A288200	HEX	8A288200
482	0668E	26254	71C70200	HEX	71C70200
483	06690	26256	00000200	HEX	00000200
484	06692	26258	00800200	HEX	00800200
485	06694	26260	00800200	HEX	00800200
486				*	
487	06696	26262	000E27C0	HEX	000E27C0
488	06698	26264	00116400	HEX	00116400
489	0669A	26266	00012400	HEX	00012400
490	0669C	26268	08062780	HEX	08062780

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491	0669E	26270	08012040	HEX	08012040
492	066A0	26272	08112040	HEX	08112040
493	066A2	26274	080E7780	HEX	080E7780
494	066A4	26276	08000000	HEX	08000000
495	066A6	26278	08002000	HEX	08002000
496	066A8	26280	08002000	HEX	08002000
497				*	
498	066AA	26282	00000710	HEX	00000710
499	066AC	26284	000008A2	HEX	000008A2
500	066AE	26286	00000082	HEX	00000082
501	066B0	26288	80020300	HEX	80020300
502	066B2	26290	80020082	HEX	80020082
503	066B4	26292	800208A2	HEX	800208A2
504	066B6	26294	80020710	HEX	80020710
505	066B8	26296	80020000	HEX	80020000
506	066BA	26298	80020008	HEX	80020008
507	066BC	26300	80020008	HEX	80020008
508				*	
509	066BE	26302	70000003	HEX	70000003
510	066C0	26304	88000004	HEX	88000004
511	066C2	26306	88000000	HEX	88000000
512	066C4	26308	88200081	HEX	88200081
513	066C6	26310	88200080	HEX	88200080
514	066C8	26312	88200084	HEX	88200084
515	066CA	26314	70200083	HEX	70200083
516	066CC	26316	00200080	HEX	00200080
517	066CE	26318	00200080	HEX	00200080
518	066D0	26320	00200080	HEX	00200080
519				*	
520	066D2	26322	82700000	HEX	82700000
521	066D4	26324	46400000	HEX	46400000
522	066D6	26326	4A400000	HEX	4A400000
523	066D8	26328	92780800	HEX	92780800
524	066DA	26330	5F040800	HEX	5F040800
525	066DC	26332	42040800	HEX	42040800
526	066DE	26334	82780800	HEX	82780800
527	066E0	26336	00000800	HEX	00000800
528	066E2	26338	02000800	HEX	02000800
529	066E4	26340	02000800	HEX	02000800
530				*	
531	066E6	26342	00022000	HEX	00022000
532	066E8	26344	00032000	HEX	00032000
533	066EA	26346	0002A000	HEX	0002A000
534	066EC	26348	2002A002	HEX	2002A002
535	066EE	26350	20026002	HEX	20026002
536	066F0	26352	20022002	HEX	20022002
537	066F2	26354	20022002	HEX	20022002
538	066F4	26356	20000002	HEX	20000002
539	066F6	26358	20008002	HEX	20008002
540	066F8	26360	20008002	HEX	20008002
541				*	
542	066FA	26362	0000009F	HEX	0000009F
543	066FC	26364	00000190	HEX	00000190
544	066FE	26366	00000090	HEX	00000090
545	06700	26368	0008009E	HEX	0008009E
546	06702	26370	00080081	HEX	00080081
547	06704	26372	00080081	HEX	00080081
548	06706	26374	000801DE	HEX	000801DE
549	06708	26376	00080000	HEX	00080000
550	0670A	26378	00080020	HEX	00080020
551	0670C	26380	00080020	HEX	00080020
552				*	
553	0670E	26382	00000000	HEX	00000000
554	06710	26384	00000001	HEX	00000001
555	06712	26386	00000000	HEX	00000000
556	06714	26388	00800200	HEX	00800200
557	06716	26390	00800200	HEX	00800200
558	06718	26392	00800201	HEX	00800201
559	0671A	26394	00800200	HEX	00800200
560	0671C	26396	00800200	HEX	00800200

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 LINE ABS. ADDRESS INSCODE SOURCE STATEMENT

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561 0671E 26398 00800200      HEX      00800200
562 06720 26400 00800200      HEX      00800200
563                                     *
564 06722 26402 E3800000      HEX      E3800000
565 06724 26404 14400000      HEX      14400000
566 06726 26406 14400000      HEX      14400000
567 06728 26408 64402000      HEX      64402000
568 0672A 26410 14402000      HEX      14402000
569 0672C 26412 14402000      HEX      14402000
570 0672E 26414 E3802000      HEX      E3802000
571 06730 26416 00002000      HEX      00002000
572 06732 26418 08002000      HEX      08002000
573 06734 26420 08002000      HEX      08002000
574                                     *
575 06736 26422 0009F000      HEX      0009F000
576 06738 26424 00190000      HEX      00190000
577 0673A 26426 00290000      HEX      00290000
578 0673C 26428 8049E008      HEX      8049E008
579 0673E 26430 807C1008      HEX      807C1008
580 06740 26432 80081008      HEX      80081008
581 06742 26434 8009E008      HEX      8009E008
582 06744 26436 80000008      HEX      80000008
583 06746 26438 80020008      HEX      80020008
584 06748 26440 80020008      HEX      80020008
585                                     *
586                                     *
587 0674A 26442 5060949C STRTPT LDX      12, GLBRTN PUT ADDR OF JS+2 INTO XR12
588 0674C 26444 34640000      LAE      0, 12, I  OBTAIN STRTING LOC OF THE ARGUMENT LIST
589 0674E 26446 06E8          LXA      13
590 0674F 26447      0700
590 06750 26448 60620002      IMP      12, 2, M
591 06752 26450 1060949C      STX      12, GLBRTN MODIFY THE RETURN ADDR
592                                     * TRANSFER THE ARGUMENTS
593 06754 26452 50220000      LDX      4, NARGX2-2, M
594 06756 26454 16680000      XFER    LDA      0, 4, 13
595 06758 26456 3E003E00      STA      ARG1ST, 4
596 0675A 26458 60230002      IMN      4, 2, M
597 0675C 26460 6086          JU       XFER
597 0675D 26461      0700
598 0675E 26462 14003E00      STRT   LDA      HDG      HDG IN DEGREES FL. PT. ( 0 <= HDG < 360 )
599 06760 26464 6304          JL       *+4      TST FOR NEGATIVE INPUT
600 06761 26465      0700
600 06762 26466 30006436      STA      HDGIN
601 06764 26468 14006436      LDA      HDGIN
602 06766 26470 9400643A      MLF      K1
603 06768 26472 30003E16      STA      BDSPL
604 0676A 26474 84006438      DVF      THRTY2
605 0676C 26476 0400          CFX
606 0676D 26477      0700
606 0676E 26478 30003E14      STA      DSPL
607 06770 26480 14020000      LDA      0, M
608 06772 26482 0805          SLLD    5
609 06773 26483      0700
609 06774 26484 AC00643C      ADL      MSB
610 06776 26486 A4020000      ADU      0, M
611 06778 26488 06A0          LXA      4
612 06779 26489      0700
612 0677A 26490 14003E14      LDA      DSPL
613 0677C 26492 D402000A      MUL      10, M
614 0677E 26494 0500          EAB
615 0677F 26495      06C8      LXA      9
616 06780 26496 5C420000      LDX      8, 0, M
617                                     * ROUTINE TO SHIFT AND TRANSFER THE HEADING SCALE INTO THE RASTER
618                                     * XR9 - THE STARTING WORD ACROSS THE STORED SCALE
619                                     * XR4 - SHIFT COUNT

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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620 * XRB - RASTER WORD COUNTER
621 06782 26498 1448643E SCL00P LDA HDGSCL,9
622 06784 26500 54486452 LDB HDGSCL+20,9
623 06786 26502 0A00 SLLD 0,4
624 06787 26503 0700
624 06788 26504 C4408102 LOR SCLPOS+2,8
625 0678A 26506 3C408102 STA SCLPOS+2,8
626 0678C 26508 6C4A0002 IMP 9,2,M
627 0678E 26510 6C420010 IMP 8,16,M
628 06790 26512 244300A0 ICL 8,160,M
629 06792 26514 6004 JU NXWC
629 06793 26515 0700
630 06794 26516 6092 JU SCL00P
631 06795 26517 0700
631 06796 26518 6C43009E NXWC IMN 8,158,M
632 06798 26520 2443000C ICL 8,12,M
633 0679A 26522 6004 JU RFMK
633 0679B 26523 0700
634 0679C 26524 609A JU SCL00P
635 *
636 0679D 26525 0700
636 0679E 26526 5C420000 RFMK LDX 8,0,M
637 067A0 26528 5C22000C LDX 4,12,M
638 067A2 26530 1400643C RFLOOP LDA MSB
639 067A4 26532 C44081B8 LOR SCLPOS+184,8
640 067A6 26534 3C4081B8 STA SCLPOS+184,8
641 067A8 26536 6C420010 IMP 8,16,M
642 067AA 26538 6C230002 IMN 4,2,M
643 067AC 26540 608A JU RFLOOP
643 067AD 26541 0700
644 067AE 26542 7400949C RTA GLBRTN
645 END

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0 ERRORS

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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139          * VSCALE -- VERTICAL SCALE SUBROUTINE
140          *
141 00008      8          NARGX2 SETD  8          THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142 06A0E    27310      ORG          VSCALE
143 06A0E    27310 0400949C    PTR          GLBRTH
144 06A00    27312 64306A86    JGU          STRTPT
145          * STORAGE FOR XFER OF ARGUMENTS INTO THE ROUTINE
146 03E00    15872      HPOS EQU          ARG1ST  WRD COLUMN NO. OF HORIZONTAL POSITION OF SCALE
147 03E02    15874      VSCLC EQU         ARG1ST+2  RASTER LINE NO. OF SCALE CENTER MARK
148 03E04    15876      VSPC EQU          ARG1ST+4  NO. OF RASTER LINES BETWEEN SCALE DIVISIONS
149 03E06    15878      VMRKS EQU         ARG1ST+6  TOTAL NO. OF SCALE MARKS, EXCLUDING CENTER MARK
150          *
151 06AB2    27314 00FFFE00    LMARK HEX    00FFFE00
152 06AB4    27316 000FE000    SMARK HEX    000FE000
153          *
154 06AB6    27318 5060949C    STRTPT LDX    12, GLBRTH PUT ADDR OF JS+2 INTO XR12
155 06AB8    27320 34640000    LAE          0, 12, I  OBTAIN STRING LOC OF THE ARGUMENT LIST
156 06ABA    27322 06E8        LXA          13
157 06ABB    27323 0700
158 06ABC    27324 60620002    IMP          12, 2, M
159 06ABE    27326 1060949C    STX          12, GLBRTH MODIFY THE RETURN ADDR
159          * TRANSFER THE ARGUMENTS
160 06AC0    27328 5C220006    LDX          4, NARGX2-2, M
161 06AC2    27330 16680000    XFER LDA     0, 4, 13
162 06AC4    27332 3E003E00    STA         ARG1ST, 4
163 06AC6    27334 6C230002    IMH         4, 2, M
164 06AC8    27336 6086        JU          XFER
164 06AC9    27337 0700
165          *
166 06ACA    27338 14003E02    LDA         VSCLC
167 06ACC    27340 0843        SLL         LGUPL
168 06ACD    27341 0700
169 06ACE    27342 A4003E00    ABU         HPOS
170 06AD0    27344 0841        SLL         1          A CONTAINS TVRSTR INDEX OF THE SCALE CENTER
171 06AD1    27345 06C0        LXA         8
172 06AD2    27346 06C8        LXA         9
173 06AD3    27347 0700
174 06AD4    27348 506A0000    LDX         13, 0, M
173          *
174          * COMPUTE (RASTER LINE SPACING)*UPLX2
175 06AD6    27350 14003E04    LDA         VSPC      VSPC CONTAINS SPACING IN RASTER LINES
176 06AD8    27352 0844        SLL         LGUPL+1
177 06AD9    27353 0700
178 06ADA    27354 30003E04    STA         VSPC      VSPC NOW CONTAINS SPACING IN TVRSTR WRDS
178          *
179          * PUT IN THE SCALE CENTER MARK
180 06ADC    27356 14408000    LDA         TVRSTR, 8
181 06ADE    27358 C4006AB2    LOR         LMARK
182 06AE0    27360 3C408000    STA         TVRSTR, 8
183          *
184          * NOW PUT IN THE OTHER SCALE MARKS
185 06AEB    27362 6C413E04    LOOP IMH     8, VSPC
186 06AE4    27364 6C483E04    IMP         9, VSPC
187 06AEE    27366 14408000    LDA         TVRSTR, 8
188 06AE8    27368 C4006AB4    LOR         SMARK
189 06AEA    27370 3C408000    STA         TVRSTR, 8
190 06AEC    27372 14488000    LDA         TVRSTR, 9
191 06AEE    27374 C4006AB4    LOR         SMARK
192 06AF0    27376 3C488000    STA         TVRSTR, 9
193 06AF2    27378 6C413E04    IMH         8, VSPC
194 06AF4    27380 6C483E04    IMP         9, VSPC
195 06AF6    27382 14408000    LDA         TVRSTR, 8
196 06AF8    27384 C4006AB2    LOR         LMARK
197 06AFA    27386 3C408000    STA         TVRSTR, 8
198 06AFC    27388 14488000    LDA         TVRSTR, 9
199 06AFE    27390 C4006AB2    LOR         LMARK
200 06B00    27392 3C488000    STA         TVRSTR, 9
201 06B02    27394 6C6A0004    IMP         13, 4, M
202 06B04    27396 24693E06    ICL         13, VMRKS  VMRKS = NO. OF SCALE DIVISIONS
203 06B06    27398 7400949C    RTA         GLBRTH
204 06B08    27400 60A6        JU          LOOP
205 06B09    27401 0700
205          END

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0 ERRORS

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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139          * HSCALE -- HORIZONTAL SCALE SUBROUTINE
140          *
141 00008      8      NARGX2 SETD      8      THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142 06B12    27410      ORG      HSCALE
143 06B12    27410 0400949C      PTR      GLBRTN
144 06B14    27412 64306B22      JGU      STRTPT
145          * STORAGE FOR XFER OF ARGUMENTS INTO THE ROUTINE
146 03E00    15872      VPOS EQU      ARGLST RASTER LINE NO. OF VERTICAL POSITION OF SCALE
147 03E04    15874      HSTRT EQU     ARGLST+2 WDR CLMN NO. OF THE BEGINNING OF THE SCALE
148 03E04    15876      HMSK EQU     ARGLST+4 MASK NO. THAT DETERMINES THE NO. OF SCALE DIVISIONS
149 03E06    15878      HSIZE EQU     ARGLST+6 WIDTH OF SCALE IN WRD COLUMNS
150          *
151          * STORAGE FOR LOCAL VARIABLES
152 03E16    15894      MSK EQU      TEMP+2 STORAGE FOR THE SELECTED MASK
153 06B16    27414 00000000      SCLMSK HEX      0
154 06B18    27416 80000000      HEX      80000000
155 06B1A    27418 80008000      HEX      80008000
156 06B1C    27420 80808080      HEX      80808080
157 06B1E    27422 88888888      HEX      88888888
158 06B20    27424 AAAAAAAAAA      HEX      AAAAAAAAAA
159          *
160 06B22    27426 5C60949C      STRTPT LDX      12, GLBRTN PUT ADDR OF JS+2 INTO XR12
161 06B24    27428 34640000      LAE      0, 12, I OBTAIN STRTING LOC OF THE ARGUMENT LIST
162 06B26    27430 06E8          LXA      13
163 06B27    27431 0700
163 06B28    27432 6C620002      IMP      12, 2, M
164 06B2A    27434 1C60949C      STX      12, GLBRTN MODIFY THE RETURN ADDR
165          * TRANSFER THE ARGUMENTS
166 06B2C    27436 5C220006      LDX      4, NARGX2-2, M
167 06B2E    27438 16680000      XFER LDA      0, 4, 13
168 06B30    27440 3F003E00      STA      ARGLST, 4
169 06B32    27442 6C230002      IMN      4, 2, M
170 06B34    27444 64306B2E      JU      XFER
171          *
172 06B36    27446 14003E04      LDA      HMSK
173 06B38    27448 0841          SLL      1
174 06B39    27449 06E8          LXA      13
175 06B3A    27450 14686B16      LDA      SCLMSK, 13
176 06B3C    27452 3C003E18      STA      MSK+2
177 06B3E    27454 14686B14      LDA      SCLMSK-2, 13
178 06B40    27456 3C003E16      STA      MSK
179 06B42    27458 14003E00      LDA      VPOS
180 06B44    27460 0843          SLL      LGUPL
181 06B45    27461 0700
181 06B46    27462 A4003E02      ADU      HSTRT
182 06B48    27464 0841          SLL      1
183 06B49    27465 06C0          LXA      8
184 06B4A    27466 06C8          LXA      9
185 06B4B    27467 0700
185 06B4C    27468 14003E06      LDA      HSIZE
186 06B4E    27470 0841          SLL      1
187 06B4F    27471 0700
187 06B50    27472 E4020002      SBU      2, M
188 06B52    27474 3C003E14      STA      TEMP
189 06B54    27476 5C620002      LDX      12, 2, M
190 06B56    27478 5C6A0006      LOOP0 LDX      13, 6, M
191 06B58    27480 5C203E14      LOOP1 LDX      4, TEMP
192 06B5A    27482 16408008      LDA      TVRSTR+8, 4, 8
193 06B5C    27484 C4006B18      LOR      SCLMSK+2
194 06B5E    27486 3E408002      STA      TVRSTR+2, 4, 8
195 06B60    27488 16488002      LDA      TVRSTR+2, 4, 9
196 06B62    27490 C4006B18      LOR      SCLMSK+2
197 06B64    27492 3E488002      STA      TVRSTR+2, 4, 9
198 06B66    27494 16408000      LOOP2 LDA      TVRSTR, 4, 8
199 06B68    27496 C4603E16      LOR      MSK, 12
200 06B6A    27498 3E408000      STA      TVRSTR, 4, 8
201 06B6C    27500 16488000      LDA      TVRSTR, 4, 9
202 06B6E    27502 C4603E16      LOR      MSK, 12
203 06B70    27504 3E488000      STA      TVRSTR, 4, 9
204 06B72    27506 6C230002      IMN      4, 2, M
205 06B74    27508 64306B66      JU      LOOP2
206 06B76    27510 6C430010      IMN      8, WPLX2, M
207 06B78    27512 6C4A0010      IMP      9, WPLX2, M
208 06B7A    27514 6C6B0002      IMN      13, 2, M
209 06B7C    27516 64306B58      JU      LOOP1
210 06B7E    27518 6C630002      IMN      12, 2, M
211 06B80    27520 64306B56      JU      LOOP0
212 06B82    27522 7400949C      RTA      GLBRTN
213          END

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0 ERRORS

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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139          * VBAR -- VERTICAL BAR SUBROUTINE
140          *
141 0000E      14          NARGX2 SETD      14          THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142 06B8A    27530          ORG          VBAR
143 06B8A    27530 0400949C          PTR          GLBRTN
144 06B8C    27532 64306B98          JGU          STRTPT
145          *
146          * STORAGE FOR ARGUMENTS XFERED INTO THIS ROUTINE
147 03E00    15872          YBAR EQU          ARG1ST
148 03E02    15874          KABAR EQU         ARG1ST+2
149 03E04    15876          KBBAR EQU         ARG1ST+4
150 03E06    15878          HPVB EQU          ARG1ST+6
151 03E08    15880          BARSL EQU         ARG1ST+8
152 03E0A    15882          VBUL EQU          ARG1ST+10
153 03E0C    15884          VBLL EQU          ARG1ST+12
154          *
155          * STORAGE FOR LOCAL VARIABLES AND PARAMETERS
156 03E0E    15886          BARMSK EQU         ARG1ST+14
157 06B8E    27534 000000E0          BRCCODE HEX         000000E0
158 06B90    27536 00000E00          HEX          00000E00
159 06B92    27538 00038000          HEX          00038000
160 06B94    27540 00E00000          HEX          00E00000
161 06B96    27542 0E000000          HEX          0E000000
162          *
163 06B98    27544 5C60949C STRTPT LDX          12, GLBRTN PUT ADDR OF JS+2 INTO XR12
164 06B9A    27546 34640000          LAE          0, 12, I OBTAIN STRTING LOC OF THE ARGUMENT LIST
165 06B9C    27548 06E8          LXA          13
166 06B9D    27549 0700
166 06B9E    27550 6C620002          IMP          12, 2, M
167 06BA0    27552 1C60949C          STX          12, GLBRTN MODIFY THE RETURN ADDR
168          * TRANSFER THE ARGUMENTS
169 06BA2    27554 5C22000C          LDX          4, NARGX2-2, M
170 06BA4    27556 16680000          XFER LDA          0, 4, 13
171 06BA6    27558 3E003E00          STA          ARG1ST, 4
172 06BA8    27560 6C230002          IMN          4, 2, M
173 06BAA    27562 6086          JU          XFER
173 06BAB    27563 0700
174          * COMPUTE THE BAR CODE WHICH WAS SELECTED AND STORE IT IN BARMSK
175 06BAC    27564 14003E08          LDA          BARSL
176 06BAE    27566 0841          SLL          1
177 06BAF    27567 06C0          LXA          8
178 06BB0    27568 14406B8E          LDA          BRCCODE, 8
179 06BB2    27570 3C003E0E          STA          BARMSK
180          * COMPUTE THE STARTING RASTER WORD NO. FROM WHICH THE BAR WILL ORIGINATE
181 06BB4    27572 14003E04          LDA          KBBAR
182 06BB6    27574 0400          CFX
183 06BB7    27575 0500          EAB
184 06BB8    27576 6204          JG          RND
185 06BB9    27577 0700
185 06BBA    27578 AC009404          ADL          IONE
186 06BBC    27580 0500          RND EAB
187 06BBD    27581 0843          SLL          LGWPL
188 06BBE    27582 A4003E06          ADU          HPVB
189 06BC0    27584 0841          SLL          1
190 06BC1    27585 06C0          LXA          8
191          * CHECK FOR YBAR WITHIN RANGE, RESCALE IT, AND MODIFY THE INC XR INST WITHIN
192          * THE LOOP
193 06BC2    27586 14003E00          LDA          YBAR
194 06BC4    27588 6224          JG          POS
195 06BC5    27589 0700
195 06BC6    27590 FC003E0C          NEG SBF          VBLL
196 06BC8    27592 6306          JL          LOCLL
197 06BC9    27593 0700
197 06BCA    27594 14003E00          LDA          YBAR
198 06BCC    27596 6004          JU          LOCLL+2
199 06BCD    27597 0700
199 06BCE    27598 14003E0C          LOCLL LDA          VBLL
200 06BD0    27600 94003E02          MLF          KABAR
201 06BD2    27602 0400          CFX
202 06BD3    27603 0500          EAB
203 06BD4    27604 6204          JG          RNDN
204 06BD5    27605 0700
204 06BD6    27606 AC020001          ADL          1, M
205 06BD8    27608 0500          RNDN EAB

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206 06BD9 27609 06E8 LXA 13
207
208 *
209 06BDA 27610 14408000 BARNEG LDA TVRSTR,8
210 06BDC 27612 04003E0E LOR BARMSK
211 06BDE 27614 30408000 STA TVRSTR,8
212 06BE0 27616 60420010 IMP 8,WPLX2,M
213 06BE2 27618 606B0001 IMH 13,1,M
214 06BE4 27620 608A JU BARNEG
215 06BE5 27621 0700
216 06BE6 27622 7400949C RTA GLBRTH
217 06BER 27624 FC003E0A POS SBF VBUL
218 06BEA 27626 6206 JG LOCUL
219 06BEB 27627 0700
219 06BEC 27628 14003E00 LDA YBAR
220 06BEE 27630 6004 JU LOCUL+2
221 06BEF 27631 0700
221 06BF0 27632 14003E0A LOCUL LDA VBUL
222 06BF2 27634 9400948C MLF MONE
223 06BF4 27636 94003E02 MLF KABAR
224 06BF6 27638 0400 CFX
225 06BF7 27639 0500 EAB
226 06BF8 27640 6204 JG RNDP
227 06BF9 27641 0700
227 06BFA 27642 AC020001 ADL 1,M
228 06BFC 27644 0500 RNDP EAB
229 06BFD 27645 06E8 LXA 13 XR13 CONTAINS THE INTEGER MAGNITUDE OF THE BAR
230
231 *
232 06BFE 27646 14408000 BARPOS LDA TVRSTR,8
233 06C00 27648 04003E0E LOR BARMSK
234 06C02 27650 30408000 STA TVRSTR,8
235 06C04 27652 60430010 IMH 8,WPLX2,M
236 06C06 27654 606B0001 IMH 13,1,M
237 06C08 27656 608A JU BARPOS
237 06C09 27657 0700
238 06C0A 27658 7400949C RTA GLBRTH
239 END
  
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0 ERRORS

LINE ABS ADDRESS INSTCODE SOURCE STATEMENT

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139          * VDOF -- VERTICAL DEGREE OF FREEDOM (DOF) SYMBOL SUBROUTINE
140          *
141 0000E      14      NARGX2 GETD      14      THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142 06C16    27670          ORG      VDOF
143 06C16    27670 0400949C      PTR      GLBRTN
144 06C18    27672 64306C84      JGU      STRTPT
145          * STORAGE FOR XFER OF ARGUMENTS INTO THE ROUTINE
146 03E00    15872      YDOF EQU      ARGST      SYMBOL INPUT (FL. PT. MAX ABS VALUE = 1.0)
147 03E02    15874      KAVD EQU      ARGST+2    SCALING PARAMETER
148 03E04    15876      KBVD EQU      ARGST+4    SCALING PARAMETER
149 03E06    15878      HPVD EQU      ARGST+6    WRD COLUMN POS OF THE POINTER
150 03E08    15880      VDSEL EQU      ARGST+8    SYMBOL SELECT
151 03E0A    15882      VDUL EQU      ARGST+10   UPPER LIMIT
152 03E0C    15884      VDLL EQU      ARGST+12   LOWER LIMIT
153          * VERTICAL DEGREE OF FREEDOM SYMBOL STORAGE
154 06C1A    27674 00000002 VDSYM0 HEX      2      LEFT POINTER (<)
155 06C28    27688 80000000 VDSYM1 HEX      80000000 RIGHT POINTER (>)
156 06C36    27702 FFFF0000 VDSYM2 HEX      FFFF0000 REF MARK - LEFT SIDE OF SCALE
157 06C38    27704 0000FFFF VDSYM3 HEX      0000FFFF REF MARK -RIGHT SIDE OF SCALE
158 06C3A    27706 73C8B9CF VDSYM4 HEX      73C8B9CF CRUISE ALPHA CHAR DOT ARRAY
159 06C48    27720 7DE11138 VDSYM5 HEX      7DE11138 TRANSITION CHAR DOT ARRAY
160 06C56    27734 44E45F78 VDSYM6 HEX      44E45F78 HOVER CHAR DOT ARRAY
161 06C64    27748 F1CF045E VDSYM7 HEX      F1CF045E BOB-UP CHAR DOT ARRAY
162 06C72    27762          SYMEND EQU      *      END OF SYMBOL STORAGE
163          *
164 06C72    27762 04006C1A SYMPTR PTR      VDSYM0
165 06C74    27764 04006C28          PTR      VDSYM1
166 06C76    27766 04006C36          PTR      VDSYM2
167 06C78    27768 04006C38          PTR      VDSYM3
168 06C7A    27770 04006C3A          PTR      VDSYM4
169 06C7C    27772 04006C48          PTR      VDSYM5
170 06C7E    27774 04006C56          PTR      VDSYM6
171 06C80    27776 04006C64          PTR      VDSYM7
172 06C82    27778 04006C72          PTR      SYMEND
173          *
174 06C84    27780 5C60949C STRTPT LDX      12, GLBRTN PUT ADDR OF JS+2 INTO XR12
175 06C86    27782 34640000      LAE      0, 12, I      OBTAIN STRTING LOC OF THE ARGUMENT LIST
176 06C88    27784 06E8          LXA      13
177 06C89    27785          0700
178 06C8A    27786 6C620002          IMP      12, 2, M
179 06C8C    27788 1C60949C          STX      12, GLBRTN MODIFY THE RETURN ADDR
180          * TRANSFER THE ARGUMENTS
181 06C8E    27790 5C22000C      LDX      4, NARGX2-2, M
182 06C90    27792 16680000 XFER LDA      0, 4, 13
183 06C92    27794 3E003E00      STA      ARGST, 4
184 06C94    27796 6C230002      IMN      4, 2, M
185 06C96    27798 6086          JU      XFER
186 06C97    27799          0700
187          * ARGUMENTS ARE XFERED , NOW SELECT THE PROPER SYMBOL
188 06C98    27800 14003E08      LDA      VDSEL
189 06C9A    27802 0841          SLL      1
190 06C9B    27803 06C0          LXA      8
191 06C9C    27804 34446C72      LAE      SYMPTR, 8, I
192 06C9E    27806 06E8          LXA      13
193 06C9F    27807          0700
194 06CA0    27808 3C003E14      STA      TEMP
195 06CA2    27810 34446C74      LAE      SYMPTR+2, 8, I
196 06CA4    27812 06A0          LXA      4
197 06CA5    27813          0700
198 06CA6    27814 6C213E14      INH      4, TEMP
199 06CA8    27816 6C230002      INH      4, 2, M
200 06CAA    27818 14003E14      SBU      TEMP      A REG CONT FULL WRD LNGTH OF SELECTED SYMB STORAGE
201 06CAC    27820 0700 06A0      SBU      2
202 06CAE    27822 06A0 06A0      SLL      10, 1
203 06CAE    27822 06A0 06A0      STA      TEMP      TEMP CONTAINS BIAS FOR XRB
204          * CHECK FOR VDOF WITHIN RANGE (VDUL < VDOF < VDLL)
205 06CB0    27824 14003E08      LDA      VDOF
206 06CB2    27826 14003E08      LDA      VDUL
207 06CB4    27828 06C0          SUB      VDOF, VDUL
208 06CB6    27830 06C0          JZ      LOGO

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

252	06CB6	27830	14003E00		LDA	YDOF	YDOF IS NOT GREATER THAN UPPER LIMIT
253	06CB8	27832	FC003E0C		SBF	VDLL	
254	06CBA	27834	630A		JL	LOCLL	
255	06CBB	27835	0700				
255	06CBC	27836	14003E00		LDA	YDOF	YDOF IS WITHIN RANGE
256	06CBE	27838	6008		JU	LOC0	
257	06CBF	27839	0700				
257	06CC0	27840	14003E0A	LOCUL	LDA	VDUL	
258	06CC2	27842	6004		JU	LOC0	
259	06CC3	27843	0700				
259	06CC4	27844	14003E0C	LOCLL	LDA	VDLL	
260	06CC6	27846	94003E02	LOC0	MLF	KAVD	
261	06CC8	27848	BC003E04		ADF	KBVD	
262	06CCA	27850	0400		CFX		
263	06CCB	27851	0500		EAB		
264	06CCC	27852	6204		JG	RNDP	
265	06CCD	27853	0700				
265	06CCE	27854	AC009404		ADL	IONE	
266	06CD0	27856	0500	RNDP	EAB		
267	06CD1	27857	0843		SLL	LQWPL	
268	06CD2	27858	A4003E06		ADU	HPVD	
269	06CD4	27860	0841		SLL	1	
270	06CD5	27861	08C0		LXA	8	
271	06CD6	27862	6C413E14		IMN	8,TEMP	
272	06CD8	27864	14408000	PTR	LDA	TVRSTR,8	
273	06CDA	27866	C4680000		LOR	0,13	
274	06CDC	27868	30408000		BTA	TVRSTR,8	
275	06CDE	27870	6C420010		IMP	8,WPLX2,M	
276	06CE0	27872	6C6A0002		IMP	13,2,M	
277	06CE2	27874	6C230002		IMN	4,2,M	
278	06CE4	27876	608C		JU	PTR	
278	06CE5	27877	0700				
279	06CE6	27878	7400349C	RTN	RTA	GLBRTN	
280					END		

0 ERRORS

LINE ADDR. ADDRESS INSCODE SOURCE STATEMENT

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139          * XYDOF -- FIXED SIZE SYMBOL ROUTINE WITH TWO (X AND Y) TRANSLATIONAL DEGREES
140          * OF FREEDOM (DOF)
141          *
142 0000E      14          NARGXB BETD      14          THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
143 06CF2     27890      ORQ          XYDOF
144 06CF2     27890      0400949C      PTR          GLBRTN
145 06CF4     27892      64306EF8      JGU          STRTPT
146 06CF6     27894      42C00000      SXTEEN DEC      16.0
147          * STORAGE FOR XFER OF ARGUMENTS INTO THE ROUTINE
148 03E00     15872      XFX          EQU          APGLST      FIXED SIZE SYMBOL X INPUT
149 03E02     15874      YFX          EQU          ARG1ST+2    FIXED SIZE SYMBOL Y INPUT
150 03E04     15876      KAFX          EQU          ARG1ST+4    SCALING PARAMETER
151 03E06     15878      KBFX          EQU          ARG1ST+6    SCALING PARAMETER
152 03E08     15880      KCFX          EQU          APGLST+8    SCALING PARAMETER
153 03E0A     15882      KDFX          EQU          ARG1ST+10   SCALING PARAMETER
154 03E0C     15884      XY          EQU          APGLST+12   FIXED SIZE SYMBOL SELECTED
155          * STORAGE FOR THE FIXED SYMBOLS
156 06CF8     27896      00000078    FXSYM0 HEX      00000078    MALE SYMBOL
157 06D20     27936      0003E000    FXSYM1 HEX      0003E000    FEMALE SYMBOL
158 06D4E     27982      0001C000    FXSYM2 HEX      1C000      LARGE CROSS
159 06D7C     28028      00008000    FXSYM3 HEX      00008000    SMALL CROSS
160 06DA8     28074      0007F000    FXSYM4 HEX      0007F000    LARGE CIRCLE
161 06DE8     28136      0003E000    FXSYM5 HEX      0003E000    SMALL CIRCLE
162 06E06     28166      0001C000    FXSYM6 HEX      0001C000    SOLID SMALL CIRCLE
163 06E14     28180      0007F000    FXSYM7 HEX      0007F000    DOWN POINTER
164 06E22     28194      00008000    FXSYM8 HEX      00008000    UP POINTER
165 06E30     28208      00008000    FXSYM9 HEX      00008000    UP OR DOWN POINTER
166 06E48     28234      00041000    FXSM10 HEX      00041000    LARGE SEMI CIRCLE
167 06E88     28296      03FFFFFFE0  FXSM11 HEX      03FFFFFFE0  BOX
168 06EB2     28338      7FF087FF    FXSM12 HEX      7FF087FF    ATTITUDE REF MARK
169 06EB6     28348          SYMEND EQU          *
170          *
171 06EBC     28348      04006CF8    SYMPTR PTR      FXSYM0
172 06EBE     28350      04006D20    PTR          FXSYM1
173 06EC0     28352      04006D4E    PTR          FXSYM2
174 06EC2     28354      04006D7C    PTR          FXSYM3
175 06EC4     28356      04006D9A    PTR          FXSYM4
176 06EC6     28358      04006DE8    PTR          FXSYM5
177 06EC8     28360      04006E06    PTR          FXSYM6
178 06ECA     28362      04006E14    PTR          FXSYM7
179 06ECC     28364      04006E22    PTR          FXSYM8
180 06ECE     28366      04006E30    PTR          FXSYM9
181 06ED0     28368      04006E4A    PTR          FXSM10
182 06ED2     28370      04006E88    PTR          FXSM11
183 06ED4     28372      04006EB2    PTR          FXSM12
184 06ED6     28374      04006EBC    PTR          SYMEND
185          *
186 06ED8     28376      04006D10    SYMCTR PTR      CTR0
187 06EDA     28378      04006D2E    PTR          CTR1
188 06EDC     28380      04006D64    PTR          CTR2
189 06EDE     28382      04006D92    PTR          CTR3
190 06EE0     28384      04006DC8    PTR          CTR4
191 06EE2     28386      04006DF6    PTR          CTR5
192 06EE4     28388      04006E0C    PTR          CTR6
193 06EE6     28390      04006E14    PTR          CTR7
194 06EE8     28392      04006E2E    PTR          CTR8
195 06EEA     28394      04006E3C    PTR          CTR9
196 06EEC     28396      04006E68    PTR          CTR10
197 06EEE     28398      04006E9C    PTR          CTR11
198 06EF0     28400      04006EB2    PTR          FXSM12
199          *
200 06EF2     28402      5C60949C    STRTPT LDX      12, GLBRTN PUT ADDR OF JS+2 INTO XR12
201 06EF4     28404      34640000    LAE          0, 12, I  OBTAIN STRTING LOC OF THE ARGUMENT LIST
202 06EF6     28406      06E8        LX          13
203 06EF7     28407          0700
204 06EF8     28408      6C620002    IMP          12, 2, M
205 06EFA     28410      1C60949C    STX          12, GLBRTN MODIFY THE RETURN ADDR
206          * TRANSFER THE ARGUMENTS
207 06EFC     28412      5C220000    LDX          4, NARGX2-2, M
208 06EFE     28414      16680000    XFER        LDA          0, 4, 13
209 06FF0     28416      3E003E00    STA          ARG1ST, 4
210 06FF2     28418      6C230002    IMH          4, 2, M

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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451 06F04 28420 6086          JU      XFER
451 06F05 28421 0700
452
453 *
454 06F06 28422 14003E0C      LDA     XY
455 06F08 28424 0841          SLL     1
456 06F09 28425 06C0          LXA     8
457 06F0A 28426 34446EBC      LAE     SYMPTR,8,I
458 06F0C 28428 06E8          LXA     13
459 06F0D 28429 0700
459 06F0E 28430 3C003E14      STA     TEMP
460 06F10 28432 34446ERE      LAE     SYMPTR+2,8,I
461 06F12 28434 06E0          LXA     12
462 06F13 28435 0700
462 06F14 28436 6C613E14      IMN     12,TEMP
463 06F16 28438 6C630002      IMN     12,2,M
464 06F18 28440 34446ED8      LAE     SYMCTR,8,I
465 06F1A 28442 E4003E14      SBU     TEMP
466 06F1C 28444 0843          SLL     LGUPL
467 06F1D 28445 0700
467 06F1E 28446 3C003E14      STA     TEMP      TEMP CONTAINS BIAS FOR XRB
468 *
469 06F20 28448 14003E02      LDA     YFX      CHECK FOR (-1.0 < Y1 < 1.0)
470 06F22 28450 FC00948A      SBF     ONE
471 06F24 28452 620C          JG      ULIM1      (Y1 - 1.0) > 0
472 06F25 28453 0700
472 06F26 28454 14003E02      LDA     YFX
473 06F28 28456 FC00948C      SBF     NONE
474 06F2A 28458 630A          JL      LLIM1      (Y1 + 1.0) < 0
475 06F2B 28459 0700
475 06F2C 28460 14003E02      LDA     YFX
476 06F2E 28462 6008          JU      LOC0
477 06F2F 28463 0700
477 06F30 28464 1400948A ULIM1 LDA     ONE      YFX IS SET TO THE UPPER LIMIT +1.0
478 06F32 28466 6004          JU      LOC0
479 06F33 28467 0700
479 06F34 28468 1400948C LLIM1 LDA     NONE     YFX IS SET TO THE LOWER LIMIT -1.0
480 06F36 28470 94003E04 LOC0 MLF     KAFX
481 06F38 28472 BC003E06      ADF     KAFX
482 06F3A 28474 0400          CFX
483 06F3B 28475 0801          SLLD    1
484 06F3C 28476 8C0020001      SAM     1,M
485 06F3E 28478 6004          JU      ++4
485 06F3F 28479 0700
486 06F40 28480 A40020001      ADU     1,M
487 06F42 28482 0C41          SRA     1
488 06F43 28483 0844          SLL     4
489 06F44 28484 06C0          LXA     8
490 06F45 28485 0700
490 06F46 28486 6C413E14      IMN     8,TEMP
491 *
492 06F48 28488 14003E00      LDA     XFX      CHECK FOR (-1.0 < X1 < 1.0)
493 06F4A 28490 FC00948A      SBF     ONE
494 06F4C 28492 620C          JG      ULIM2      (X1 - 1.0) > 0
495 06F4D 28493 0700
495 06F4E 28494 14003E00      LDA     XFX
496 06F50 28496 FC00948C      SBF     NONE
497 06F52 28498 630A          JL      LLIM2      (X1 + 1.0) < 0
498 06F53 28499 0700
498 06F54 28500 14003E00      LDA     XFX
499 06F56 28502 6008          JU      LOC1
500 06F57 28503 0700
500 06F58 28504 1400948A ULIM2 LDA     ONE      XFX IS SET TO THE UPPER LIMIT 1.0
501 06F5A 28506 6004          JU      LOC1
502 06F5B 28507 0700
502 06F5C 28508 1400948C LLIM2 LDA     NONE     XFX IS SET TO THE LOWER LIMIT -1.0
503 06F5E 28510 94003E08 LOC1 MLF     KAFX
504 06F60 28512 BC003E0A      ADF     KAFX
505 06F62 28514 B4006CF6      DVF     SXTEEN

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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506 06F64 28516 0400          CFM
507 06F65 28517      0700
507 06F66 28518 80A20001          SAM      1,M
508 06F68 28520 6026          JU      EVEN
508 06F69 28521      0700
509 06F6A 28522 8402000E          AND      14,M
510 06F6C 28524 30003E14          STA      TEMP
511 06F6E 28526 60403E14          IMP      8,TEMP
512 06F70 28528 14020000          LDA      0,M
513 06F72 28530 0804          SLLD     LGBPW-1
514 06F73 28531      0600          LXA      4
515 06F74 28532 54020000          LDB      0,M
516 06F76 28534 14680000          LDA      0,13
517 06F78 28536 0E20          SRCD     0,4
518 06F79 28537      0700
518 06F7A 28538 04408000          LOR      TVRSTR,8
519 06F7C 28540 30408000          STA      TVRSTR,8
520 06F7E 28542 0500          EAB
521 06F7F 28543      0700
521 06F80 28544 04408002          LOR      TVRSTR+2,8
522 06F82 28546 30408002          STA      TVRSTR+2,8
523 06F84 28548 60420010          IMP      8,WPLX2,M
524 06F86 28550 60600002          IMP      13,2,M
525 06F88 28552 60630002          IMH      12,2,M
526 06F8A 28554 6096          JU      LOOP0
526 06F8B 28555      0700
527 06F8C 28556 7400949C          RTA      GLBRTN
528 06F8E 28558 50220010          LDX      4,16,H
529 06F90 28560 0C41          SPA      1
530 06F91 28561      0841          SLL      1
531 06F92 28562 30003E14          STA      TEMP
532 06F94 28564 60403E14          IMP      8,TEMP
533 06F96 28566 14020000          LDA      0,M
534 06F98 28568 0804          RLLD     LGBPW-1
535 06F99 28569      0700
535 06F9A 28570 30003E14          STA      TEMP
536 06F9C 28572 60213E14          IMH      4,TEMP
537 06F9E 28574 54020000          LDB      0,M
538 06FA0 28576 14680000          LDA      0,13
539 06FA2 28578 0A20          SLCD     0,4
540 06FA3 28579      0700
540 06FA4 28580 04408000          LOR      TVRSTR,8
541 06FA6 28582 30408000          STA      TVRSTR,8
542 06FA8 28584 0500          EAB
543 06FA9 28585      0700
543 06FAA 28586 04407FFE          LOR      TVRSTR-2,8
544 06FAC 28588 30407FFE          STA      TVRSTR-2,8
545 06FAE 28590 60420010          IMP      8,WPLX2,M
546 06FB0 28592 60600002          IMP      13,2,M
547 06FB2 28594 60630002          IMH      12,2,M
548 06FB4 28596 6096          JU      LOOPE
548 06FB5 28597      0700
549 06FB6 28598 7400949C          RTA      GLBRTN
550 07214 29204          ORG      29204
551 07214 29204 00000800          HEX     00000800
552 07216 29206 00000FFF          HEX     00000FFF
553 07218 29208 000007FF          HEX     000007FF
554

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0 ERRORS

LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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139 * DRDOUT -- ROUTINE TO GENERATE A DIGITAL READOUT SYMBOL
140 *
141 0000A 10 NARGX2 SETD 10 THE NO. OF ARGUMENTS (TIMES 2) TO BE XFERED
142 06FC2 28610 ORG DRDOUT
143 06FC2 28610 0400949C PTR GLBRTH
144 06FC4 28612 6430709E JGU STRTPT
145 03E00 15872 INPT EQU ARG1ST
146 03E02 15874 NMB0 EQU ARG1ST+2
147 03E04 15876 STLN EQU ARG1ST+4
148 03E06 15878 STWC EQU ARG1ST+6
149 03E08 15880 TITLE EQU ARG1ST+8
150 06FC6 28614 0000001F DGTMSK HEX 0000001F MASKS FOR THE INDIVIDUAL DIGIT POSITIONS
151 06FC8 28616 000007C0 HEX 000007C0
152 06FCA 28618 0001F000 HEX 0001F000
153 06FCC 28620 007C0000 HEX 007C0000
154 06FCF 28622 1F000000 HEX 1F000000
155 06FD0 28624 E0000000 HEX E0000000
156 06FD2 28626 00022F1C TTLS HEX 00022F1C HDG
157 06FD4 28628 000224A2 HEX 000224A2 HDG
158 06FD6 28630 000224A0 HEX 000224A0 HDG
159 06FD8 28632 0003E4A0 HEX 0003E4A0 HDG
160 06FDA 28634 000224A6 HEX 000224A6 HDG
161 06FDC 28636 000224A2 HEX 000224A2 HDG
162 06FDE 28638 00022F1C HEX 00022F1C HDG
163 06FE0 28640 LOCRTN BSS 2
164 06FE2 28642 0000201C HEX 0000201C AIRSPEED
165 06FE4 28644 000140A2 HEX 000140A2 AIRSPEED
166 06FE6 28646 00022120 HEX 00022120 AIRSPEED
167 06FE8 28648 0002221C HEX 0002221C AIRSPEED
168 06FEA 28650 0003E402 HEX 0003E402 AIRSPEED
169 06FEC 28652 00022222 HEX 00022222 AIRSPEED
170 06FEE 28654 0002201C HEX 0002201C AIRSPEED
171 06FF0 28656 0000000A TEN DEC 10
172 06FF2 28658 0003C89C HEX 0003C89C RANGE
173 06FF4 28660 00012CA2 HEX 00012CA2 RANGE
174 06FF6 28662 00012AA0 HEX 00012AA0 RANGE
175 06FF8 28664 00010CAA0 HEX 00010CAA0 RANGE
176 06FFA 28666 000129A6 HEX 000129A6 RANGE
177 06FFC 28668 000128A2 HEX 000128A2 RANGE
178 06FFE 28670 0001289C HEX 0001289C RANGE
179 07000 28672 0E38E38E NUMBR5 HEX 0E38E38E ZERO
180 07002 28674 11451451 HEX 11451451
181 07004 28676 11451451 HEX 11451451
182 07006 28678 11451451 HEX 11451451
183 07008 28680 11451451 HEX 11451451
184 0700A 28682 11451451 HEX 11451451
185 0700C 28684 0E38E38E HEX 0E38E38E
186 0700E 28686 00000000 TENTH HEX 00000000
187 07010 28688 0E38E38E HEX 0E38E38E ONE
188 07012 28690 04104104 HEX 04104104 ONE
189 07014 28692 04104104 HEX 04104104 ONE
190 07016 28694 04104104 HEX 04104104 ONE
191 07018 28696 04104104 HEX 04104104 ONE
192 0701A 28698 00300300 HEX 00300300 ONE
193 0701C 28700 04104104 HEX 04104104 ONE
194 0701E 28702 07107100 SIGNWRD HEX 07107100 SIGN WORD - CONTAINS MINUS SIGN FOR ALL DIGIT POSITIONS
195 07020 28704 1F7DF7DF HEX 1F7DF7DF TWO
196 07022 28706 08208208 HEX 08208208 TWO
197 07024 28708 04104104 HEX 04104104 TWO
198 07026 28710 02082082 HEX 02082082 TWO
199 07028 28712 01041041 HEX 01041041 TWO
200 0702A 28714 11451451 HEX 11451451 TWO
201 0702C 28716 0E38E38E HEX 0E38E38E TWO
202 0702E 28718 SIGN BSS 2
203 07030 28720 0E38E38E HEX 0E38E38E THREE
204 07032 28722 11451451 HEX 11451451 THREE
205 07034 28724 01041041 HEX 01041041 THREE
206 07036 28726 06186186 HEX 06186186 THREE
207 07038 28728 01041041 HEX 01041041 THREE
208 0703A 28730 11451451 HEX 11451451 THREE
209 0703C 28732 0E38E38E HEX 0E38E38E THREE
210 0703E 28734 00000000 HEX 0

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

211	07040	28736	02082082	HEX	02082082	FOUR
212	07042	28738	02082082	HEX	02082082	FOUR
213	07044	28740	1F7DF7DF	HEX	1F7DF7DF	FOUR
214	07046	28742	12492492	HEX	12492492	FOUR
215	07048	28744	0A28A28A	HEX	0A28A28A	FOUR
216	0704A	28746	06186186	HEX	06186186	FOUR
217	0704C	28748	02082082	HEX	02082082	FOUR
218	0704E	28750	00000000	HEX	0	
219	07050	28752	1E79E79E	HEX	1E79E79E	FIVE
220	07052	28754	01041041	HEX	01041041	FIVE
221	07054	28756	01041041	HEX	01041041	FIVE
222	07056	28758	1E79E79E	HEX	1E79E79E	FIVE
223	07058	28760	10410410	HEX	10410410	FIVE
224	0705A	28762	10410410	HEX	10410410	FIVE
225	0705C	28764	1F7DF7DF	HEX	1F7DF7DF	FIVE
226	0705E	28766	00000000	HEX	0	
227	07060	28768	0E38E38E	HEX	0E38E38E	SIX
228	07062	28770	11451451	HEX	11451451	SIX
229	07064	28772	19659659	HEX	19659659	SIX
230	07066	28774	16596596	HEX	16596596	SIX
231	07068	28776	10410410	HEX	10410410	SIX
232	0706A	28778	11451451	HEX	11451451	SIX
233	0706C	28780	0E38E38E	HEX	0E38E38E	SIX
234	0706E	28782	00000000	HEX	0	
235	07070	28784	08208208	HEX	08208208	SEVEN
236	07072	28786	08208208	HEX	08208208	SEVEN
237	07074	28788	04104104	HEX	04104104	SEVEN
238	07076	28790	04104104	HEX	04104104	SEVEN
239	07078	28792	02082082	HEX	02082082	SEVEN
240	0707A	28794	01041041	HEX	01041041	SEVEN
241	0707C	28796	1F3DF3DF	HEX	1F3DF3DF	SEVEN
242	0707E	28798	00000000	HEX	0	
243	07080	28800	0E38E38E	HEX	0E38E38E	EIGHT
244	07082	28802	11451451	HEX	11451451	EIGHT
245	07084	28804	11451451	HEX	11451451	EIGHT
246	07086	28806	0E38E38E	HEX	0E38E38E	EIGHT
247	07088	28808	11451451	HEX	11451451	EIGHT
248	0708A	28810	11451451	HEX	11451451	EIGHT
249	0708C	28812	0E38E38E	HEX	0E38E38E	EIGHT
250	0708E	28814	00000000	HEX	0	
251	07090	28816	0E38E38E	HEX	0E38E38E	NINE
252	07092	28818	11451451	HEX	11451451	NINE
253	07094	28820	01041041	HEX	01041041	NINE
254	07096	28822	0F3CF3CF	HEX	0F3CF3CF	NINE
255	07098	28824	11451451	HEX	11451451	NINE
256	0709A	28826	11451451	HEX	11451451	NINE
257	0709C	28828	0E38E38E	HEX	0E38E38E	NINE
258			*			
259			*			
260	0709E	28830	5C60949C	STRTP	LDX	12, GLBRTN PUT ADDR OF JS+2 INTO XR12
261	070A0	28832	34640000	LAE		0, 12, I OBTAIN STRING LOC OF THE ARGUMENT LIST
262	070A2	28834	06E8	LXA		13
263	070A3	28835	0700			
263	070A4	28836	6C620002	IMP		12, 2, M
264	070A6	28838	1C60949C	STX		12, GLBRTN MODIFY THE RETURN ADDR
265				*		TRANSFER THE ARGUMENTS
266	070A8	28840	5C220008	LDX		4, NARGX2-2, M
267	070AA	28842	16680000	XFER	LDA	0, 4, 13
268	070AC	28844	3E003E00	STA		ARGLST, 4
269	070AE	28846	6C230002	IMN		4, 2, M
270	070B0	28848	6086	JU		XFER
270	070B1	28849	0700			
271			*			
272			*			
273			*			
274			*			
275	070B2	28850	14003E04	STRT1	LDA	STLN

276	070B4	28852	0844	SLL	4	
277	070B5	28853	0700			
277	070B6	28854	A4003E06	ADU	STWC	
278	070B8	28856	06C0	LXA	8	
279	070B9	28857	0700			
279	070BA	28858	14003E08	LDA	TITLE	
280	070BC	28860	0844	SLL	4	
281	070BD	28861	06C8	LXA	9	
282						
283	070BE	28862	14009486	LDA	ONES	PUT THE BORDER ABOVE AND BELOW THE DIGITAL DISPLAY
284	070C0	28864	3C407FD0	STA	TVRSTR-48.8	
285	070C2	28866	3C407FCE	STA	TVRSTR-50.8	
286	070C4	28868	3C40808E	STA	TVRSTR+142.8	
287	070C6	28870	3C408090	STA	TVRSTR+144.8	
288	070C8	28872	5C220006	LDX	4.6,M	
289	070CA	28874	14407FFE	LDA	TVRSTR-2.8	
290	070CC	28876	C4486FD2	LOR	TTLS.9	
291	070CE	28878	3C407FFE	STA	TVRSTR-2.8	
292	070D0	28880	6C420010	IMP	8.16,M	
293	070D2	28882	6C4A0002	IMP	9.2,M	
294	070D4	28884	6C230001	IMN	4.1,M	
295	070D6	28886	608C	JU	TITL	
295	070D7	28887	0700			
296	070D9	28888	6C430070	IMN	8.112,M	
297	070DA	28890	5C5A0000	LDX	11.0,M	
298	070DC	28892	14003E00	LDA	INPT	
299	070DE	28894	54020000	LDB	0,M	
300	070E0	28896	6206	JG	PINPT	
301	070E1	28897	0700			
301	070E2	28898	9400948C	MLF	MONI	
302	070E4	28900	54020001	LDB	1,M	
303	070E6	28902	7C00702E	PINPT	STB	SIGN
304	070E8	28904	54020000	LDB	0,M	
305	070EA	28906	0400	CFX		
306	070EB	28907	0801	SLLD	1	
307	070EC	28908	8C020001	SAM	1,M	TEST FOR ROUNDOFF
308	070EE	28910	6004	JU	SHBK0	
308	070EF	28911	0700			
309	070F0	28912	A4020001	ADU	1,M	
310	070F2	28914	0861	SHBK0	SRLD	1
311	070F3	28915	0700			
311	070F4	28916	D400700E	MUL	TENTH	
312	070F6	28918	3C003E00	STA	INPT	
313	070F8	28920	0500	EAB		
314	070F9	28921	0861	SRLD	1	
315	070FA	28922	D402000A	MUL	10,M	
316	070FC	28924	0201	SLLD	1	
317	070FD	28925	0700			
317	070FE	28926	8C020001	SAM	1,M	
318	07100	28928	6014	JU	SHBK1	
318	07101	28929	0700			
319	07102	28930	CC02001F	EXO	31,M	
320	07104	28932	8C020012	SAM	18,M	
321	07106	28934	6008	JU	ITS9	
321	07107	28935	0700			
322	07108	28936	CC02001F	EXO	31,M	
323	0710A	28938	A4020001	ADU	1,M	
324	0710C	28940	6008	JU	SHBK1	
325	0710D	28941	0700			
325	0710E	28942	14020001	ITS9	LDA	1,M
326	07110	28944	5C3A0000	LDX	7.0,M	
327	07112	28946	A7803E00	ADUR	INPT	
328	07114	28948	0861	SHBK1	SRLD	1
329	07115	28949	0844	SLL	4	
330	07116	28950	06C8	LXA	9	

LINE	ABS.	ADDRESS	INSTCODE	SOURCE	STATEMENT
331	07117	28951	0700		
331	07118	28952	5C22000C	LDX	4,12,M
332	0711A	28954	16487000	WRTDGT LDA	NUMBR5,4,9
333	0711C	28956	84586FC6	AND	DGTMSK,11
334	0711E	28958	C4408000	LOR	TVRSTR,8
335	07120	28960	3C408000	STA	TVRSTR,8
336	07122	28962	6C420010	IMP	8,16,M
337	07124	28964	6C230002	IMN	4,2,M
338	07126	28966	608C	JU	WRTDGT
338	07127	28967	0700		
339	07128	28968	14003E00	LDA	INPT
340	0712A	28970	6C430070	IMN	8,112,M
341	0712C	28972	8C5A0002	IMP	11,8,M
342	0712E	28974	84503E02	ICL	11,NMB0
343	07130	28976	6004	JU	TSTA
343	07131	28977	0700		
344	07132	28978	60BE	JU	SHBK0+2
345	07133	28979	0700		
345	07134	28980	8C009486	TSTA SAM	ONES
346	07136	28982	6008	JU	TSTSGN
346	07137	28983	0700		
347	07138	28984	245B000A	ICL	11,10,M
348	07130	28986	6004	JU	TSTSGN
348	0713B	28987	0700		
349	0713C	28988	6008	JU	SHBK0+2
350	0713D	28989	0700		
350	0713E	28990	1400702E	TSTSGN LDA	SIGN
351	07140	28992	8C020001	SAM	1,M
352	07142	28994	7400949C	RTA	GLBRTN
353	07144	28996	1400701E	LDA	SGNWRD
354	07146	28998	84586FC6	AND	DGTMSK,11
355	07148	29000	C4408040	LOR	TVRSTR+64,8
356	0714A	29002	3C408040	STA	TVRSTR+64,8
357	0714C	29004	7400949C	RTA	GLBRTN
358				END	

0 ERRORS

APPENDIX B

VARIAN PRINTER/PLOTTER ROUTINE (PRNTSM)

This appendix contains the SKC-2000 computer listing for the PRNTSM routine. This routine was used to output in the report onto a Varian electrostatic printer/plotter.

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

```

139          * PRNTSM -- SUBROUTINE TO OUTPUT THE SYMBOL MATRIX TO THE STATOS PRINTER/PLOTTER
140          *          XRB MUST CONTAIN THE STARTING ADDRESS OF THE BUFFER TO BE OUTPUT.
141          *
142 04100 16640          ORG      PRNTSM
143 04100 16640 0400949C PTR      GLBRTH
144 04102 16642 6430416E JGU      MTRXOUT
145 04104 16644 C5809444 LORINS  LOR      BMSK1,3
146 04106 16646 0700    NOPINS  NOP
147 04107 16647      0700    NOP
148          *
149 04108 16648 00000003 MAG      HEX      3  MAGNIFICATION (1< MAG <5 )
150 0410A 16650 00000000 LGHDIV DEC      0      BASE 2 LOG OF THE NO. OF DESIRED HORIZONTAL GRID LINES
151 0410C 16652 00000000 LGVDIV DEC      0      BASE 2 LOG OF THE NO. OF DESIRED VERTICAL GRID LINES
152 0410E 16654          HSPACE BSS      2
153 04110 16656          VSPACE BSS      2
154 04112 16658          WPLXMG BSS      2  -2*WPL*MAG
155 04114 16660          SARSTR BSS      2
156 04116 16662          SCNBUFF BSS     88 SCAN LINE BUFFER STORAGE
157          * COMPUTE THE NO. OF HALF WORDS ON A MAGNIFIED LINE
158 0416E 16750 14004108 MTRXOUT LDA      MAG
159 04170 16752 0844          SLL      LGUPL+1
160 04171 16753      0700
160 04172 16754 3C004112          STA      WPLXMG
161          * COMPUTE THE NO. OF RASTER LINES BETWEEN SCALE DIVISIONS
162 04174 16756 14020100          LDA      RL,M
163 04176 16758 5C18410C          LDX      3,LGVDIV
164 04178 16760 0DC0          SRA      0,3
165 04179 16761      0700
165 0417A 16762 3C004110          STA      VSPACE
166          * COMPUTE THE NO. OF RASTER COLUMNS BETWEEN SCALE DIVISIONS
167 0417C 16764 14004112          LDA      WPLXMG
168 0417E 16766 5C18410A          LDX      3,LGHDIV
169 04180 16768 0DC0          SRA      0,3
170 04181 16769      0700
170 04182 16770 3C00410E          STA      HSPACE
171          * COMPUTE THE STARTING ADDRESS OF THE ARRAY TO BE OUTPUT.
172 04184 16772 1C404114          STX      8,SARSTR
173 04186 16774 140141AE          LDAM    NXWPD+2
174 04188 16776 C4004114          LOR      SARSTR
175 0418A 16778 3C0041AE          STA      NXWRD+2
176          * READY THE STATOS
177 0418C 16780 64044234          JS      LPEBL  ENABLE THE STATOS
178 0418E 16782 6404424C          JS      RSTRMD PUT THE STATOS IN RASTER MODE
179 04190 16784 6404425A          JS      TOF    TOP OF FORM
180 04192 16786 64044268          JS      SYNC   RESET THE STATOS SCAN PTR
181          *
182          * OUTPUT A TOP BORDER
183 04194 16788 64044284          JS      CLRSCN CLR THE SCNBUFF
184 04196 16790 64044296          JS      FILBUF FILL THE NO. OF WRDS REQD FOR THE TOP BORDER
185 04198 16792 640442BC          JS      PRNTLN PRINT THE LINE
186          *

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LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

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187 *ROUTINE TO LOAD SCNBUF WITH ONE LINE, PROPERLY
188 * MAGNIFIED, FROM THE SYMBOL MATRIX
189 0419A 16794 5C420000 LDX 8.0,M
190 0419C 16796 5C6A0000 LDX 13.0,M
191 0419E 16798 64044284 NXLINE JS CLRSCN CLEAR THE SCAN BUFFER
192 041A0 16800 640442A8 JS VGRID
193 041A2 16802 14020000 LDA 0,M
194 041A4 16804 06E0 LXA 12 XR12-SCNBUF WRD CTR
195 041A5 16805 06D0 LXA 10 XR10-WRD WITHIN LINE CTR (SYMBOL MATRIX)
196 041A6 16806 0698 LXA 3 XR3-SCNBUF WRD BIT CTR
197 041A7 16807 0700
197 041A8 16808 14009444 LDA BMSK1
198 041AA 16810 3C604116 STA SCNBUF,12 INSERT A LEFT SIDE BORDER
199 041AC 16812 5C4A0000 NXWRD LDX 9.0,M XR9-BIT CTR
200 041AE 16814 54400000 LDB 0.8
201 041B0 16816 7C003E14 STB TEMP
202 041B2 16818 5C120000 NXBIT LDX 2.0,M XR2-MAGNIFICATION INDEX
203 041B4 16820 54003E14 LDB TEMP
204 041B6 16822 0201 SLLD 1
205 041B7 16823 0700
205 041B8 16824 7C003E14 STB TEMP
206 041BA 16826 8C009404 SAM IONE
207 041BC 16828 6004 JU BLANK
207 041BD 16829 0700
208 041BE 16830 6008 JU DOT
209 *
210 041BF 16831 0700
210 041C0 16832 14004106 BLANK LDA NOPINS
211 041C2 16834 3C0041CE STA NSRTBT+2
212 041C4 16836 6008 JU NSRTBT
213 041C5 16837 0700
213 041C6 16838 14004104 DOT LDA LORINS
214 041C8 16840 3C0041CE STA NSRTBT+2
215 041CA 16842 6002 JU NSRTBT
216 *
217 *ROUTINE TO INSERT A ONE OR ZERO INTO THE SCNBUF WORD
218 041CB 16843 0700
218 041CC 16844 14604116 NSRTBT LDA SCNBUF,12
219 041CE 16846 05809444 LOR BMSK1,3
220 041D0 16848 3C604116 STA SCNBUF,'2
221 041D2 16850 6C1A0002 IMP 3,2,M
222 041D4 16852 241B0040 ICL 3,BPW*2,M END OF WRD IN SCNBUF?
223 041D6 16854 600A JU TST1 YES
223 041D7 16855 0700
224 041D8 16856 6C120001 NSRTBT1 IMP 2,1,M NO
225 041DA 16858 24114108 ICL 2,MAG MAGNIF OF BIT COMPLETE?
226 041DC 16860 600A JU TST2 YES
226 041DD 16861 0700
227 041DE 16862 6092 JU NSRTBT NO
228 *
229 *THE END OF A WRD WITHIN THE SCNBUF WAS REACHED
230 041DF 16863 0700
230 041E0 16864 5C1A0000 TST1 LDX 3.0,M RESET SCNBUF BIT PTR
231 041E2 16866 6C620002 IMP 12,2,M INC SCNBUF WRD CTR
232 041E4 16868 608C JU NSRTBT1
233 *
234 *THE SYMBOL MATRIX BIT HAS BEEN PROPERLY MAGNIFIED
235 041E5 16869 0700
235 041E6 16870 6C4A0001 TST2 IMP 9,1,M
236 041E8 16872 244B0020 ICL 9,BPW,M END OF SYMBOL MATRIX WRD?
237 041EA 16874 6004 JU TST3 YES
237 041EB 16875 0700
238 041EC 16876 60BA JU NXBIT NO
239 *
240 *
241 *THE END OF A SYMBOL MATRIX WRD WAS REACHED
242 041ED 16877 0700
242 041EE 16878 6C420002 TST3 IMP 8,2,M INC TVRSTR WRD CTR
243 041F0 16880 6C520001 IMP 10,1,M INC WRD WITHIN LINE CTR
244 041F2 16882 24530008 ICL 10,WPL,M END OF SYMBOL MATRIX LINE
245 041F4 16884 6004 JU RTBRDR YES
245 041F5 16885 0700
246 041F6 16886 60CA JU NXWRD NO

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247
248 *
249 *THE END OF THE SYMBOL MATRIX LINE WAS REACHED, NOW
250 041F7 16887 0700 * INSERT A RIGHT BORDER
250 041F8 16888 14020001 RTBRDR LDA 1,M
251 041FA 16890 C4604114 LOR SCNBUF-2,12
252 041FC 16892 30604114 STA SCNBUF-2,12 INSERT A RIGHT BORDER
253 *TEST TO DETERMINE IF A HORIZ GRID LINE IS REQUIRED
254 041FE 16894 50120000 LDX 2,0,M
255 04200 16896 606A0001 IMP 13,1,M
256 04202 16898 24694110 ICL 13,VSPACE
257 04204 16900 6004 JU HGRID
257 04205 16901 0700
258 04206 16902 6018 JU PRNT
259 *A HORIZ GRID LINE IS REQUIRED
260 04207 16903 0700
260 04208 16904 6C120001 HGRID IMP 2,1,M
261 0420A 16906 640442BC JS PRNTLN
262 0420C 16908 6C120001 IMP 2,1,M
263 0420E 16910 24114108 ICL 2,MAG
264 04210 16912 6004 JU TST5
264 04211 16913 0700
265 04212 16914 6088 JU HGRID+2
266 04213 16915 0700
266 04214 16916 5C6A0000 TST5 LDX 13,0,M
267 04216 16918 64044284 JS CLRSCN
268 04218 16920 64044296 JS FILBUF
269 0421A 16922 640442BC JS PRNTLN
270 0421C 16924 6000 JU TST4
271 *A HORIZ GRID LINE IS NOT REQUIRED
272 0421D 16925 0700
272 0421E 16926 640442BC PRNT JS PRNTLN
273 04220 16928 6C120001 IMP 2,1,M
274 04222 16930 24114108 ICL 2,MAG
275 04224 16932 6004 JU TST4
275 04225 16933 0700
276 04226 16934 6088 JU PRNT
277 *
278 *
279 *THE RASTER LINE HAS BEEN OUTPUT TO THE STATOS
280 04227 16935 0700
280 04228 16936 24431000 TST4 ICL 8,RSTRU,M END OF SYMBOL MATRIX RASTER?
281 0422A 16938 6004 JU PRNTDN YES
281 0422B 16939 0700
282 0422C 16940 6430419E JU NXLINE NO
283 *
284 *
285 *OUTPUTTING OF THE SYMBOL MATRIX IS COMPLETE- DISABLE THE
286 * STATOS AND RETURN
287 0422E 16942 64044242 PRNTDN JS RSETLP
288 04230 16944 7400949C RTA GLBRTN
289 *
290 *
291 *STATOS PRINTER/PLOTTER ROUTINES
292 *
293 *
294 *STATOS ENABLE ROUTINE
295 00B20 2848 LPNABL SETX 0B20
296 04232 16946 RLPEBL BSS 2
297 04234 16948 04004232 LPEBL PTR RLPEBL
298 04236 16950 14020820 LDA LPNABL,M LD THE CNTRL WRD
299 04238 16952 4AB1 DOA 22,C,K OUTPUT TO STATOS
300 04239 16953 48B2 LPEBL1 DIA 22 READ THE STATUS WRD
301 0423A 16954 8C020006 SAM 0,M TST LP NOT RDY AND LP BSV
302 0423C 16956 74004232 RTA RLPEBL
303 0423E 16958 64304239 JGU LPEBL1 TST AGAIN
304 *
305 *STATOS SYSTEM RESET

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 LINE ABS. ADDRESS INSTCODE SOURCE STATEMENT

```

306 00000 32762      LPRSET SETX 8000
307 04240 16960      RRSET  BSS 2
308 04242 16962 04004240 RSETLP PTP RRSET
309 04244 16964 14028000 LDA LPRSET,M LD RESET CMD WRD
310 04246 16966 4AB1 DOA 22,C,K SEND TO STATOS
311 04247 16967 0700
312 04248 16968 74004240 RTA RRSET
313 *
314 00BE0 3040      LPRSTR SETX 0BE0
315 0424A 16970      RLPRST BSS 2
316 0424C 16972 0400424A RSTRMD PTR RLPRST
317 0424E 16974 14020BE0 LDA LPRSTR,M LD CNTRL WRD
318 04250 16976 4AB1 DOA 22,C,K SEND TO STATOS
319 04251 16977 48B2 RSTRM1 DIA 22 READ STATUS WRD
320 04252 16978 80020000 SAM 12,M TST LP BSY AND PC BSY
321 04254 16980 7400424A RTA RLPRST
322 04256 16982 64304251 JGU RSTRM1 TST AGAIN
323 *
324 *STATOS TOP OF FORM
325 00BB3 2995      LPTOF SETX 0BB3
326 04258 16984      RTOF BSS 2
327 0425A 16986 04004258 TOF PTR RTOF
328 0425C 16988 14020BB3 LDA LPTOF,M LD TOF CMD WRD
329 0425E 16990 4AB1 DOA 22,C,K SEND TO STATOS
330 0425F 16991 48B2 TOF1 DIA 22 TST LP BSY AND PC BSY
331 04260 16992 80020000 SAM 12,M TST LP BSY AND PC BSY
332 04262 16994 74004258 RTA RTOF
333 04264 16996 6430425F JGU TOF1 TST AGAIN
334 *
335 *ROUTINE TO SYNC THE SCAN LINE PTR
336 00BA2 2978      SYNCLN SETX 0BA2
337 04266 16998      RSYNC BSS 2
338 04268 17000 04004266 SYNC PTR RSYNC
339 0426A 17002 14020BA2 LDA SYNCLN,M LD SYNC CMD WRD
340 0426C 17004 4AB1 DOA 22,C,K SEND TO STATOS
341 0426D 17005 48B2 SYNC1 DIA 22 READ THE STATUS WRD
342 0426E 17006 80020000 SAM 12,M TST LP BSY AND PC BSY
343 04270 17008 74004266 RTA RSYNC
344 04272 17010 6430426D JGU SYNC1 TST AGAIN
345 *
346 *STATOS SYNC/STEP ROUTINE
347 00E23 2851      LPSTEP SETX 0E23
348 04274 17012      RSTEPS BSS 2
349 04276 17014 04004274 STEPS PTR RSTEPS
350 04278 17016 14020E23 LDA LPSTEP,M LD SYNC/STEP CMD WRD
351 0427A 17018 4AB1 DOA 22,C,K SEND TO STATOS
352 0427B 17019 48B2 STEPS1 DIA 22 READ THE STATUS WRD
353 0427C 17020 80020000 SAM 12,M TST LP BSY AND PC BSY
354 0427E 17022 74004274 RTA RSTEPS
355 04280 17024 6430427B JGU STEPS1 TST AGAIN
356 *
357 *ROUTINE TO CLEAR THE SCAN LINE BUFFER (44 FULL WRDS)
358 04282 17026      RCLRSN BSS 2
359 04284 17028 04004282 CLRSCN PTR RCLRSN
360 04286 17030 14020000 LDA 0,M
361 04288 17032 06E0 LXA 12
362 04289 17033 0700
363 0428A 17034 30604116 CLRNX STA SCNBUF,12 CLR NX WRD
364 0428C 17036 60620002 IMP 12,2,M
365 0428E 17038 24630058 ICL 12,88,M
366 04290 17040 74004282 RTA RCLRSN
367 04292 17042 6430428A JGU CLRNX CLR NEXT WRD

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367
368 *
369 *ROUTINE TO FILL THE SCAN LINE BUFFER
370 * FOR THE TOP AND BOTTOM BORDER
370 04294 17044          FILBF BSS      2
371 04296 17046 04004294 FILBUF PTR      RFILBF
372 04298 17048 50620000 LDX      12,0,M
373 0429A 17050 14009486 LDA      ONES
374 0429C 17052 30604116 FILBF1 STA     SCNBUFF,12
375 0429E 17054 60620002 IMP      12,2,M
376 042A0 17056 24614112 ICL      12,WPLXMG
377 042A2 17058 74004294 RTA      RFILBF
378 042A4 17060 6430429C JGU      FILBF1
379
380 *
381 *ROUTINE TO INSERT VERTICAL GRID LINES
381 042A6 17062          RVGRID BSS      2
382 042A8 17064 040042A6 VGRID PTR      RVGRID
383 042AA 17066 50620000 LDX      12,0,M
384 042AC 17068 14009444 LDA      BMSK1
385 042AE 17070 30604116 VGRID1 STA     SCNBUFF,12
386 042B0 17072 6060410E IMP      12,WSPACE
387 042B2 17074 24614112 ICL      12,WPLXMG
388 042B4 17076 740042A6 RTA      RVGRID
389 042B6 17078 643042AE JGU      VGRID1
390
391 *
392 *ROUTINE TO OUTPUT A SINGLE LINE TO THE STATUS USING DMA
393 * FOR 44 FULL WRDS
393 00600 1536          DMASTRT SETX     0600
394 042B8 17080          RPRNTL BSS      2
395 042BA 17082 FD300000 WCCMP HEX      FD300000 -1'S COMP OF 44 PLACED IN BITS 20-31
396 042BC 17084 040042B8 PRNTLN PTR      RPRNTL
397 042BE 17086 34004116 DMASET LAE     SCNBUFF LD STRING ADDR
398 042C0 17088 0041     SPA      1 COMPUTE FULL WRD ADDR
399 042C1 17089 0700
399 042C2 17090 040042BA LOP      WCCMP INSRT 1'S COMP OF WRD CNT
400 042C4 17092 48B1     DOA      22,K SEND TO STATUS
401 042C5 17093 48B2 DMA1 DIA      22
402 042C6 17094 8002000C SAM      12,M TST LP BSY AND PC BSY
403 042C8 17096 6004     JU      STRTDM GO TO DMA STRT
403 042C9 17097 0700
404 042CA 17098 6085     JU      DMA1 TST AGAIN
405 042CB 17099 0700
405 042CC 17100 14000600 STRTDM LDA     DMASTRT,M
406 042CE 17102 4AB1     DOA      22,C,K SEND TO STATUS
407 042CF 17103 48B2 STRTD1 DIA      22
408 042D0 17104 80020004 SAM      4,M TST LP BSY
409 042D2 17106 6003     JU      EBLINT
409 042D3 17107 0700
410 042D4 17108 6085     JU      STRTD1
411 042D5 17109 0080 EBLINT EMI      ENABLE MEMORY INTERRUPT
412 042D6 17110 48B2     DIA      22
413 042D7 17111 0700
413 042D8 17112 80020001 SAM      1,M TST FOR W0Z
414 042DA 17114 6084     JU      *-4
414 042DB 17115 0700
415 042DC 17116 64044276 JS      STEPS DO A SYNC/STEP
416 042DE 17118 740042B8 RTA      RPRNTL
417
END

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0 ERRORS

END
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