

Software Reference Manual

ALP

Central Data Corporation

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The ALP

The ALP (Assembler Language Package) is made up of three different programs. The package contains all the programs a user would need to write and debug assembly language programs for 2650 systems. The program starts at address H2000 and ends at approximately H4A00. It requires buffer space outside of this area for its editing and assembly functions. The buffer space can be changed by the user to fit their system or programming needs. More about buffer space can be found in the Text Editor chapter.

How to use the ALP

To start using the ALP package load in the program from tape using the supervisor program. Then execute at address H2000. This puts you into the editor program. You can use this program to create tape files of your 2650 source code. Completed source code files are converted to binary (object code) by the assembler program. The assembler is run by typing 'R' as a command in the editor. Commands to the assembler for handling the object code are in the source of the program. Using the 'G' command (Go to the debugger) in the editor, the user enters debug mode. In this mode many options are available for debugging object code. More detailed information on each program is in its chapter.

1. Text Editor

The Central Data text editor allows a user to create and change source code (ASCII) files for use with an assembler, interpreter, or any other application of this type. The user's file (otherwise called the text or the source code) is read into a RAM buffer where the user can inspect it and make changes to it.

The editor takes full advantage of the system's features. The video display is always used to display the lines of text in the immediate area of last editing which frees the user from the task of trying to remember where he is in the file. The cassette interface is used to store files and also allows editing of files which are larger than the amount of RAM that you have available for the editing buffers. The supervisor program is used by the editor for its serial input and output routines.

Basic Information

The editor takes up roughly 2K of RAM starting at address H2000. This space includes all of the working RAM locations that the editor needs. The editor requires two buffers to operate: the edit buffer and the insert buffer. The edit buffer is where the source code is held while editing. The insert buffer is where all changes to the edit buffer are made. After an editing operation is finished (i.e. an insert), the insert buffer is merged into the edit buffer to form the new source code.

There are two restrictions concerning the buffers:

1. The edit buffer must be before the insert buffer in RAM, and there can be no space between the two buffers.
2. The buffers must be multiples of 256 bytes long, and their starting and ending addresses must also be multiples of 256 bytes.

Examples of incorrect formatting of the buffers are:

<u>Text Buffer Start</u>	<u>Insert Buffer Start</u>	<u>Reason Why Wrong</u>
H5000	H4A00	The edit buffer must start at a lower address than the insert buffer.
H4A00	H5010	Buffers must start in multiples of 256 bytes.

If the text buffer were to start at H4A00 and the insert buffer at H4E00 this would work fine. Note that this means that the edit buffer has 1024 bytes of space (H4A00 to H4E00). You can't tell how big the insert buffer is since its ending address is not known. You must, therefore, also specify an address (256 byte multiple) for the first byte after the insert buffer. This byte's address will be called the end of RAM location from here on. If this address was H5000 in this case, the length of the insert buffer would be 512 bytes. Thus far, in our example of correct buffer addressing, we have the following:

<u>Text Buffer Start</u>	<u>Insert Buffer Start</u>	<u>End Of RAM</u>
H4A00	H4E00	H5000

The user defines where the buffers start and end by altering three RAM locations (using the supervisor) before executing the editor. Because of the 256-byte-multiple address restriction, it can be seen that the low byte of each address is H00. For this reason, you need only specify the high byte of the address for the edit buffer, insert buffer, and the end of RAM location. You alter locations H2003 through H2006 to give this information to the editor and then jump to the editor (address H2000). In our example, location H2003 would be changed to H4A, while H2004 would be changed to H4E, and H2006 would be changed to H50. Address H2005 is changed to allocate an assembler buffer, and this is explained later.

The buffers have no size restrictions so they can span from any one address to any other as long as the end address is greater than the start address.

After the three bytes have been set up for the editor (using the alter command) and the editor has been jumped to (by the execute command) using the supervisor, you are able to edit your source code using one of the 21 editor commands which are described later.

Display Format

While you are inspecting the source code of your file, the editor displays a header line and up to 15 lines of text. The header line tells you how many completely empty blocks (256 bytes per block) you have left in the edit buffer and displays the command you have entered. The bottom 15 lines of the display are used for the text. These lines are numbered from 1 to 15 as they progress down the page. Note that a line can be up to 256 characters long and that the line numbers are not actually part of the text. The line numbers are simply displayed on the screen to allow you to reference each individual line easily.

In the edit buffer, the end of a line is indicated by a ASCII carriage return code (HOD). The end of file is sensed to be the first character in the buffer with bit 7 set to one. Note that the ASCII characters are all encoded using bits 0 through 6, so bit 7 is free for this use.

Commands — —

There are 21 commands which the editor accepts. All commands are typed in through the keyboard, and all except four are executed after the press of the carriage return key. The four commands that do not require a carriage return are position moving commands which are used so frequently that they are allowed to take only one keypress. They are explained in detail in the section called 'Moving Around in the File' as well as in the Command Reference Section. The other 17 commands require a carriage return for their execution. These other commands also allow you to type in up to sixteen additional characters which tell the routines exactly what should be done. The backspace key is active during command entering so that mistakes can be easily corrected. Pressing control-P causes the last command entered to be executed again.

Depending on the command, the additional characters may be alphabetic, numeric, or not used. If a number is required (such as in the Forward command) it can be of any size, although the maximum number sent to the routine will be 255. For example, if the command typed was F3000 (move forward 3000 lines), the user would only be moved ahead 255 lines. More details about the Forward command are presented later. Also, if a command requiring a number is entered with no extra characters (just the command and then a carriage return), a number of one will automatically be used. This feature was added due to frequent changes the user will make to the 1st line of text.

The specific command explanations tell you what you should enter after the command (a number, a word, or nothing).

User Defined Commands

You can cause the editor to jump to your own routines by utilizing any of the unused command letters. All that you need to do is change the correct locations in the command address table. Refer to the program listing to find out which two memory locations to change for your command.

Moving Around in the File

Since the display can show only 15 lines at a time and the file can be much larger than this, there are commands which allow you to move around in the file (display different areas of the file).

Four of these commands are executed immediately when the command key is pressed. These four commands are: go to end of file (+), go to beginning of file (-), go forward 15 lines (space), and go backward 15 lines (/). The only exception to this immediate action is when another command is entered, erased (by back-spaces) and then one of the four immediate action commands is entered. The four commands then will require a carriage return to execute them.

The other moving commands are: forward x lines (Fx), backward x lines (Bx), and search for an ASCII string 'xxxx' (Xxxxx). The detailed explanations for all seven of the moving commands are given in the command reference section.

Inserting New Lines

To enter new lines of text, use the Insert (I) command. This command should be followed by a number which signifies which line on the screen the text should be inserted after.

After the command, number, and carriage return have been entered, the screen is cleared and you are in INSERT MODE. In this mode you simply type in your new text pressing carriage return at the end of each line. Backspace is active to the beginning of your current line. Note that while in insert mode the characters you type in are being put in the insert buffer, and they are held there until ETX is pressed. Pressing ETX (control-C) when you are done inserting will put the lines just typed into the edit buffer after the line number originally typed with the command.

If you insert too much text (either the insert buffer is

full or it can be seen that the text to be inserted will fill the edit buffer), insert mode is automatically ended and the lines are inserted.

Modifying a String

To modify one ASCII string to another there are two commands available. Using the preset modify strings (P) command you can tell the editor what the original string is and what the new string should be. With the modify (M) command, you tell the editor to look for the original ASCII string on a specified line and, if the string is found, to change it to the new string.

The sequence of steps for a modify is:

- 1) Type "P" for the preset modify command.
- 2) Type old string you would like to modify.
- 3) Hit carriage return. The top line of the display will change to:
MODIFY STRING "old string just typed " TO
- 4) Type in the new string.
- 5) Hit carriage return.
At this point, the two strings have been entered and are stored in a special set of RAM locations.

To continue modifying lines containing the same old string to the new one:

- 6) Type "M" for the modify command.
- 7) Type the line number where the old string can be found.
- 8) Hit carriage return.
If the old string is found in that line, it is changed to the new string.
If the old string is not found, an error message of NOT FOUND is displayed.

You can continue to modify the old string throughout your program using the "M" command.

Saving and Appending Lines

If you have a number of lines of code that repeat themselves

throughout a program, rather than having to retype the lines at each point in the program you can hold the lines in the insert buffer and place them as you wish in the program.

To hold lines in the insert buffer, bring the first line to be held to the top of the screen (using the forward and backward commands) and type "Hx" to hold the top x lines. After the carriage return is pressed, the command is executed. If you try to hold more lines than will fit in the insert buffer, the editor will give you an error message saying TOO MUCH.

To insert these lines. use the append (A) command. This command is in the form of "Ax" with x being the line number after which the held lines should be inserted. If there is no room in the text buffer for all of the lines, the command is aborted and you are given an error message of TOO MUCH.

Deleting Lines

To delete selected lines, bring the first line to be deleted to the top of the screen. Then use the delete (D) command followed by a line number to delete that number of lines from the text buffer (starting from the top line on the screen).

Changing Lines

If you have a line in the text buffer which is wrong, you can change it (without having to retype the whole thing). To change a line, type "Cx", with x being the line number. The screen is then cleared and the line selected is displayed. At this time several keys are active:

- 1) Copy character (control-U): causes one character from the old line to be copied to the new line. The new line is written just below the old one as the characters are copied.
- 2) Copy word (control-Y): does continued character copies until the first occurrence of a space or comma.
- 3) Delete old character (control-O): causes one character of the old line to be deleted. In other words one or more characters from the old line can be skipped from being copied.
- 4) Erase (control-H): just erases one character from the new line.
- 5) Erase word (control-N): erases characters until it comes to a space or a comma.

6) Copy to end of line (control-P): causes all of the remaining characters of the old line to be copied to the new line.

7) Any printable (non-control) character will be added to the new line.

8) Carriage return ends the change of this line. After this key is pressed, the next line in the text buffer is displayed and you are allowed to change it.

If you press ETX (control-C) right after a new line appears, the editor returns to the normal page showing all of the corrected lines.

Storing your Text

The editor allows you to store and retrieve your programs using cassette tape. You can name your text with labels of up to eight characters long and therefore have the system keep track of the various programs on a tape.

To store the edit buffer on cassette tape, turn the tape recorder to record and type "Sxxxx" with xxxx being the name (up to 8 characters). After carriage return is pressed, the editor starts sending the name and the text to the tape recorder. It finishes when the end of file is reached (any byte in the edit buffer with bit 7 set) and will simply prompt for a new command.

To load that file back just as it was before storing it, first move to the beginning of the file (using the "-" command). Then type "Lxxxx" followed by a carriage return and play the tape recorder. The editor will read everything on the tape and will load the data contained in blocks with the name xxxx. After the end of file byte is read in, the routine terminates.

You should note that the load routine starts loading at the current line position (it starts loading over the top line on the screen). Thus you can merge two files by loading one in as was explained earlier, moving to the end of that file, and loading the second file. Once it is loaded it will appear after the first file in the text buffer.

Also, the full name need not be typed in for the load routine. The routine only checks the tape against the letters typed in with the command, and no others. For instance, if you have a file named STARTREK on tape, you can load it back by typing any of the following as the command:

LSTARTREK	will load only startrek
L	will load any file
LSTAR	will load any file whose name's first four letters are STAR

Note that the last two methods have the possibility of loading the wrong program--the second one loading anything and the third one loading anything which starts with STAR (i.e. STARWAR OR STAR).

Jumping out of the Editor

Use the command 'E' to return to the supervisor program. Type the command 'R' to jump to the assembler, and 'G' to go to the debugger.

2. Editor Command Reference

The following abbreviations are used in this section:

- l--a line number
- n--a number of lines
- a--an ASCII string (up to 16 characters)

Also, note that all commands (except the ones with immediate action) must be terminated with a carriage return.

Command: APPEND

Format: A1

Description: This command places what is in the insert buffer immediately after the line listed in the command. The data in the insert buffer may be the result of a HOLD, INSERT, CHANGE, or MODIFY command.

Errors: If the text in the insert buffer is too large to fit in the edit buffer, you are given an error saying TOO MUCH.

Example:

If the insert buffer had the following lines in it:

```
NOW IS THE TIME
FOR ALL GOOD MEN
TO COME TO THE AID
```

And the screen looked like:

```
                BLOCKS LEFT: 04    COMMAND:
1  THIS IS LINE ONE
2  THIS IS LINE TWO
3  THIS IS LINE THREE
```

And the command "A2" was executed, the insert buffer would remain the same and the screen would change to:

```
                BLOCKS LEFT: 04    COMMAND:
1  THIS IS LINE ONE
2  THIS IS LINE TWO
3  NOW IS THE TIME
4  FOR ALL GOOD MEN
5  TO COME TO THE AID
6  THIS IS LINE THREE
```

Command: BACKWARD

Format: Bn

Description: This command causes the editor to start displaying n lines before the top line on the screen.

Example:

If the screen had displayed the 10th-13th lines of a program as shown below:

```
                BLOCKS LEFT:  04      COMMAND:
1  THIS IS LINE 10
2  THIS IS LINE 11
3  THIS IS LINE 12
4  THIS IS LINE 13
```

And the command "B3" was executed, the first line displayed is number 7 and the display would change to:

```
                BLOCKS LEFT:  04      COMMAND:
1  THIS IS LINE 7
2  THIS IS LINE 8
3  THIS IS LINE 9
4  THIS IS LINE 10
5  THIS IS LINE 11
6  THIS IS LINE 12
7  THIS IS LINE 13
```


Command: CHANGE

Format: C1

Description: This command allows you to change a line of text. After entering this command, the screen is cleared and the line selected is displayed on the top of the screen. You can then type control-U to copy a character of the old line to the new one, control-Y to copy a word from the old line to the new one, control-O to skip a character of the old line from being copied, control-H (erase) to delete a character from the new line, control-N to erase a word from the new line, control-P to copy all of the remaining characters from the old line to the new line, or any printable (non-control) character to just be added to the new line. After the new line is as you want it, press carriage return. The next line of the text buffer is then displayed and you can change it. Pressing ETX (control-C) at this point returns you to the command entry page with the corrections entered into the text buffer.

Example:

If you have the line NOW IA THE TIME ready to change (you have just entered the "C" command), the following keypresses will correct the mistake:

<u>KEY</u>	<u>New line so far</u>
control-Y	NOW
control-U	NOW (there is a space after NOW)
control-U	NOW I
control-O	NOW I (the A was deleted)
S	NOW IS
control-P	NOW IS THE TIME

Pressing carriage-return and ETX now will return you to the normal editor display page with the changes in effect.

Command: DELETE

Format: Dn

Description: This command deletes n lines from the text buffer starting with the top line on the screen.

Example:

If the screen had lines 6-10 of the text buffer displayed as is shown below:

	BLOCKS LEFT: 04	COMMAND:
1	LINE 6	
2	LINE 7	
3	LINE 8	
4	LINE 9	
5	LINE 10	

And the command "D2" was executed, text lines 6&7 would be deleted and the screen would look like:

	BLOCKS LEFT: 04	COMMAND:
1	LINE 5	
2	LINE 8	
3	LINE 9	
4	LINE 10	

Command: EXIT

Format: E

Description: This command exits the user back to location 0 (normally back into the supervisor program).

Command: FORWARD

Format: Fn

Description: This command causes the editor to start displaying n lines after the present line.

Example:

If the screen had the 10th-16th lines of the text buffer displayed as below:

	BLOCKS LEFT:	04	COMMAND:
1	LINE 10		
2	LINE 11		
3	LINE 12		
4	LINE 13		
5	LINE 14		
6	LINE 15		
7	LINE 16		

And the command "F5" was executed, the first text line now displayed ~~is~~ line 15 and the screen will look as below:

	BLOCKS LEFT:	04	COMMAND:
1	LINE 15		
2	LINE 16		

Command: GO TO THE DEBUGGER

Format: G

Description: This command jumps the user into debugger mode. This allows the user to execute all debugger options.

Command: HOLD

Format: Hn

Description: Copies n lines of the text buffer into the insert buffer starting with the first line displayed on the screen.

Errors: If you try to hold too many lines, you will get an error message of TOO MUCH.

Example:

If the display looked as it does below:

	BLOCKS LEFT:	02	COMMAND:
1	LINE 1		
2	LINE 2		
3	LINE 3		
4	LINE 4		
5	LINE 5		
6	LINE 6		

And the command "H3" was executed, the screen will remain the same and the insert buffer will be changed to

LINE 1
LINE 2
LINE 3

Command: INSERT

Format: I1

Description: This command allows the insertion of new text. The new text is typed in after the command and is ended by a ETX (control-C) key. Then the text is inserted after the line number specified in the command.

Errors: If you try to type in too much text (either too much for the insert buffer to hold or too much to be able to put back into the edit buffer), the insert is automatically ended just as if you had pressed ETX.

Example:

If the screen looked as it does below:

```
                                BLOCKS LEFT:  04          COMMAND:
1  LINE 1
2  LINE 2
3  LINE 3
4  LINE 4
5  LINE 5
```

And the command "I2" was executed, the screen would be erased and you would be allowed to type in new text. If you typed in the following lines (each line followed by a carriage return):

```
NOW IS THE TIME
FOR ALL GOOD MEN
TO COME TO THE AID
```

And pressed ETX, the 3 new lines would be inserted after line 2 of the text buffer, and the screen would change to:

```
                                BLOCKS LEFT:  04          COMMAND:
1  LINE 2
2  NOW IS THE TIME
3  FOR ALL GOOD MEN
4  TO COME TO THE AID
5  LINE 3
6  LINE 4
7  LINE 5
```

Command: LOAD

Format: Lx

Description: Loads a file from cassette tape into the text buffer. The name, x, can be up to 8 characters, and any file which has at least the letters specified in the command will be loaded. A simple "L" command (one with no file name) will load any file. Loading ceases when a byte is read in with the end of file bit set.

The file is loaded starting at the first character position on the screen. Any lines before the ones displayed will not be changed during the load.

Errors: If you run out of text buffer space before a load is complete, you will get an error saying TOO MUCH. If upon loading, a cassette error occurs, you are given a SUMCHECK ERROR message and you must reload.

Command: MODIFY

Format: M1

Description: This command uses the old and new ASCII strings entered with the "P" command. First, the line number specified in the command is searched for the old string. If it is found, that old ASCII string is replaced with the new string.

Errors: If the old string is not found in the line, you are given an error of NOT FOUND.

Example:

If the text buffer had the following lines displayed:

```
                BLOCKS LEFT:  04          COMMAND:
1  NOW IS THE TIME
2  FOR ALL GOOD MEN
3  TO COME TO THE AID
```

And you wanted to change the word "come" in line 3 to "go", you would first enter the two strings using the P command and then do a "M3" command. The text would be changed, and the screen would change to:

```
                BLOCKS LEFT:  04          COMMAND:
1  FOR ALL GOOD MEN
2  TO GO TO THE AID
```

Command: NORMAL MODE

Format: N

Description: this command turns the upper case mode OFF.

Command: PRESET MODIFY STRINGS

Format: Pa

Description: To allow entry of two ASCII strings for later use with the Modify command. The string to be looked for and replaced (the old string) with the modify is typed in with this command followed by a carriage return. After that, the top line of the screen will change to:

MODIFY STRING "old string just typed" TO

at which time you should type in the string which is to replace the old one (the new string) followed by a carriage return.

Command: RUN

Format: R

Description: This command jumps to the assembler and automatically starts its execution.

Command: STORE

Format: Sx

Description: This command stores the text buffer onto cassette tape. A name (x) is also stored on the tape, and that specific name can be referenced during a LOAD command.

Command: UPPERCASE MODE

Format: U

Description: this command bumps all characters displayed on the screen to upper case. It does not affect what is stored in the text buffer, only what you see. Upper case mode is off when you enter the editor.

Command: X-SEARCH

Format: Xa

Description: This command searches for the ASCII string starting at the 2nd line displayed on the screen. If the string is found, the line with the string is brought to the top of the screen.

Errors: If the string is not found, you are given the error message of NOT FOUND.

Example:

If the screen looked as it is pictured below:

```
                BLOCKS LEFT:  04          COMMAND:
1  THIS IS LINE ONE
2  THIS IS LINE TWO
3  THIS IS LINE THREE
4  THIS IS LINE FOUR
5  THIS IS LINE FIVE
```

And the command "XTHREE" is entered, the screen would start displaying at line 3 and would look as follows:

```
                BLOCKS LEFT:  04          COMMAND:
1  THIS IS LINE THREE
2  THIS IS LINE FOUR
3  THIS IS LINE FIVE
```

Command: GO TO BEGINNING--IMMEDIATE ACTION

Format: -

Description: Starts displaying lines at the first line of the file.

Command: GO TO END--IMMEDIATE ACTION

Format: +

Description: Starts displaying lines beginning at the last line in the file. You should note that after this command is executed, the screen will contain only one line of text (the last line of the text buffer).

Command: FORWARD 15 LINES--IMMEDIATE ACTION

Format: space

Description: This command functions exactly the same way as the command "F15".

Command: BACKWARD 15 LINES--IMMEDIATE ACTION

Format: /

Description: This command functions in exactly the same way as the command "B15".

3. 2650 Assembler

The Central Data Assembler allows a user to change the 2650 instruction mnemonics into machine executable binary. It takes the source code created by the text editor and makes two passes through it creating the binary tape, output listing, and binary blocks in storage. The assembler uses routines in the text editor and the supervisor program to allow its small size.

Basic Information

The assembler takes up roughly 4K of RAM starting right after the editor. This 4K includes all space required for the assembler's working RAM area (small buffers, pointers, and general storage locations).

Like the editor, the assembler needs a text buffer to hold the text that it is operating on. Unlike the editor, it needs a symbol table and a output binary storage area (OBST) and does not need the insert buffer. For this reason, the space normally allocated for the editor's insert buffer is, when assembling, divided between the assembler's symbol table and OBST.

The symbol table starts at the same place that the insert buffer would start, and the OBST starts at an address between where the symbol table starts and where RAM ends. As in the editor, you tell the program where you want the buffer to start by altering a RAM location to correspond to the high byte of the start address of the buffer. This RAM location is at address H2005.

For example, if the following allocations were previously made for the editor:

<u>Address</u>	<u>Function</u>	<u>Value</u>
H2003	Text buffer start	H4A
H2004	Insert buffer start	H5B
H2006	End of RAM	H60

and you wished to split the insert buffer's space into two equal pieces for the assembler's use, you would alter location H2005 to a H5D. In this case, the text buffer

starts at H4A00, the symbol table at H5B00, and the binary storage block at H5D00. The last position of RAM is H5FFF.

The allocation would now be:

<u>Address</u>	<u>Function</u>	<u>Value</u>
H2003	Text buffer start	H4A
H2004	Symbol table start	H5B
H2005	Binary Storage Blk.	H5D
H2006	End of RAM	H60

At this time it may be valuable to explain the structure of the symbol table and storage blocks you will be allocating space for.

A symbol is some combination of up to 6 characters where the first character is alphabetic. These 6 ASCII characters each fill one byte of RAM. It should be noted that 6 bytes are always allotted for the symbol name even though the name may consist of fewer characters. Following the 6 bytes in which the name is stored, two bytes of RAM are allotted for the address or data which the symbol refers to. Thus, eight bytes of RAM must be available for each symbol used. In our example above, 512 bytes of memory were provided for the symbol table which would enable us to store up to 64 labels or variables in our program. Of course, we could provide room for more or fewer symbols by changing the number of bytes allotted for the symbol table.

The other block of memory entitled the Binary Storage Block will be used to store the binary code for your program if the pseudo-op TAPE is used. If this option is not used, a Binary Storage Block must still be declared; however, the value stored at address 2006H can be set to the same value as END OF RAM at address 2005H. This will effectively provide no storage locations for Binary Storage. If, on the other hand, you do wish to use the TAPE pseudo-op, you need not provide room in the BSB to store your entire program's binary coding. The coding can be dumped to tape in groups the length of which is determined by the amount of BSB area that you allot. If you plan to use the TAPE pseudo-op, it is best to allocate at least 512 bytes to the BSB. For further details on this see the section entitled "How to Assemble a Program" found in this manual.

Assembler Operation

The source code of your program consists of statements. Each of the statements must be in the following format;

<u>Line positions</u>	<u>Description</u>
1-6	Label
8-11	Opcode
13-14	Register or Condition
18	Indirect Field
19-26	Operand, Index Code

The label is a symbolic name which is given a value equal to the address where the instruction is. The opcode is either one of the 2650's mnemonics or a pseudo-operation. See the Signetics 2650 Manual for detailed information about the 2650's instructions and the Pseudo-Operation Reference Section of this manual for information about the pseudo-ops. If a register or a condition is required for a 2650 instruction, it goes in positions 13-14. If the instruction is to use indirect addressing, an asterisk (*) should go into position 18.

The operand is from 1-6 characters long and can be followed by a comma and an index code if you use indexed addressing for the instruction. The operand itself can be either a hex number, a label which is defined elsewhere in the program, a dollar sign (\$) which will make the operand equal to the address of the first byte of this instruction, or an ASCII character in single quote marks (i.e. 'A') which returns the hex value of that ASCII character. Also, an operand can consist of any of the above listed items used in an arithmetic expression using addition or subtraction. Some examples of valid operands are:

```
'A'
100A-START+$
$-2
START-END+1
```

Finally, if position 18 of a source statement contains an up arrow then the value returned is the high byte of the evaluated operand. If there is no up-arrow, then it returns the low byte of the operand (for instructions which need only 1 byte of data). Comments can fill the remainder of the line.

An example of a program is:

```
START  LODI,3      FF
LOOP   STRA,3      DATAX
        SUBI,3      1
        TMI,3       40
        BCTR,0      LOOP
        HALT
```

*

```

DATAX RES      1
      END

```

The following lines are generalized examples for indexed and indirect instructions:

```

R0      EQU      0
R3      EQU      3
START   LODA,R0   *POINT
          STRA,R3   DSTRT,I   R3 USED AS INDEX REGISTER
          STRA,R3   BSTRT,+   R3 USED AS INDEX REG,
                                AUTO INCREMENT
          STRA,R3   ASTRT,-   R3 USED AS INDEX REG,
                                AUTO DECREMENT
          STRA,R0   CSTRT      NO INDEXED OR INDIRECT
          STRA,R3   *FSTRT,I   R3 USED AS INDEX REG,
                                ALSO INDIRECT

```

If any errors are discovered while assembling the program, an error message is printed above the line with the error. On the event of an error, display mode is automatically switched on so that the user can see the line with the error. The error messages that are printed are all self-explanatory.

Assembly Options

Using various pseudo-operations you can have the assembler include certain normally skipped functions. The operation PRNT will cause a listing to be made. The op-code DISP will cause the program listing to be displayed on the screen as it is assembled. The SYMB option allows the assembler to create a symbol table file which will hold the symbol names used in the programs along with their values. This file is used by the debugger program to allow symbolic referencing of locations.

How to Assemble a Program

To assemble a program, first type the program in using the editor. Note that pressing TAB (control-I) while inserting or changing will move the cursor to the next tab stop-- either position 8, 19, or 28. When the source code has been completely entered, including an END statement, leave the editor and then execute the assembler.

The screen will clear, and the message PASS 1 will appear on the top line. This means that the assembler is running through the source code and making a table of all of the labels and their values. When this is finished, the message PASS 2 will appear. This is the time when the assembler actually creates the binary. If you have the BLKS option

on, the bytes are put in memory as they are assembled. If the TAPE option is on, the bytes and their addresses are put into the binary storage block until it is full. When the OBST is full or at the end of the assembly, you will get the message BINARY OUTPUT. At that time you should put a tape in your recorder and turn it to record. Then hit any key on the keyboard and the assembler will start dumping out the data. In long programs, you may have to dump to tape several times. The tape can be loaded back using the supervisor program's LOAD routine.

If the source code for your program will not all fit into the text buffer at one time, you can still assemble it. Simply have on tape the whole program in several sections. Then, before running the assembler, load the first section into memory (using the editor). Then run the assembler with the name of the tape blocks typed after "R" in the command. Everything will be the same except when the assembler comes to the end of the section of text. At this point (in either pass 1 or 2) you will get a message DATA INPUT. This is your signal to turn your tape recorder to play and hit any key on the keyboard. The assembler then loads in another section of source code. When it comes to an END statement, it knows that it is the last section of the program.

When pass 2 starts, it will immediately ask for data input. This means that the assembler wants to go through the whole program again so you must rewind the tape recorder and play in the first section of the program.

When the whole program has been assembled, you will get the message xx ERRORS (where xx is the number of errors that were found in the program). You can then press any key to return to the editor. Note that any time while the assembler is running you can press escape to return to the editor.

If you wish your program to be listed, use the PRNT operation and write a small program to drive your printer. This program should check the printer's status and, if it is ready, should send it the character which is in register 0. This routine can be put anywhere in memory, with the address of the routine stored at H200B and H200C.

4. Pseudo-Operation Reference

The following pages detail the assembler's pseudo-operation commands. When the format of a statement is given, fields typed in upper case are required while any fields typed in lower case are optional.

Operation: DEFINE ADDRESS CONSTANT

Format: label ACON <expression> [,<expression>...]

Description: This opcode tells the assembler to allocate two bytes. The expression will be stored in these two bytes, the higher order bits in the first byte and the low order bits in the second byte. If a label is present, it will be assigned the address of the first byte allocated. The expression listed cannot be a space or comma enclosed in quotes.

Operation: GENERATE AN ASCII LITERAL

Format: label ALIT 'ASCII string'

Description: This command generates a string of bytes in memory which corresponds to the ASCII string in the operand field. The string must be enclosed in delimiter characters, which can be of your choosing. The first character of the operand field is taken to be the delimiter character. In the above example single quote marks (') are used. Note that the string can extend into the comment field but cannot go past the 80th character of the line.

Operation: LOAD BINARY AS ASSEMBLED

Format: BLKS ON or OFF

Description: This operation instructs the assembler to start or stop storing the data into storage as it is assembled. You must be careful not to overwrite the alp, or its buffers when using this option. If you want your program to run in the same locations as the alp, you must use the TAPE option. That way nothing is written into storage until the assembly is complete and you load the tape back.

Operation: CONVERT ALL ASCII LITERALS TO UPPER CASE

Format: BUMP ON or OFF

Description: normally the assembler will generate ASCII literals exactly like they are shown (upper or lower case). If the BUMP ON operation is given, then all ASCII literals will be converted to upper case before being stored. You can switch back to normal mode by using the BUMP OFF operation.

Operation: DEFINE MEMORY DATA

Format: label DATA <expression> [,<expression>...]

Description: This operation takes the byte of data given by the expression and puts it into one byte of storage. If a label is specified, it will be equated to the address of the data byte. The expression listed cannot be a space or comma enclosed in quotes.

Operation: DISPLAY PROGRAM LISTING ON SCREEN

Format: DISP ON or OFF

Description: This command will start or stop (depending on the operand) displaying the program listing on the screen in pass 2. The format for the display is the same as the format for output listings to a printer (see the PRNT operation). When the screen is full of data, the assembler waits for a keypress before continuing. If this keypress is a control-X, display mode is terminated. Display mode is automatically started if an error is detected in pass 2.

Operation: END OF ASSEMBLY

Format: END

Description: The end of the source must be indicated with this operation at the end of any program.

Operation: EQUATE A SYMBOL'S EQUIVALENCE

Format: LABEL EQU EXPRESSION

Description: The label is made equivalent to the expression. From that point on, you can use the label as an operand, register, or condition just as if it were the expression.

Operation: SET PROGRAM COUNTER

Format: label ORG EXPRESSION

Description: The program counter is set to the expression. Normally used to start your program at an address other than 0 (the default value). If a label is present, it is equated to the expression.

Operation: PRINT LISTING OF PROGRAM

Format: PRNT ON or OFF

Description: The assembler will start or stop (depending on the operation) sending the source lines out to the printer during pass 2. In addition, this option will print line numbers, the address of each byte and the assembled data. The format for this is as follows:

<u>Print Positions</u>	<u>Description</u>
1-4	Line number
7-10	Address
12-13	Byte 1 of the data
15-16	Byte 2 of the data
18-19	Byte 3 of the data
20-22	Byte 4 of the data
23-103	Source line

Note that only the first 80 characters of the line are listed on the printer.

Operation: RESERVE MEMORY

Format: label RES EXPRESSION

Description: The number of bytes of memory specified are reserved starting at the present program counter. The number of bytes allocated is given by the expression, and if the label is present, it is given equivalence to the address of the first byte reserved.

Operation: CREATE BINARY TAPE

Format: TAPE ON

Description: This pseudo-op instructs the assembler to put the binary of the program into the OBST. When the OBST is filled, it is dumped out to cassette tape for later loading by the supervisor program. This must be used as the first line of your program for reliable operation.

5. Debugger Program

The debugger program is designed to be used as an aid in locating and correcting errors in machine language programs. While executing a program on the 2650, there are times the programmer may wish to know what values exist in the microprocessor's registers or flags. An incorrect assumption regarding the value of one of these could send a program off into never never land without the slightest evidence of how it got there. These values are usually not readily obtainable because the registers and flags are internal to the 2650 CPU. The debugger program, however, solves this problem by emulating the instructions of the 2650. All registers, flags, and return stack addresses are stored in RAM where they can be inspected or changed at any time through use of the commands explained later.

Pre-Execution Requirements

The debugger program resides in approximately 4K of memory. Since the debugger is located after the editor/assembler, both programs are present at the same time. Remember, however, that the debugger program can only operate on assembled programs. To enter the debugger program, you should use the 'G' command in the editor.

Running a Program with the Debugger

Upon entering the debugger program, all RAM locations used for registers, stack return addresses, the program counter, and breakpoint addresses are left at their previous value (which is zero if you just loaded the program). Also, upon first entry, all I/O modes are initialized to REALTIME. A further discussion of I/O modes can be found in the section titled "I/O Modes". The programmer will find himself in command entry mode where a myriad of powerful options are available. All commands are listed with detailed descriptions of proper formatting and explanations of execution in the next chapter. At this point an attempt will be made to show how the debugger program might be implemented and to explain some of the convenient features of this program.

Set Program Counter (PC)

It is necessary to set the value of the program counter to the first address of the program to be debugged before initiating program emulation. The program counter is incremented during emulation just as it would be if the 2650 were executing the program. Because the program counter is now external to the 2650 chip, however, new possibilities are open. At any time during trace, step, or simulate mode, pressing the control-X key one or two times will return the user to command entry mode. At this point the programmer can inspect or change RAM locations to find out in detail the operations of the program. Since the program counter residing in RAM is not changed while using most commands, a command could be entered to restart emulation. The program would start exactly where it left off. No external stack return addresses, register values, breakpoints, etc. would be changed. The real flexibility offered here is that during program emulation you can stop program flow, inspect or change registers or selected areas of RAM, and then pick up program flow again with all other states unaltered. The imagination of the user provides the only limitation to the ways in which this feature can be used.

Emulation Modes

There are essentially three different emulation modes in which to run programs: simulate, trace, and single-step. Trace and single-step modes can be thought of as subsets of the simulate mode in that their object codes are interpreted by the same process. Each of the three modes has its own specific command and each performs a different function. A broad description of their different functions follows while a detailed description of each command's format and function can be found in the next chapter.

Simulate (SI): This mode begins emulating the 2650's instructions from the address currently held in the RAM program counter or the optional starting address specified by the user as part of the command. No instructions are displayed on the screen, but I/O options may be specified which allow the user to monitor I/O operations. Normal simulation will allow the program to be emulated until an I/O operation is to be performed. If that I/O operation is programmed for REALTIME or preset mode, the debugger will execute it with no operator message. If it is programmed for SIMULATED or ASCII mode, the appropriate messages will be printed and responses required. All I/O options are available for use during this mode. (These are discussed further in another section of the manual). At any time during simulation in this mode, the program can be stopped by typing a control-X. The debugger program will then automatically switch over to step mode.

Trace (TR): The user enters a number with this command which indicates how many instructions should be emulated in trace mode. The debugger then begins with the address in the RAM program counter and prints on the display each instruction as it is emulated along with the present contents of all registers. As an option, a different starting address can be entered as part of the trace command. When the specified number of instructions have been completed, the debugger automatically switches to step mode.

Step (ST): Again, the user should enter a number with this command to indicate how many instructions should be emulated before single step mode is entered. In this mode, register contents are not displayed during emulation prior to single step. If no number is entered, a default value of 0 is assumed. Once single-step mode is active, the instruction at the address found in the RAM program counter will be displayed. As in trace mode, the PC value can be optionally entered as part of the step command. The contents of all registers and the value of the condition code prior to emulation are also displayed on the same line. The debugger program will not emulate the displayed instruction until the user hits the space bar. Once the space bar is hit, that instruction is emulated and the next instruction is displayed with the register values resulting from the last instruction.

I/O Modes

Most programs require input or output operations sometime during execution. The I/O may be to or from a printer, disk drive, tape drive, keyboard or other peripheral according to the user's needs. When emulating the user program, it may be desirable or even necessary to specify an alternate method of I/O. For instance, a series of write operations to a disk drive would not work while the program was being emulated. This is because the disk moves at a rapid, constant speed which the 2650 microprocessor just barely keeps up with under normal execution. During emulation the user program runs considerably slower and cannot possibly keep up with the speed of the disk head. The first write might be placed near the correct disk area; but, the second write might place data in a totally different section. Sequential writing could crash the disk by storing bits of data throughout the entire track. In fact, only slow speed peripheral devices which use handshaking signals in microprocessor interaction should be accessed in REALTIME mode during program emulation. Data transfer to and from speed sensitive peripherals can sometimes be avoided through use of one or more of the other I/O modes offered.

Four different I/O modes are made available: REALTIME, SIMULATED, ASCII and PRESET. REALTIME and SIMULATED modes can be specified for each I/O port individually or for all ports at once. ASCII mode is available only for output operations while PRESET mode is available only for input operations. Again, the modes can be specified for all ports or for each port individually. If ports are to be specified individually, 258 different ports are capable of being accessed for both input and output, 256 extended ports, 1 data port, and 1 control port. For extended I/O ports, the hexadecimal value of the actual port number, 00 through FF, should be used in the command. The data and control ports are recognized by the hexadecimal values 100 and 101, respectively, being entered for the command. When an I/O command is entered affecting all ports, each port is initialized to the specified mode. The desirability of each mode depends upon the specific application.

REALTIME: This mode transfers I/O through normal channels. I/O takes place as it would during program execution except that, because the 2650 is being emulated, the process occurs much more slowly. Obviously, this mode would create the disk drive problem mentioned above.

SIMULATED: This mode does not transfer data through normal I/O channels. Instead, all data inputs are requested from the keyboard after display prompting and all data outputs are designated through the display screen. The actual port is never accessed so, in the example given above, the data would be displayed on the screen without disturbing the information stored on the disk. This mode can be used successfully as a means of intercepting and displaying an output.

Unfortunately, it is not as helpful in simulating a disk read. In all probability, the number of keypresses required as input from the keyboard would render this mode impractical. As a means of input, this mode is useful only when small amounts of data need to be brought into the system.

ASCII: This is an output mode which is very similar to the simulated output mode listed above. The only difference is that the output value is displayed as an ASCII character instead of in hexadecimal form. If there is no ASCII character corresponding to the value, then the hexadecimal form is displayed.

PRESET: This input mode allows the user to store one input value for any or all ports. When an input is expected by your program, the preset value is returned to the program instead of actually reading the port. Only one hexadecimal

value can be associated with each port at one time. Although this may seem to place severe limitations on the useful applications of the mode, there are some interesting ways in which the option can be used. During data output to some handshaking peripheral device, the simulation process will output data and then enter a loop in your program to test for a ready condition which would return from the peripheral device. If the input port were preset to give the ready condition, then the debugger program would read the input, fall through the ready test loop in your program and continue emulation. Hopefully, this example suggests other ways in which preset mode might be used.

The problem with disk drive input still has to be solved. There just isn't anyway to get data off a disk using the emulator. The only way to get data off these devices is full speed 2650 microprocessor execution. That doesn't mean the debugger can't be used with your program--there is a way around the problem.

Execution (EX) and Breakpoint (BR)

The debugger allows use of an execute command which loads all the registers from RAM into the 2650 chip. The 2650 microprocessor is then given control to execute, beginning at the address specified during command entry. If an address is not specified in the command, execution begins at the address specified in the RAM program counter. During execution none of the specified I/O modes are active. Of course, at some point you will have to indicate that the 2650 should return processing responsibility back to the debugger program. This can be done by setting up a breakpoint prior to execution. Setting up a breakpoint is a convenient way to return to step mode without interrupting program flow. When the breakpoint is reached, internal register values are stored back out to RAM; the breakpoint just hit is cleared; and, step mode emulation begins.

Returning to our disk input problem, how can these features be used? Let's assume that the disk drive input routine occurs between two areas where the programmer would like to use the emulator to aid in debugging. The commands used to debug this program could be entered in this way:

<u>Command Entered</u>	<u>Comments</u>
ST 15F,5C00	15F hex instructions are emulated in simulate mode after which single-step mode is entered.
Space bar	The current instruction is emulated and the next instruction is dis-

played along with the registers.

Space bar	the space bar has been hit to advance one more instruction. The programmer now decides to prepare for execution.
Escape key	the display shows the command entry message (DEBUG>).
BR 1,5E20	the 1st breakpoint address is set where 2650 execution will stop and single-step mode will begin.
EX	execution begins at the address where we stopped single-step mode. The program will run at normal operating speeds and no specified I/O modes in the debugger program are active.
Breakpoint 1 reached at 5E20	(displayed by the debugger) the breakpoint address 5E20 has been reached, the breakpoint is cleared, and the program is now in single-step mode.
Space bar	you can now continue to step through your program by hitting the space bar for each instruction,

This procedure could have been done other ways, but the point has been made; the transition between emulation and execution is fairly simple.

A potential problem exists which the programmer should be made aware of; executing breakpoints destroy the return address stack. However, if you are simulating and reach a breakpoint, your stack will be saved. Care should be exercised while executing into subroutines since when the debugger returns at a breakpoint the return address stack is invalid for the section of code that was executed. In general, although there are exceptions, when you set a breakpoint inside of a subroutine and then subsequently execute or simulate after the breakpoint, don't expect the subroutine to return properly.

6. Debugger Command Reference

Command Summary

INSPECT AND EDIT

CH {<reg number>, <data byte>}...change register values
CO <start addr>,<compare addr>,<end addr>...compare memory
DI <memory addr>...display memory
DS...display stack
ED...return to the editor program
IN <start addr>, <end addr>, <data>...initialize memory
PA <start addr>...display page
PC <addr>...set program counter
RE...print out registers
RU...run the assembler program

I/O MODES -

AA...all outputs ASCII
AP...all inputs preset
AR...all I/O realtime
AS...all I/O simulated
IP <port number>, <data>...input preset
IR <port number>...input realtime
IS <port number>...input simulated
OA <port number>...output ASCII
OS <port number>...output simulated
OR <port number>...output realtime

EMULATION MODES

SI [<addr>]...simulate mode
ST <number of steps> [,<start addr>]...step mode
TR <number of steps> [,<start addr>]...trace mode

MISC COMMANDS

BR <number>, <addr>...set breakpoint
CL <number>...clear breakpoint
EX [<addr>]...execute

All values in angle brackets (<>) are parameters to be entered by the user in hexadecimal. Any parameters contained within braces ({}) can be repeated one or more times. Any items in square brackets ([]) are optional.

COMMAND: CH change register values

FORMAT: CH {<register number>, <data byte>}

The value of a specified register being changed corresponds to the register number you need to specify as follows:

<u>Specified register number</u>	<u>Actual register</u>
0	R0
1	R1,bank 0
2	R2,bank 0
3	R3,bank 0
4	R1,bank 1
5	R2,bank 1
6	R3,bank 1
7	PSL
8	PSU

The data byte must be typed in as a hexadecimal number. Multiple registers can be changed for each command entry by continuing to type pairs of numbers which correspond to the registers and the data.

The new values stored in the specified registers will be displayed as indicated under the 'RE' command after the command is executed.

COMMAND: CO compare memory blocks

FORMAT: CO <1st blk start addr>,<2nd blk start addr>,
 <2nd blk end addr>

The <start addr> is the first address of a block of data. The <compare address> is the first address of a second block of data. Each consecutive byte of data in the second block is compared to each corresponding consecutive byte of data in the first block beginning with the first addresses as listed. The <end addr> is the address of the last byte of data in the second block which is to be compared. When the data in any two corresponding address do not match, an error message is given of the following form: <1st block addr> = <data>, <2nd block addr> = <data>.

COMMAND: DI display memory

FORMAT: DI <memory addr>

16 consecutive data bytes located in memory starting with the address specified in the command are displayed in one line across the screen. At the far right of the screen on the same line will appear the sequential ASCII representations of the listed hexadecimal values when possible. If there is no ASCII character corresponding to the hexadecimal value, a period is used to fill that place in the sequence.

Once the display command has been entered, it becomes possible not only to inspect that memory, but to edit it also. On entry to the command, the cursor is positioned to the left of the first data byte displayed. By typing a "J" to move left or an "L" to move right, the cursor can be positioned at any byte in the line. Typing a "K" will slide the cursor all the way back to the left-most position. To change a hexadecimal value stored in memory which appears somewhere along this line, the cursor must be moved to the blank space at the immediate left of the data to be altered. If two hexadecimal digits are then typed in, the data stored in that memory location will be changed to the new value.

Once all desired change to the displayed data have been made, the escape key must be pressed to return to command entry mode. If you hit carriage return while in display mode, the next 16 bytes will be displayed and you will be allowed to edit them.

COMMAND: DS display stack

FORMAT: DS

The return address stack is displayed on the screen in the following format:

STACK = <return addr 1>,<return addr 2>...<return addr 8>

The return address stack stores addresses on a Last In, First Out basis with <RETURN ADDR 1> being the address most recently added.

Command: ED edit

Format: ED

This command returns the user back to the editor.

COMMAND: IN initialize memory

FORMAT: IN <starting addr>,<ending addr>,<data>

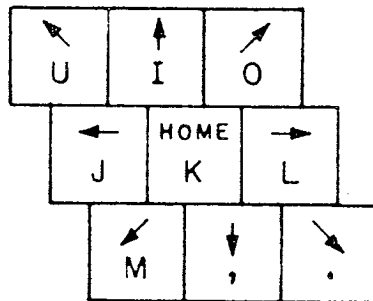
All memory locations between the starting address and the ending address (inclusive) are loaded with the data. All parameters in the command are entered as hexadecimal numbers.

COMMAND: PA display page

FORMAT: PA <start addr>

Beginning with the start address, the contents of 256 memory locations are displayed filling the entire screen. To the far right of each line, ASCII characters appear sequentially corresponding to the hexadecimal digits already appearing on that line. If an ASCII character does not exist for a particular value, that place is held with a period in order to maintain the sequence.

Once this command has been entered, the programmer has the option to change any data bytes on the screen. A cursor is located at the upper-left hand corner and can be moved to any space of the display through the use of the following keys:



(K returns the cursor to the upper-left hand corner of the screen.)

In order to change the data stored in a displayed memory location, move the cursor to the blank space at the immediate left of the hexadecimal value currently in memory. Then type in the new two digit hexadecimal number. The new value will appear reflecting the new data which is stored at that location.

To inspect or edit the next page of memory, press the return key. When you have finally completed making changes, you can return to command entry mode by pressing the escape key.

COMMAND: PC set program counter

FORMAT: PC <addr>

The RAM program counter is set to the specified address.
This command allows you to choose which address to begin
program emulation at.

COMMAND: RE print out registers

FORMAT: RE

The values stored in the CPU's registers are displayed on the screen. The format, which is the same in trace and step emulation modes, follows:

ADDR B1 B2 B3 R0=hd, R1=hd, R2=hd, R3=hd, R4=hd, R5=hd,
R6=hd, PSL=hd, PSU=hd, CC=d

where

ADDR is the current value of the PC

B1, B2, B3 are the data bytes for the current instruction

R means register

R1, R2, R3 are registers 1, 2 & 3 in bank 0

R4, R5, R6 are registers 1, 2 & 3 in bank 1

PSL is the lower program status word

PSU is the upper program status word

CC is the condition code

hd is the hexadecimal data stored in the register

d is the value of the condition code

COMMAND: RU run the assembler

FORMAT: RU

This command jumps to the assembler and automatically starts its execution. After the assembler program is done, it returns the user back to the editor.

COMMAND: AA all outputs ASCII

FORMAT: AA

All output data will be simulated on the display screen in ASCII. The data will appear on the screen as follows;

OUTPUT PORT <port number> = <data value in ASCII>

The data shown is the ASCII character which would have been sent to the specified port if the program had been executed. If there is no ASCII representation for the byte, the hex value is printed on the screen.

COMMAND: AP all inputs preset

FORMAT: AP <data byte>

All input ports are set to return the value of the data byte specified in the command. This value should be entered in hexadecimal form.

COMMAND: AR all I/O realtime

FORMAT: AR

All I/O ports are accessed as specified by the user's program. Data transfer occurs as it would during execution except that it takes place much more slowly.

COMMAND: AS all I/O simulated

FORMAT: AS

All I/O port accesses are simulated. When a read instruction has been initiated, a prompting message will appear on the display as follows:

INPUT PORT <port number> =

The emulation process does not continue until a hexadecimal value followed by a carriage return is entered through the keyboard. The one byte of hexadecimal data typed in is used by the debugger program as if it had been input through the actual input port. When a write instruction is reached, the following message appears on the display screen:

OUTPUT PORT <port number> = <data value>

The port number is displayed in hexadecimal and is the number of the port the data would have been sent to if the program had been executing. The data output is now only designated on the screen (and is not actually sent to the port).

COMMAND: IP input preset

FORMAT: IP <port number>,<data value>

This command sets the hexadecimal value which has been typed in to be the incoming data from the specified port.

COMMAND: IR input realtime

FORMAT: IR <port number>

The specified port is set to realtime mode. Only one port can be specified per command entry. When realtime mode is specified, the actual port is accessed, however, at a much slower speed than it would during 2650 microprocessor execution.

COMMAND: IS input simulated

FORMAT: IS <port number>

This command is used to set an individual port to simulated mode. The debugger program prompts for data input instead of accessing the port specified by the input instruction in binary code. A detailed description of the display prompt can be found under the command AS, all inputs simulated.

COMMAND: OA output ASCII

FORMAT: OA <port number>

Any output to the specified port will be simulated on the display screen where it is shown in ASCII form. Only one port can be set per command entry. A detailed description of the display screen output is given under the command AA, all output ASCII.

COMMAND: OS output simulated

FORMAT: OS <port number>

The indicated port is not accessed for a write instruction. Instead, the data is displayed on the screen. A further description can be found under the command AS, all I/O in simulated mode.

COMMAND: OR output realtime

FORMAT: OR <port number>

The specified port will be sent output data as if the binary code were being executed except that data transfer will occur much more slowly.

COMMAND: SI simulate program mode

FORMAT: SI [<start addr>]

This command initiates program simulation beginning with the address stored in the program counter external to the 2650. The optional start address will reinitialize the program counter before simulation to the address chosen by the user. Pressing CONTROL-X is one way out of this simulation mode and into step mode. An alternate means of exiting this mode is by reaching a breakpoint address which also switches to step mode. Thus, the level at which the programmer chooses to monitor the program flow is completely flexible at any time. For this advantage, the user must give up microprocessor execution speed.

COMMAND: ST step simulation mode

FORMAT: ST <number of instructions>[,<start addr>]

The number of instructions specified in this command will be simulated beginning with the instruction at the address stored in the RAM program counter. After this number of instructions have been simulated, you are put into step mode. Once step mode begins each instruction is displayed on the screen with all current register values. The instruction is not executed until the space bar is hit. With this, the instruction is simulated, the registers are updated with their new values and the next instruction is displayed on the screen. The format of the display is shown under the command called "RE". As an option, you can specify as the second parameter of the command a new value to be assigned to the RAM program counter prior to emulating.

COMMAND: TR trace mode

FORMAT: TR <number of instructions>

The trace command simulates the specified number of instructions, displaying the instruction and register values on the screen automatically. (The format for the display is described in the description of the command "RE".) Upon completion of the trace, the debugger program jumps immediately into step mode and waits for the space bar to be hit. If the number of instructions to be traced exceeds sixteen, then the display scrolls up with the newest instruction appearing on the bottom line. As an option, you can specify as the second parameter of the command a new value to be assigned to the RAM program counter prior to emulating.

COMMAND: BR breakpoint

FORMAT: BR <breakpoint number>,<address>

A breakpoint can be set which will cause a transfer to step mode from either execute or simulate mode. Concurrently, four different breakpoint addresses can be set. Each breakpoint address should be assigned a number from one to four which will be used by the debugger program at a later time to identify the breakpoint address which has been reached. The message indicating a breakpoint will appear as follows:

BREAKPOINT X REACHED AT AAAA

Where X is the breakpoint number and AAAA is the address of the breakpoint.

COMMAND: CL clear breakpoint

FORMAT: CL <breakpoint number>

This command is used to clear a breakpoint if the address was never reached and the breakpoint is no longer desired. Since four different breakpoints are possible, it is important that the correct breakpoint number be specified.

If you try to clear a breakpoint which has not been reached (and subsequently cleared) the following message will appear:

BREAKPOINT <#> CLEARED

If the breakpoint has been reached (or cleared previously), no message will be displayed when the command is executed.

COMMAND: EX execute

FORMAT: EX [<address>]

Control returns to the CPU and execution begins at the address designated in the command. Since this is normal execution, only setting a breakpoint can return you to simulate mode without affecting program flow. Execution is essential during I/O accesses to or from speed sensitive peripherals such as cassette tapes or disk drives. Naturally, no I/O modes in the debugger program are available when the user program is being executed. If execution is begun inside a subroutine, do not expect the return from the calling routine to be executed correctly. The return address stack is invalid.

7. ALP Program Listing

On the following pages are the program listings for the ALP program.

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0221	2000					*			
0222	2000					EXEC		2222	
0223	2000					ORG		2022	
0224	2000					R0	EQU	0	
0225	2000					R1	EQU	1	
0226	2000					R2	EQU	2	
0227	2000					R3	EQU	3	
0228	2000					*			
0229	2000					*			
0230	2000					EQ	EQU	0	
0231	2000					GT	EQU	1	
0232	2000					LT	EQU	2	
0233	2000					UN	EQU	3	
0234	2000					NE	EQU	00	
0235	2000					LE	EQU	51	
0236	2000					GE	EQU	02	
0237	2000					Z	EQU	0	
0238	2000					N	EQU	2	
0239	2000					*			
0240	2000					*			
0241	2000					CRY	EQU	1	PSL
0242	2000					CCM	EQU	2	
0243	2000					OVF	EQU	4	
0244	2000					WC	EQU	8	
0245	2000					RS	EQU	10	
0246	2000					IDC	EQU	20	
0247	2000					COND	EQU	02	
0248	2000					SP	EQU	7	FSU
0249	2000					II	EQU	20	
0250	2000					FLAG	EQU	40	
0251	2000					SENSF	EQU	00	
0252	2000					*			
0253	2000					*			
0254	2000					ESC	EQU	12	
0255	2000					BS	EQU	0	
0256	2000					CR	EQU	2	
0257	2000					CRCD	EQU	10	
0258	2000					CCOPY	EQU	10	
0259	2000					CTPLA	EQU	18	
0260	2000					CTA	EQU	1	
0261	2000					CTALO	EQU	7	
0262	2000					CTALP	EQU	10	
0263	2000					CTALN	EQU	1	
0264	2000					CTELY	EQU	19	
0265	2000					CTFLU	EQU	10	
0266	2000					HT	EQU	9	
0267	2000					*			
0268	2000					LF	EQU	0A	
0269	2000					FORMP	EQU	2C	
0270	2000					*			
0271	2000					SIFRO	EQU	024F	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0256	2220					SERI	EQU	02F9	
0257	2020					DELAY	EQU	0279	
0258	2000					*			
0259	2000	1F	20	30		BCTA,UN		EDITOR	
0260	2003	4A				BSTART	DATA	4A	
0261	2004	50				IBST	DATA	50	
0262	2005	50				OBST	DATA	50	
0263	2006	60				ENIRAM	DATA	60	
0264	2007	07				TABS	DATA	7	
0265	2008	12					DATA	12	
0266	2009	1E					DATA	1E	
0267	200A					*			
0268	200A	1F	00	46		DPRINT	BCTA,UN	*6046	OUR PRINTER DRIVER ROUTINE
0269	200D					*			
0270	202D	00	00	00	00	MBUF	RES	10	
0271	2011	00	00	00	00				
0272	2015	00	00	00	00				
0273	2019	00	00	00	00				
0274	201D	00				CCMS	RES	1	
0275	201E	00	00	00	00	NAME	RES	10	
0276	2022	00	00	00	00				
0277	2026	00	00	00	00				
0278	202A	00	00	00	00				
0279	202E	00				TMPS	RES	1	
0280	202F	00				TFMP	RES	1	
0281	2030					*			
0282	2030					EOC	EQU	03	
0283	2030					*			
0284	2030					*			
0285	2030					*			
0286	2030	04	22			EDITOR	LODI,R0	02	
0287	2032	93				LPSL			
0288	2033	76	40			FFSU		40	
0289	2035	20				ICR2,F0			
0290	2036	00	0A	15		STRA,F0		OBPTR-1	
0291	2039	00	01	10		STRA,F0		ULC	
0292	203C	3F	21	92		BCTA,UN		ERASE	
0293	203F	00	00	01		LODA,F0		CBST	
0294	2042	00	0A	14		STPA,F0		OBPTR	
0295	2045	3F	22	59		BCTA,UN		BEGIN	
0296	2048					*			
0297	2048	3F	21	3E		FBDN	BCTA,UN	DISP	
0298	2049	06	10			COMD	LODI,R2	10	
0299	204D	05	2F				LODI,R1	2F	
0300	204F	3F	44	40		BCTA,UN		SICOR	
0301	2052	3F	45	45		BCTA,UN		OLTCR	
0302	2055	05	10			LODI,R2		10	
0303	2057	05	02			LODI,R1		02	
0304	2059	3F	44	40		BCTA,UN		SICOR	
0305	205C	05	20			LODI,R1		20	
0306	205F	3F	46	CA		BCTA,UN		PRINC	
0307	2061	3F	21	1E		BCTA,UN		FINDND	
0308	2064	0F	00	04		LODA,F0		IBST	
0309	2067	AF	2A	22		SUBA,R0		DUMA	
0310	206A	A7	01			SUBI,R0		21	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2111	206C	3F	72	71			BSTA.UN	BTOUT	
2112	206F	06	13				LODI.R2	13	
2113	2071	05	00				LODI.R1	20	
2114	2073	3F	44	4C			BSTA.UN	SETCUR	
2115	2076	05	11				LODI.R1	1D	
2116	2078	3F	45	CA			BSTA.UN	FRING	
2117	207E	70				RL1	REDD.R0		
2118	207C	1A	77				BCTR.LT	RL1	
2119	2071	3F	71	26			BSTA.UN	OLC	
2120	2061	04	00				LODI.R0	CCMS	
2121	2063	05	11				LODI.R1	CCMS	
2122	2065	05	11				LODI.R2	11	
2123	2067	3F	45	67			BSTA.UN	ARPOW	
2124	206A	05	20	4B			PCFA.EQ	CCMD	
2125	206D	0C	03	1D			LODI.R0	CCMS	
2126	2068	3F	47	8C			BSTA.UN	LTCU	
2127	2063	3F	21	26			BSTA.UN	OLC	
2128	2066	02					FOI2.R0		
2129	2067	01					STRZ.R1		
2130	2068	07	FF				LODI.R3	FF	
2131	206A	0F	20	1E	NI		LODI.R3	NAME.4	
2132	206D	18	26				BCTR.EQ	CK2	
2133	206F	17	10				COMI.R3	10	
2134	20A1	9A	2C				FOFR.LT	EADD	
2135	20A3	14	30				COMI.R0	0	
2136	20A5	1A	26				BCTR.LT	DS	
2137	20A7	14	39				COMI.R0	0	
2138	20A9	16	22				BCTR.GT	DS	
2139	20AB	01					LODI.R1		
2140	20AC	06	09				LODI.R2	09	
2141	20A1	01			ONE		ATDZ.R1		
2142	20A2	01	01				TFSL	CRY	
2143	20B1	18	0E				BCTR.EQ	D255	
2144	20B3	FA	79				BCTR.P2	ONE	
2145	20B5	01					STRZ.R1		
2146	20B6	0F	60	1E			LODI.R3	NAME.1	
2147	20B9	44	30				SUBI.R0	0	
2148	20B5	01					ADDD.R1		
2149	20B0	01					STRZ.R1		
2150	20BD	05	01				TFSL	CRY	
2151	20B1	06	59				BCTR.EQ	NI	
2152	20C1	05	FF		D255		LODI.P1	FF	
2153	20C3	1B	0A				BCTR.UN	EADD	
2154	20C5	17	00		CK0		COMI.R3	03	
2155	20C7	06	06				FOFR.EQ	EADD	
2156	20C9	05	01				LODI.R1	01	
2157	20CB	1B	02				BCTR.UN	EATE	
2158	20CD	05	02		DS		LODI.R1	02	
2159	20CF	2C	40	1D	EADD		LODI.R0	CCMS	
2160	20D2	3F	47	8C			BSTA.UN	LTCU	
2161	20D5	03					STRZ.R0		
2162	20D8	A7	41				SCBI.R3	A	
2163	20DB	F7	19				COMI.R3	19	
2164	20DA	1E	20	4E			BCTR.GT	COMD	
2165	20DD	12					REI.R0		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2166	20DE	07	80				LOPI.R3	00	
2167	20E0	0F	01				STRZ.R3	0-3	
2168	20E2	1B	00				BCTR.UN	COMTEL	
2169	20E4	25	26			COMTEL	ACON	ISAVE	A=APPEND BUFFER AFTER LINE X
2170	20E6	22	01				ACON	BACK	B=BACK X LINES
2171	20E8	26	24				ACON	CHANGE	C=CHANGE LINES
2172	20EA	23	D5				ACON	DELT	D=DELETE X LINES FROM TOP
2173	20EC	02	53		CC CO		DATA	02.53	E=EXIT TO SUP.
2174	20EE	27	07				ACON	FORWD	F=FORWARD X LINES
2175	20F0	35	55				ACON	BUG	G=GO TO DEBUG
2176	20F2	24	E5				ACON	SAVE	H=HOLD X LINES IN INSERT BUFFER
2177	20F4	22	95				ACON	INST	I=INSERT LINES AFTER LINE X
2178	20F6	35	53				ACON	DEBUG	J=JUMP TO DEBUG AND CLEAR IT
2179	20F8	22	4B				ACON	COMD	K
2180	20FA	27	1F				ACON	IGAIL	L=LOAD X LINES FROM DISK
2181	20FC	25	0B				ACON	MODIFY	M=MODIFY STRING IN LINE X
2182	20FE	21	19				ACON	ULCASE	N=NORMAL LOWERCASE MODE
2183	2100	22	4B				ACON	COMD	O
2184	2102	25	63				ACON	FMCI	P=PRESET MODIFY PATTERNS
2185	2104	22	4B				ACON	COMD	Q =
2186	2106	25	69				ACON	ASP	R=RUN ASM
2187	2108	26	00				ACON	TAFIO	S=STORE X LINES TO DISK
2188	210A	20	4B				ACON	COMI	T
2189	210C	21	1F				ACON	UPONLY	U=GO INTO UPPER CASE ONLY MODIF
2190	210E	22	4B				ACON	COMD	V
2191	2110	22	4B				ACON	COMD	W
2192	2112	24	07				ACON	SEARCH	X=SEARCH FOR ASCII STRING X
2193	2114	20	4B				ACON	COMI	Y
2194	2116	22	4B				ACON	COMI	Z
2195	2118								
2196	2118	23				ULC	FIS	1	
2197	2119								
2198	2119	20				ULCASE	FOPI.R0		
2199	211A	0B	7C				STRZ.R0	ULC	
2200	211C	1F	20	4B			BCTR.UN	COMI	
2201	211F								
2202	211F	24	FF			UPONLY	LODI.R0	FF	
2203	2121	0B	75				STRZ.R0	ULC	
2204	2123	1F	20	4B			BCTR.UN	COMI	
2205	2125								
2206	2126								
2207	2126	14	23			OLC	COMI.R0	2B	
2208	2128	1C	21	E5			BCTR.F0	ENIF	
2209	212A	14	2D				COMI.R0	2D	
2210	212D	1C	22	53			BCTR.EQ	BIGN	
2211	212F	14	2D				COMI.R0	2D	
2212	2132	1C	22	05			BCTR.EQ	FW15	
2213	2135	14	2F				COMI.R0	2F	
2214	2137	1C	21	FF			BCTR.EQ	EX15	
2215	213A	17					BCTR.UN		
2216	2135								
2217	2135	45	0B			CURIT	ACON	CURSOR=1	
2218	2137	23				LINEI	FIS	1	
2219	2138								
2220	213E	3F	22	64		DISP	BSTA.UN	MTDA	

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
0221	2141	C1					STRI,R1		
0222	2142	22					ISPL,R2		
0223	2143	CC	81	3B			STRA,R2	*CURIT	
0224	2146	CC	0A	03			STRA,R2	DUMA+1	
0225	2149	08	72				STRA,R2	LINEX	
0226	2148	3F	45	45		LINENO	STRA,UN	OLFCR	
0227	2147	02	81	3B			LODA,R2	*CURIT	
0228	2151	44	0F				ANIL,R2	F	
0229	2153	14					RTIC,R2		
0230	2154	01	EA	02			LOIA,R1	*DUMA+1	
0231	2157	1F	21	9D			BCTA,LT	CLREND	
0232	215A	08	61				LODR,R2	LINEX	
0233	215C	84	01				ADDI,R2	1	
0234	215E	08	5D				STRA,R2	LINEX	
0235	2160	C3					STRA,R2		
0236	2161	14	02				COMI,R2	9	
0237	2163	19	05				BCTR,LT	TWOCH	
0238	2165	3F	45	8B			STRA,UN	WRTEL	
0239	2168	1B	07				BCTR,UN	WR2ND	
0240	216A	04	31			TWOCH	LODI,R2	1	
0241	216C	3F	45	8D			STRA,UN	WRT	
0242	216F	A7	0A				STRI,R2	A	
0243	2171	07	30			WR2ND	LOPI,R3	2	
0244	2173	02					LODI,R3		
0245	2174	3F	45	8D			STRA,UN	WRT	
0246	2177	3F	45	8B			STRA,UN	WRTEL	
0247	217A	0D	3A	02		NITC	LODA,R1	*DUMA+1	
0248	217E	1A	1E				BCTR,LT	CLREND	
0249	217F	C3					STRA,R2		
0250	2180	D9	05				BIRP,R1	NA1	
0251	2182	3F	21	D9			STRA,UN	AIDA	
0252	2185	5A	15				BCTR,LT	CLREND	
0253	2187	F7	0D			NA1	COMI,R3	CR	
0254	2189	1C	21	4B			BCTA,EC	LINENO	
0255	218C	02					LODI,R3		
0256	218D	3F	45	8D			STRA,UN	WRT	
0257	2190	1B	68				BCTR,UN	NITC	
0258	2192	20				ERASE	FORZ,R2		
0259	2193	CC	81	3B			STRA,R2	*CURIT	
0260	2196	3F	21	9D			STRA,UN	CLREND	
0261	2199	3F	45	45			STRA,UN	D OLFCR	
0262	219C	17					RTIC,UN		
0263	219D	0C	81	3B		CLREND	LODA,R2	*CURIT	
0264	21A0	F4	0F				TMI,R2	F	
0265	21A2	14					RTIC,EC		
0266	21A3	3F	45	45			STRA,UN	D OLFCR	
0267	21A6	1B	75				BCTR,UN	CLREND	
0268	21A8	02				FTIME	RES	1	
0269	21A9	3F	22	64			FWLX	STRA,UN	MTDA
0270	21AC	C2				FWDX2	STRA,R2		
0271	21AD	C1					LODI,R1		
0272	21AE	14					RTIC,EC		
0273	21AF	20					FORZ,R2		
0274	21B0	CC	0A	03			STRA,R2	DUMA+1	
0275	21B3	0E	EA	02		NITCR	LODA,R2	*DUMA+1	

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
0276	21B6	1A	1D				BCTR,LT	ENDFW	
0277	21B8	08	6E				STRA,R2	FTIME	
0278	21BA	1A	11				BIRP,R2	CRCK	
0279	21BC	3F	21	D9			STRA,UN	AIDA	
0280	21BF	1A	0C				BCTR,LT	CRCK	
0281	21C1	3F	23	73			STRA,UN	SIDA	
0282	21C4	06	F7				LODI,R2	FF	
0283	21C6	04	53				LODI,R2	EBG	
0284	21C8	C1	EA	02			STRA,R2	*DUMA+1	
0285	21CE	1F	08				BCTR,UN	ENDFW	
0286	21CF	0F	59			CRCK	LODR,R2	FTIME	
0287	21CF	14	0D				COMI,R2	CR	
0288	21D1	98	E2				BCTR,EC	NITCR	
0289	21D3	F9	51				FEAR,R1	NITCR	
0290	21D5	C1	0A	03		ENDFW	STRA,R2	DUMA+1	
0291	21D8	17					RTIC,UN		
0292	21D9	04	01			AIDA	LODI,R2	1	
0293	21DB	0C	0A	02			ADDA,R2	DUMA	
0294	21DE	CC	0A	02			STRA,R2	DUMA	
0295	21E1	EC	02	04			COMA,R2	IBST	
0296	21E4	17					RTIC,UN		
0297	21E5					*			
0298	21F5					*			
0299	21E5	3F	07			INDF	BCTR,UN	FINDND	
0300	21E7	3F	22	3F			STRA,UN	MTCA	
0301	21EA	05	01				LODI,R1	1	
0302	21EC	1B	13				BCTR,UN	BACK	
0303	21EE	3F	22	64		FINDND	STRA,UN	MTDA	
0304	21F1	05	FF			FINDND2	LODI,R1	FF	
0305	21F3	3F	21	AC			STRA,UN	FWDX2	
0306	21F6	0C	0A	02			LODA,R2	*DUMA	
0307	21F9	16					RTIC,LT		
0308	21FA	0C	0A	03			LODA,R2	DUMA+1	
0309	21FD	1B	72				BCTR,UN	FINDND2	
0310	21FF	05	3F			BELE	LODI,R1	F	
0311	2201	3B	0C				BCTR,UN	BACK	
0312	2203	1B	05				BCTR,UN	FWDX	
0313	2205	05	0F			FW15	LODI,R1	F	
0314	2207	3F	21	A9		FORWD	STRA,UN	FWDX	
0315	220A	3B	33			FWBXD	BCTR,UN	MTCA	
0316	220C	1F	22	49			BCTR,UN	FEDN	
0317	220F	3F	22	64		BACKI	STRA,UN	MTDA	
0318	2212	C2					STRA,R2		
0319	2213	20					FORZ,R2		
0320	2214	CC	0A	03			STRA,R2	DUMA+1	
0321	2217	5E	01				ADDI,R1	1	
0322	2219	1B	03				BCTR,UN	CHEK	
0323	221B	0E	CA	02		SUBL	LODA,R2	*DUMA+1	
0324	221E	C3				CHEK	STRA,R2		
0325	221F	16	23				COMI,R2	0	
0326	2221	9B	03				BCTR,EC	NOSU	
0327	2223	3F	23	73			STRA,UN	SIDA	
0328	2226	EC	02	03			COMA,R2	BSTART	
0329	2229	1A	28				BCTR,LT	BEGN	
0330	222B	F7	0D			NOSU	COMI,R3	CR	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0331	223D	95	6C				BCFR,EQ	SUBL	
0332	223F	19	6A				BCFR,R1	SUBL	
0333	2231	15	00				CCM1,R2	0	
0334	2233	3C	21	D9			BSTA,EQ	AIDA	
0335	2236	86	01				ADD1,R2	1	
0336	2238	3C	21	D9			BSTA,EQ	AIDA	
0337	223E	01	0A	03			STRA,R2	DUMA+1	
0338	223E	17					RETC,UN		
0339	223F	0C	0A	02		MTCA	LODA,R0	DUMA	
0340	2242	0C	0A	00			STRA,R0	CURA	
0341	2245	0C	0A	03			LOLA,R0	DUMA+1	
0342	2248	0C	0A	01			STRA,R0	CURA+1	
0343	224B	17					RETC,UN		
0344	224C					*			
0345	224C					*			
0346	224C					*			
0347	224C	35	03			CREATE	BSTR,UN	BEGIN	
0348	224E	04	03				LODI,R0	IBC	
0349	2252	0C	0A	00			STRA,R0	*CURA	
0350	2253					*			
0351	2253	3F	22	59		BEGN	BSTA,UN	BEGIN	
0352	2256	1F	20	48			BSTA,UN	FBDN	
0353	2259	0C	00	03		BEGIN	LOLA,R0	ESTART	
0354	225C	0C	0A	00			STRA,R0	CURA	
0355	225F	20					FORZ,R0		
0356	2260	0C	0A	01			STRA,R0	CURA+1	
0357	2263	17					RETC,UN		
0358	2264					*			
0359	2264	0C	0A	02		MTDA	LODA,R0	CURA	
0360	2267	0C	0A	02			STRA,R0	DUMA	
0361	226A	0C	0A	01			LODA,R0	CCPA+1	
0362	226D	0C	0A	03			STRA,R0	DUMA+1	
0363	2270	17					RETC,UN		
0364	2271					*			
0365	2271	E7	63			DISCUT	CCM1,R3	53	
0366	2273	99	07				BCFR,GT	NO100	
0367	2275	04	31				LODI,R0	'1'	
0368	2277	3F	4F	8D			BSTA,UN	WRT	
0369	227A	A7	64				SUB1,R3	64	
0370	227C	06	00			NO102	LODI,R2	2	
0371	2271	17	06			SUB10	CCM1,R3	9	
0372	2280	99	0E				BCFR,GT	TENIN	
0373	2282	A7	0A				SUB1,R3	A	
0374	2284	86	21				ADD1,R2	1	
0375	2286	1E	76				BCFR,UN	SUB10	
0376	2286	02				TENIN	LOI2,R2		
0377	2289	04	30				ICRI,R0	'2'	
0378	228B	3F	45	8D			BSTA,UN	WRT	
0379	2281	03					LOI2,R3	'0'	
0380	228F	04	30				ICRI,R0	'0'	
0381	2291	3F	45	8D			BSTA,UN	WRT	
0382	2294	17					RETC,UN		
0383	2295					*			
0384	2295					*			
0385	2295	3F	21	92		INST	BSTA,UN	ERASE	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0386	2296	3F	23	09			BSTA,UN	IBADE	
0387	2299	3F	21	A9			BSTA,UN	FWDK	
0388	229F	3F	22	3F			BSTA,UN	MTCA	
0389	22A1	3F	21	1E			BSTA,UN	FINDND	
0390	22A4	05	00				LODI,R1	00	
0391	22A6	3F	47	03		NEXI	BSTA,UN	GETKB	
0392	22A9	14	02				CCM1,R0	BS	
0393	22AB	1C	23	A4			BSTA,IO	BACKN	
0394	22AF	14	09				CCM1,R0	BT	
0395	22B2	1C	24	22			BSTA,IO	TABO	
0396	22B3	14	03				CCM1,R0	ETX	
0397	22B5	1B	05				BCFR,IO	BTPAS	
0398	22B7	3F	26	08			BSTA,UN	CKCTRL	
0399	22BA	1A	6A				BCFR,LT	NEXI	
0400	22BC	0C	EA	04		BYPAS	STRA,R1	*TMPA,I	
0401	22BF	14	03				CCM1,R0	FTX	
0402	22C1	16	31				BCFR,IO	INDEI	
0403	22C3	14	01				CCM1,R0	CR	
0404	22C5	3C	46	C9			BSTA,IO	LTGR	
0405	22C8	3B	02				BSTR,UN	INSTS	
0406	22CA	1B	5A				BCFR,UN	NEXI	
0407	22CC					*			
0408	22CC	04	21			INSTS	LODI,R0	1	
0409	22CE	06	02				LODI,R2	2	
0410	22D0	3F	24	06			BSTA,UN	ADDANY	
0411	22D3	1C	20	04			CCM1,R0	1EST	
0412	22D6	1A	2A				BCFR,LT	INCP	
0413	22D8	3F	23	73			BSTA,UN	SIDA	
0414	22E1	04	1E				LODI,R0	FE	
0415	22ED	0C	0A	23			STRA,R0	DUMA+1	
0416	22F0	1B	19				BCFR,UN	ENDINS	
0417	22F2	D9	21			INCR	BRR,R1	RETCUN	
0418	22F4	04	21				LODI,R2	1	
0419	22F6	8C	2A	24			ADIA,R2	TMPA	
0420	22F9	1C	20	0C			CCM1,R0	ENDRAM	
0421	22FC	9A	24				BCFR,LT	STRIME	
0422	22FE	0C	2A	24			STRA,R0	TMPA	
0423	22F1	17				RETCUN	RETC,UN		
0424	22F2	24	21			STRIME	LODI,R2	1	
0425	22F4	25	22				LODI,R2	2	
0426	22F6	3F	23	75			BSTA,UN	SUBANY	
0427	22F9	05	FF				LODI,R1	FF	
0428	22FB	04	03			ENDINS	LODI,R0	ETX	
0429	22FD	01	EA	24			STRA,R1	*TMPA,I	
0430	22FE					*			
0431	22FE					*			
0432	22FE					*			
0433	2302	0C	2A	22		ENDI	LODA,R0	DUMA	
0434	2303	0C	2A	24			STRA,R0	TMPA	
0435	2305	0F	2A	03			LODA,R3	DUMA+1	
0436	2305	3F	21	1E			BSTA,UN	FINDND	
0437	230C	1F	23	7C			BSTA,UN	SDCA	
0438	230F	0D	2A	03			LODA,R1	DUMA+1	
0439	2312	20					BCFR,R0		
0440	2313	0C	0A	23			STRA,R0	DUMA+1	

FILE 'ALP' AS ASSEMBLED BY SYSTEM ON 11-23-78

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0441	2316	00	0A	05			STRA,R0	TMFA-1	
0442	2319	01	1A	02		DOWN	LODA,R1	*DUMA,I	
0443	231C	0F	1A	04			STFA,R3	*TMFA,I	
0444	231F	04	01				LODI,R2	1	
0445	2321	06	06				LODI,R2	6	
0446	2323	3F	23	E5			ESTA,UN	SUBANY	
0447	2326	06	05				BCTR,EQ	NOCK	
0448	2328	00	0A	07			LODA,R2	PSA1+1	
0449	232B	18	1E				BCTR,EQ	INSTDN	
0450	232D					*			
0451	232F	A5	01			NOCK	SUBI,R1	1	
0452	232F	E5	FF				COMI,R1	FF	
0453	2331	98	06				BCFF,EQ	NSIDA	
0454	2333	3F	23	73			ESTA,UN	SIDA	
0455	2336	10	02	03			COMA,R2	ESTAPT	
0456	2339	1A	10				BCTR,LT	INSTEN	
0457	233B	A7	01			NSIDA	SUBI,R3	01	
0458	233D	17	FF				COMI,R3	FF	
0459	233F	95	58				BCFR,EQ	DOWN	
0460	2341	20	0A	04			LODA,R0	TMFA	
0461	2344	A4	01				SUBI,R0	01	
0462	2346	00	0A	04			STRA,R0	TMFA	
0463	2349	1B	4E				BCTR,UN	DOWN	
0464	234B					*			
0465	234E	2F	23	09		INSTEN	ESTA,UN	IPADD	
0466	234F	3F	22	64			ESTA,UN	MTDA	
0467	2351	C1					STFA,R1		
0468	2352	20					BCFF,R2		
0469	2353	00	0A	03			STRA,R0	DUMA+1	
0470	2356	27	FF				LODI,R3	FF	
0471	2358	0F	AA	04		INSERT	LODA,R3	*TMFA,+	
0472	235B	E4	23				COMI,R2	ITK	
0473	235D	16	0F				BCTR,EQ	INSTE	
0474	235F	0D	EA	02			STFA,R1	*DUMA,I	
0475	2362	F7	FF				COMI,R3	FF	
0476	2364	30	23	CC			ESTA,EQ	ALTA	
0477	2367	D9	6F				BCFF,R1	INSERT	
0478	2369	3F	21	D9			ESTA,UN	AIDA	
0479	236C	1A	6A				BCFF,LT	INSERT	
0480	236E	2F	01			INSTE	LODI,R1	1	
0481	2370	1F	22	01			BCTA,UN	BACK	
0482	2373					*			
0483	2373	00	0A	02		SIDA	LODA,R2	DUMA	
0484	2376	A4	01				SUBI,R2	1	
0485	2378	00	0A	02			STRA,R2	DUMA	
0486	237F	17					BCFF,UN		
0487	237C								
0488	237C	00	0A	03		SDCA	LODA,R2	DUMA+1	
0489	237F	AC	0A	01			SUBA,R2	CURA+1	
0490	2382	00	0A	07			STFA,R2	PSA1+1	
0491	2385	77	08				PFSL	WC	
0492	2387	00	0A	02			LODA,R2	DUMA	
0493	238A	AC	0A	08			STFA,R2	CURA	
0494	238C	00	0A	06			STFA,R0	PSA1	
0495	2390	75	08				CPSL	WC	

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FILE 'ALP' AS ASSEMBLED BY SYSTEM ON 11-23-78

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0496	2397	04	01				LODI,R2	1	
0497	239A	06	06				LODI,R2	6	
0498	239B	1F	24	06			BCTA,UN	ADDANY	
0499	239E					*			
0500	2399	0C	00	04		IPADD	LODA,R0	IPST	
0501	239C	00	0A	04			STFA,R2	TMFA	
0502	239F	20					BCFF,R0		
0503	23A2	00	0A	05			STFA,R2	TMFA+1	
0504	23A3	17					BCFF,UN		
0505	23A4					*			
0506	23A4	3F	45	18		BACKN	ESTA,UN	BACK1	
0507	23A7	1F	22	A5			BCTA,LT	NEXI	
0508	23AA	04	01				LODI,R0	1	
0509	23AC	06	02				LODI,R2	2	
0510	23AF	3F	23	E5			ESTA,UN	SUBANY	
0511	23B1	1F	22	A6			BCTA,UN	NEXI	
0512	23B4					*			
0513	23B4					*			
0514	23B4	00				STORE	RES	1	
0515	23B5	08	7E			SUBANY	STRR,R2	STORY	
0516	23B7	0F	6A	01			LODA,R2	CURA+1,I	
0517	23BA	A6	78				SUBR,R2	STORE	
0518	23BC	03	6A	01			STFA,R2	CURA+1,I	
0519	23BF	77	08				PFSL	WC	
0520	23C1	0F	6A	02			LODA,R2	CURA,I	
0521	23C4	A4	02				SUBI,R0	0	
0522	23C8	0E	6A	08			STFA,R2	CURA,I	
0523	23C9	75	08				CPSL	WC	
0524	23CB	17					BCFF,UN		
0525	23CC					*			
0526	23CC	04	01			ALTA	LODI,R2	1	
0527	23CE	0C	0A	04			ADDA,R0	TMFA	
0528	23D1	00	0A	04			STFA,R2	TMFA	
0529	23D4	17					BCFF,UN		
0530	23D5					*			
0531	23D5	3F	21	A9		DELT	ESTA,UN	FWDI	
0532	23D8	3B	05				BCTR,UN	SHIF	
0533	23DA	02	01				LODI,R1	1	
0534	23DC	1F	22	01			BCTA,UN	BACK	
0535	23DE					*			
0536	23DE	2F	0A	02		SEIF	LODA,R3	CURA	
0537	23E2	3F	0A	04			STFA,R3	TMFA	
0538	23E5	2F	0A	01			LODA,R3	CURA+1	
0539	23E8	2D	0A	03			LODA,R1	DUMA+1	
0540	23F2	20					BCFF,R0		
0541	23F0	00	0A	05			STFA,R0	TMFA+1	
0542	23F7	0C	0A	03			STFA,R0	DUMA+1	
0543	23F2	0C	EA	02		UP	LODA,R1	*DUMA,I	
0544	23F5	0C	EA	24			STFA,R3	*TMFA,I	
0545	23F8	16					BCFF,LT		
0546	23F9	07	01				BCFF,R3	1	
0547	23FB	3C	23	CC			BCTA,F0	ALTA	
0548	23FE	59	72				BCFF,R1	UP	
0549	2402	3F	21	D9			BCTA,UN	AIDA	
0550	2403	1A	6E				BCTR,LT	UP	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0551	2405	17					RETC,UN		
0552	2406								
0553	2406	6F	6A	01		ADDANT	ADDA,R2	CURA+1,I	
0554	2409	CF	6A	21			STPA,R2	CURA+1,I	
0555	2400	77	02				PPSL	VC	
0556	240E	20					FORZ,R0		
0557	240F	81	6A	20			ADDA,R2	CURA,I	
0558	2412	01	6A	20			STPA,R2	CURA,I	
0559	2415	75	0E				CPSL	VC	
0560	2417	17					RETC,UN		
0561	2418								
0562	2418								
0563	2418	07	0F			NOTFON	LODI,R3	0F	
0564	241A	1F	45	01			ECTA,UN	ERROR	
0565	241D	07	0D			TMF	LODI,R3	0D	
0566	241F	17	45	01			ECTA,UN	ERROR	
0567	2422								
0568	2422	3F	24	38		TABO	BSTA,UN	TABSUB	
0569	2425	1C	22	A6			ECTA,IQ	NEXI	
0570	2426	04	20			TL3	LODI,R0		
0571	242A	0D	EA	24			STRA,R1	*TMPA,I	
0572	242D	3F	45	3D			BSTA,UN	VPT	
0573	2430	3F	22	0C			BSTA,UN	INSTS	
0574	2433	FE	73				EDRR,R3	TL3	
0575	2435	1F	22	A6			ECTA,UN	NEXI	
0576	2436								
0577	2438	07	FF			TABSUB	LODI,R3	FF	
0578	243A	00	0A	04			LODA,R0	TMPA	
0579	243E	00	0A	26			STRA,R0	PSA1	
0580	2440	00	0A	07			STRA,R1	PSA1+1	
0581	2443	07	01			TL1	ADDI,R3	1	
0582	2445	04	01				LODI,R0	1	
0583	2447	06	06				LODI,R2	6	
0584	2449	3F	23	B5			BSTA,UN	SUBANT	
0585	244C	EC	00	04			COMA,R0	IBST	
0586	244F	1A	07				ECTR,LT	CRFND	
0587	2451	00	6A	06			LODA,R3	*PSA1	
0588	2454	14	0D				COMI,R0	CR	
0589	2456	98	08				ECTR,IQ	TL1	
0590	2459	06	FF			CRFND	LODI,R2	FF	
0591	245A	0E	20	07		TL2	LODA,R2	TABS.+	
0592	245D	E6	03				COMI,R2	03	
0593	2461	14					ECTC,IQ		
0594	2463	23					COMZ,R3		
0595	2461	99	77				ECTR,GT	TL2	
0596	2463	A3					SUBZ,R3		
0597	2464	03					STRZ,R3		
0598	2465	17					RETC,UN		
0599	2466								
0600	2466	3F	22	64		S2	BSTA,UN	MTDA	
0601	2469	01					STRZ,R1		
0602	247A	20					FORZ,R0		
0603	247B	CC	0A	03			STPA,R0	DUMA+1	
0604	2481	CC	04	04			STRA,R0	SSTAT	
0605	2471	2C	0A	02			LODA,R2	DUMA	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0606	2474	CC	0A	04			STRA,R0	TMPA	
0607	2477	CD	0A	05			STRA,R1	TMPA+1	
0608	247A	06	FF			REDO	LODI,R2	FF	
0609	247C	0E	20	1F		S12	LODA,R2	NAME.-	
0610	247F	1B	33				ECTR,IQ	FOUND	
0611	2481	3F	47	8C			BSTA,UN	LTOU	
0612	2484	16	10				COMI,R2	10	
0613	2486	16	2C				ECTR,IQ	FOUND	
0614	2488	03					STRZ,R3		
0615	2489	0D	EA	02			LODA,R1	*DUMA,I	
0616	248C	1E	24	05			ECTA,LT	NF	
0617	248F	3F	47	8C			BSTA,UN	LTOU	
0618	2492	CC	00	2F			STRA,R0	TMPA	
0619	2495	D9	05				BIRR,R1	NOAD	
0620	2497	3F	21	D9			BSTA,UN	AIDA	
0621	249A	9A	29				ECTR,LT	NF	
0622	249C	0C	00	2E		NOAD	LODA,R0	TMPA	
0623	249F	13					COMZ,R3		
0624	24A3	1B	5A				ECTR,IQ	S12	
0625	24A2	04	01				LODI,R0	1	
0626	24A4	06	04				LODI,R2	4	
0627	24A6	3F	24	06			BSTA,UN	ADDANT	
0628	24A9	2C	0A	04			LODA,R0	TMPA	
0629	24AC	CC	0A	02			STRA,R0	DUMA	
0630	24AF	01	0A	05			LODA,R1	TMPA+1	
0631	24B2	1B	46				ECTR,UN	REDO	
0632	24B4	CD	0A	03		FOUND	STRA,R1	DUMA+1	
0633	24B7	CE	00	2F			STRA,R2	TEMP	
0634	24BA	02					LODI,R2	02	
0635	24BB	06	02				LODI,R2	02	
0636	24BD	3F	23	B5			BSTA,UN	SUBANT	
0637	24C0	01	02	2F			LODA,R2	TEMP	
0638	24C3	17					RETC,UN		
0639	24C4								
0640	24C4	00				SSTAT	RES	1	
0641	24C5	04	FF			NF	LODI,R0	FF	
0642	24C7	0B	7B				STRR,R0	SSTAT	
0643	24C9	3F	22	64			BSTA,UN	MTDA	
0644	24CC	17					ETC,UN		
0645	24CD								
0646	24CD	05	21			SEARCH	LODI,R1	01	
0647	24CF	3F	21	A9			BSTA,UN	FWIX	
0648	24D0	31	22	3F			BSTA,UN	PTCA	
0649	24D5	3F	24	66			BSTA,UN	S2	
0650	24D8	08	6A				ICDR,R0	SSTAT	
0651	24DA	1E	24	18			ECTA,LT	NOTFON	
0652	24DD	3F	22	3F			BSTA,UN	PTCA	
0653	24E0	45	00				LODI,R1	00	
0654	24E2	1F	22	21			BSTA,UN	EACE	
0655	24E5								
0656	24E5	3F	23	99		SAVI	BSTA,UN	IBACD	
0657	24E6	3F	21	A9			BSTA,UN	FWOI	
0658	24E8	3F	23	7C			BSTA,UN	SECA	
0659	24E1	3F	22	64			BSTA,UN	PTCA	
0660	24F1	01					STRZ,R1		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0661	2452	20					BCR2,R0		
0662	2453	00	CA	03			STRA,R0	DUMA+1	
0663	2456	03					STB2,R3		
0664	2477	2D	FA	02		SL	LODA,R1	*DUMA,I	
0665	24FA	CF	FA	04			STRA,R3	*TMPA,I	
0666	24FD	D9	C5				RIR,R1	CKR3	
0667	24FF	3F	21	D9			BSTA,UN	AIDA	
0668	2502	9A	1A				BCFR,LT	SL3	
0669	2504	D3	08			CER3	RIR,R3	SICK	
0670	2508	3F	23	CC			BSTA,UN	AITA	
0671	2509	FC	22	06			COMA,R2	ENDRAM	
0672	250C	1A	02				BCFR,LT	SICK	
0673	250E	04	01			SLCK	LODI,R0	1	
0674	2512	06	05				LODI,R2	6	
0675	2512	3F	23	B5			BSTA,UN	SUBANY	
0676	2515	98	60				BCFR,EC	SL	
0677	2517	2C	0A	07			LODA,R0	BSA1+1	
0678	251A	E4	01				COMI,R0	1	
0679	251C	98	59				BCFR,EC	SL	
0680	251E	E4	03			SL3	LODI,R0	ETX	
0681	2520	CF	FA	04			STRA,R3	*TMPA,I	
0682	2523	1F	20	4B			ECTA,UN	COMP	
0683	2526								
0684	2528	3F	21	A9		ISAVE	BSTA,UN	FWIX	
0685	2529	3F	22	3F			BSTA,UN	MTCA	
0686	252C	3F	21	EF			BSTA,UN	FINDND	
0687	252F	3F	23	99			BSTA,UN	IBADD	
0688	2532	01	00				LCII,R1	0	
0689	2534	04	03			ISL2	LCII,R0	ETX	
0690	2536	ED	FA	04		ISL	COMA,R1	*TMPA,I	
0691	2539	18	0D				BCFR,EC	IFOUND	
0692	253B	D9	79				RIR,R1	ISL	
0693	253D	3F	23	CC			BSTA,UN	AITA	
0694	2540	1C	00	06			COMA,R0	ENDRAM	
0695	2543	91	20	48			BCFA,LT	FSIN	
0696	2546	1B	6C				BCFR,UN	ISL2	
0697	2548	0C	0A	04		IFOUND	LODA,R0	TMFA	
0698	254F	AC	27	24			SUBA,R2	TEST	
0699	254E	8C	0A	02			AIDA,R0	DUMA	
0700	2551	CC	0A	22			STRA,R0	DUMA	
0701	2554	01					LODI,R1		
0702	2555	06	02				LODI,R2	22	
0703	2557	3F	24	06			BSTA,UN	ADDANY	
0704	255A	FC	00	04			COMA,R0	TEST	
0705	2551	91	24	1D			BCFA,LT	TME	
0706	2562	1F	23	02			ECTA,UN	ENCI	
0707	2563								
0708	2563	06	15			FMOD	LODI,R2	15	
0709	2561	05	0F				LODI,R1	0F	
0710	2567	3F	44	4C			BSTA,UN	SETCUR	
0711	256A	3F	45	45			BSTA,UN	CLTCR	
0712	256D	05	FF				LODI,R1	FF	
0713	256F	01	20	1E		NITNM	LODA,R1	NAME,+	
0714	2572	CD	77	EF			STRA,R1	MNAME,I	
0715	2575	1B	0F				COMI,R1	F	

FILE 'ALP' AS ASSEMBLED BY SYSTEM ON 11-23-78

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LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0716	2577	98	76				BCFR,R0	NITNM	
0717	2579	05	0F			WRTH	LODI,R1	0F	
0718	257E	3F	46	CA			BSTA,UN	FRING	
0719	257E	05	0D				LODI,R1	MBUF	
0720	2583	04	20				LODI,R0	MBUF	
0721	2582	06	10				LODI,R2	10	
0722	2584	3F	46	67			BSTA,UN	ARROW	
0723	2587	1F	20	4B			ECTA,UN	COMP	
0724	258A								
0725	258A	00				MTEMP	RES	1	
0726	258B	01				MODIFY	LODI,R1		
0727	258C	1C	22	4E			BCFR,EC	COND	
0728	258F	A5	01				SUBI,R1	1	
0729	2591	3F	21	A9			BSTA,UN	FWIX	
0730	2594	3F	22	3F			BSTA,UN	MTCA	
0731	2597	05	FF				LODI,R1	FF	
0732	2599	05	10				LODI,R2	10	
0733	259B	0D	37	EF		XFER	LODA,R1	MNAME,+	
0734	259E	CD	60	1E			STRA,R1	NAME,I	
0735	25A1	FA	70				RIR,R2	XFER	
0736	25A3	01	01				LODI,R1	1	
0737	25A5	3F	21	A9			BSTA,UN	FWIX	
0738	25A8	0C	8A	02			LODA,R0	*DUMA	
0739	25AB	C8	5D				STRA,R0	MTEMP	
0740	25AD	04	83				LODI,R0	IBC	
0741	25AF	CC	8A	02			STRA,R0	*DUMA	
0742	25B2	3F	24	66			BSTA,UN	S2	
0743	25B4	CF	00	2E			STRA,R2	TMPS	
0744	25B8	3F	22	3F			BSTA,UN	MTCA	
0745	25BB	05	01				LODI,R1	1	
0746	25BD	3F	21	A9			BSTA,UN	FWIX	
0747	25C0	08	48				LODI,R0	MTEMP	
0748	25C2	CC	8A	02			STRA,R0	*DUMA	
0749	25C5	0C	04	C4			LODA,R2	SSTAT	
0750	25C8	1E	24	18			BCFR,LT	NOTFCN	
0751	25CB	3F	22	64			BSTA,UN	MTCA	
0752	25CF	0C	00	2E			LODA,R0	TMPS	
0753	25D1	06	02				LODI,R2	2	
0754	25D3	3F	24	06			BSTA,UN	ADDANY	
0755	25D8	3F	23	DF			BSTA,UN	SHIF	
0756	25D9	3F	23	99			BSTA,UN	IBADD	
0757	25E0	24	FF				LODI,R1	FF	
0758	25E1	05	22	0E		HL1	LODI,R1	MBUF,+	
0759	25E1	16	09				BCFR,EC	ENDM	
0760	25E3	CD	FA	04			STRA,R1	*TMPA,I	
0761	25E6	1F	2F				COMI,R1	0F	
0762	25EB	98	74				BCFR,EC	HL1	
0763	25EA	05	10				LODI,R1	10	
0764	25EC	04	23			ENDM	LODI,R0	ETX	
0765	25EE	CC	1A	04			STRA,R1	*TMPA,I	
0766	25F1	CD	00	2E			STRA,R1	TMPS	
0767	25F4	3F	21	EE			BSTA,UN	FINDND	
0768	25F7	2C	02	2E			LODA,R0	TMPS	
0769	25FA	06	22				LODI,R2	2	
0770	25FC	3F	24	06			BSTA,UN	ADDANY	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0771	262F	ED	00	24			COMA,R0	IBST	
0772	2622	5E	24	1D			BCFA,LT	TMI	
0773	2625	1F	23	00			BCTA,UN	INDI	
0774	2628								
0775	2626	14	0D				CKCTRL COM1,R0	CR	
0776	262A	98	05				BCFR,EQ	CKLP12	
0777	262C	75	80				CPSL	62	
0778	262E	77	43				PPSL	42	
0779	2610	17					RETC,UN		
0780	2611	24	FF				CKLP12 EORI,R0	FF	
0781	2613	77	10				PPSL	RS	
0782	2615	C1					STFZ,R1		
0783	2616	24	FF				EORI,R0	FF	
0784	2618	FE	E0				TMI,R1	E0	
0785	261A	98	05				BCFR,EQ	NOCTCK	
0786	261C	77	80				PPSL	62	
0787	261E	75	80				CPSL	52	
0788	2620	17					RETC,UN		
0789	2621	75	D0				NOCTCK CPSL	E0	
0790	2623	17					RETC,UN		
0791	2624								
0792	2624	01					CHANGE 102Z,R1		
0793	2625	1C	20	4E			BCTA,EQ	COMD	
0794	2626	3F	23	99			BSTA,UN	IBADD	TMPA=IBST
0795	262F	A5	01				SUBI,R1	1	
0796	262D	3F	21	A9			BSTA,UN	FWDI	
0797	2630	3F	22	3F			BSTA,UN	MTCA	CURA=ADDRESS OF BYTE TO CHANGE
0798	2633	3F	21	92			BSTA,UN	ERASE	
0799	2636	3F	21	1E			BSTA,UN	FINDND	DUMA=END OF BUFFER
0800	2639	0C	0A	40			LODA,R2	CURA	CHGA=ADDRESS OF BYTE TO CHANGE
0801	263C	0C	0A	44			STRA,R0	CHGA	
0802	263F	0C	0A	41			LODA,R0	CURA+1	
0803	2642	0C	0A	49			STRA,R0	CHGA+1	
0804	2645	05	00				LODI,R1	02	
0805	2647	3F	45	C9			BSTA,UN	LPCR	
0806	264A	0C	01	3E			LODA,R0	*CURIT	
0807	264D	34	0F				TMI,R0	Y	
0808	264F	3C	21	52			BSTA,EQ	ERASE	
0809	2652	0E	0A	08			LODA,R2	CHGA	
0810	2655	0E	0A	0E			STRA,R2	BSA1	
0811	2658	0F	0A	09			LODA,R3	CHGA+1	
0812	265B	0C	0A	08			LODA,R0	*CHGA	
0813	265E	11	27	D8			BCTA,LT	ENDCHG	EOF
0814	2661	14	0D				COM1,R0	CP	
0815	2663	18	12				BCFR,EQ	ELFND	
0816	2665	3F	45	BD			BSTA,UN	WRT	
0817	2668	24	01				LODI,R2	1	BUMP CHGA
0818	266A	26	00				LODI,R2	R	
0819	266C	3F	24	26			BSTA,UN	ADDANY	
0820	266F	1C	00	04			COMA,R0	IBST	
0821	2672	1A	07				BCTA,LT	DISPLP	
0822	2674	1F	27	D6			BCTA,UN	ENDCHG	
0823	2677	0F	0A	09			STRA,R3	CHGA+1	
0824	267A	0C	0A	06			LODA,R0	BSA1	
0825	267D	0C	0A	08			STRA,R0	CHGA	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0826	2682	3F	45	C9			BSTA,UN	LPCR	
0827	2683	3F	47	03			BSTA,UN	OTKE	
0828	2686	14	09				COM1,R0	53	
0829	2689	98	05				BCFR,EQ	NOCPPS	
0830	268A	3F	27	E0			BSTA,UN	CHRAV	
0831	268D	1B	74				BCTR,UN	CHGL	
0832	268F	14	09				COM1,R0	ET	TAB
0833	2691	08	15				BCFR,EQ	NCBT	
0834	2693	3F	24	38			BSTA,UN	TABSUB	
0835	2696	18	6B				BCTR,EQ	CHGL	
0836	2698	0F	0A	26			STRA,R3	BSA1	
0837	269B	07	22				LODI,R3		
0838	269D	3F	27	A0			BSTA,UN	STRTHS	
0839	26A0	0F	0A	26			LODA,R3	BSA1	
0840	26A3	FE	73				BDRR,R3	TABLS	
0841	26A5	1F	26	63			BCTA,UN	CHGL	
0842	26A8	14	15				COM1,R0	CTRLU	
0843	26AA	98	0A				BCFR,EQ	NOCOPY	
0844	26AD	3F	27	89			BSTA,UN	LOADD	
0845	26AF	18	52				BCTR,EQ	CHGL	
0846	26B1	3F	27	A0			BSTA,UN	STRTHS	
0847	26B4	1F	4D				BCTR,UN	CHGL	
0848	26B6	14	19				COM1,R0	CTRLU	
0849	26B8	98	26				BCFR,EQ	NOCWD	
0850	26BA	3F	27	89			BSTA,UN	LOADD	
0851	26BD	18	44				BCTR,EQ	CHGL	
0852	26BF	E7	20				COM1,R3		
0853	26C1	98	18				BCFR,EQ	CWD3	
0854	26C3	3F	27	A0			BSTA,UN	STRTHS	
0855	26C6	1B	72				BCTR,UN	CWD1	
0856	26C8	0F	0A	28			LODA,R3	*CHGA	
0857	26CB	E7	20				COM1,R3		
0858	26CD	1C	26	83			BCTA,EQ	CHGL	
0859	26D0	E7	20				COM1,R3		
0860	26D2	1C	26	83			BCTA,EQ	CHGL	
0861	26D5	3F	27	89			BSTA,UN	LOADD	
0862	26D8	1C	26	83			BCTA,EQ	CHGL	
0863	26DB	3F	27	A0			BSTA,UN	STRTHS	
0864	26DE	1B	68				BCTR,UN	CWD2	
0865	26E0	14	02				COM1,R0	CTRLU	
0866	26E2	98	35				BCFR,EQ	NCFWD	
0867	26E4	0D	0A	0B			STRA,R1	CHGST+1	
0868	26E7	0C	0A	24			LODA,R0	TMPA	
0869	26EA	0C	0A	0A			STRA,R0	CHGST	
0870	26ED	06	0A				LODI,R2	A	
0871	26EF	04	01				LODI,R0	1	
0872	26F1	3F	23	B5			BSTA,UN	SUBANT	
0873	26F4	0C	0A	0A			LODA,R0	*CHGST	
0874	26F7	14	20				COM1,R0		
0875	26F9	98	19				BCFR,EQ	FWD3	
0876	26FE	3F	27	E0			BSTA,UN	CHBACK	
0877	26F1	1F	6D				BCTR,UN	IRWD1	
0878	2702	06	0A				LODI,R2	A	
0879	2702	04	01				LODI,R0	1	
0880	2704	3F	23	B5			BSTA,UN	SUBANT	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0881	2727	0C	8A	2A		LODA,R0	*CHQST		
0882	2728	14	22			COMI,R0			
0883	272C	1C	2E	83		ECTA,E0	CHGL		
0884	273F	14	2C			COMI,R0			
0885	2711	1C	26	83		ECTA,E0	CHGL		
0886	2714	2F	27	10	EPWDS	ESTA,UN	CHBACK		
0887	2717	1F	67			ECTR,UN	EPW22		
0888	2719	14	10		NOERWD	COMI,R0	CTRLP		COPY TO END OF LINE
0889	271E	9E	23			ECTR,E0	NOCEOL		
0890	271D	2F	27	89	CCPYLP	ESTA,UN	LOAD		
0891	2720	1C	26	83		ECTA,E0	CHGL		
0892	2723	3F	27	A0		ESTA,UN	STRMS		
0893	2716	1B	75			ECTR,UN	CCPYLP		
0894	2728	14	2F		NOCEOL	COMI,R0	CTPLD		
0895	272A	9E	85			ECTR,E0	NOBISC		
0896	272C	3F	27	89		ESTA,UN	LCADD		
0897	272F	1F	2E	83		ECTA,UN	CHGL		
0898	2732	03			MODISC	STRZ,R3			
0899	2735	14	23			COMI,R0	ETX		
0900	2738	1F	2E			ECTR,E0	BYPASS		
0901	2737	3F	2E	88		ECTA,UN	CHCTRL		
0902	273A	1F	2E	83		ECTA,LT	CHOL		
0903	273D	3F	27	A4	BYPASS	ESTA,UN	STRZ2		
0904	2747	02				LODZ,R3			
0905	2741	14	01			COMI,R0	CR		
0906	2743	1B	0F			ECTR,E0	ENDCHL		
0907	2745	14	23			COMI,R0	ETX		
0908	2747	9C	2E	83		ECTA,E0	CHGL		
0909	274A	24	21			LOCI,R0	1		
0910	274C	0E	02			LOLI,R2	2		
0911	274E	3F	2E	25		ESTA,UN	SUBANY		GET RID OF ETX BEING IN PICTURE
0912	2751	1F	27	FF		ECTA,UN	ENDCH		
0913	2754	3F	27	69	ENDCHL	ESTA,UN	LOAD		
0914	2757	9E	75			ECTR,E0	ENDCHL		
0915	2759	3F	27	87		ESTA,UN	AISC		
0916	275C	1F	2E	47		ECTA,UN	DISPL		
0917	275F				*				
0918	275F	0C	2A	02	INDCH	LODA,R0	DUMA		
0919	2762	0C	2A	0E		STRA,R0	BSA1		
0920	2765	0C	2A	03		LODA,R0	DUMA+1		
0921	2768	0C	2A	07		STRA,R0	BSA1+1		
0922	276E	0C	2A	08		LODA,R0	CRGA		
0923	2761	0C	2A	02		STRA,R0	DUMA		
0924	2771	0C	2A	09		LODA,R0	CRGA+1		
0925	2774	0C	2A	23		STRA,R0	DUMA+1		
0926	2777	3F	23	DF		ESTA,UN	SHIF		
0927	277A	0C	2A	06		LODA,R0	BSA1		
0928	277D	0C	2A	02		STRA,R0	DUMA		
0929	2780	0C	2A	07		LODA,R0	BSA1+1		
0930	2783	0C	2A	03		STRA,R0	DUMA+1		
0931	2785	1F	23	02		ECTA,UN	ENDI		
0932	2789				*				
0933	2789	2F	8A	28	LOAD	LOIA,R3	*CHGA		
0934	278C	1F	02			COMI,R3	CR		
0935	278E	14				RETC,EQ			

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
0936	278F	24	01		AISC	LOLI,R0	1		DECR DUMA
0937	2791	0E	02			LOLI,R2	2		
0938	2793	3F	23	B5		ESTA,UN	SUBANY		
0939	2796	04	01			LOLI,R0	1		BUMP CRGA
0940	2798	0E	08			LOLI,R2	8		
0941	279A	3F	24	06		ESTA,UN	ADDANY		
0942	279D	04	08			LOLI,R0	88		
0943	279F	17				RETC,UN			
0944	27A0				*				
0945	27A2	03			STRZ,R3	LODZ,R3			
0946	27A1	3F	45	8D		ESTA,UN	WRT		
0947	27A4	03			STRZ2	LODZ,R3			
0948	27A5	0D	EA	04		STRA,R1	*TMPA.I		
0949	27A8	04	01			LOLI,R0	1		BUMP DUMA
0950	27AA	0E	02			LOLI,R2	2		
0951	27AC	3F	24	26		ESTA,UN	ADDANY		
0952	27AF	1C	02	04		COMA,R0	IBST		
0953	27B2	14	02			ECTR,LT	AIR1		
0954	27B4	3F	23	73		ESTA,UN	SITA		
0955	27B7	04	FE			LOLI,R0	FE		
0956	27B9	0C	2A	03		STRA,R0	DUMA+1		
0957	27BC	1F	27	28		ECTA,UN	ENICCH		
0958	27BF	19	01		AIR1	RETC,R1	RETCN		
0959	27C1	04	21			LOLI,R0	1		
0960	27C3	0C	2A	04		ABCA,R0	TMPA		
0961	27C5	1C	28	06		COMA,R0	ENIHAM		
0962	27C9	0A	04			ECTR,LT	ABRUPT		
0963	27CB	0C	2A	04		STRA,R0	TMPA		
0964	27CE	17			RETCN	RETC,UN			
0965	27CF	04	01		ABRUPT	LOLI,R0	1		
0966	27D1	0E	02			LOLI,R2	2		
0967	27D3	3F	23	B5		ESTA,UN	SUBANY		
0968	27D6	0E	FF			LOLI,R1	FF		
0969	27D8	34	03		ENDCHG	LOLI,R0	ETX		
0970	27DA	0D	EA	04		STRA,R1	*TMPA.I		
0971	27DE	1F	27	FF		ECTA,UN	ENICCH		
0972	27E0				*				
0973	27E2	3F	45	18	CHBACK	ESTA,UN	BACK1		
0974	27E3	16				RETC,LT			
0975	27E4	04	01			LOLI,R0	1		
0976	27E6	3E	02			LOLI,R2	2		
0977	27E8	3F	23	B5		ESTA,UN	SUBANY		
0978	27E1	17				RETC,UN			
0979	27EC				*				
0980	27EC	20	20	02	LOADS	RES	3		
0981	27EF				*				
0982	27F1	3F	2E	CA	LCADL	ESTA,UN	ACK		
0983	27F2	3F	2E	6F		ESTA,UN	LCADA		
0984	27F5	9C	27	1B		ECTA,E0	SCERR		
0985	27F8	1F	20	46		ECTA,UN	VBEN		
0986	27F9				*				
0987	27FB	07	13		SCERR	LOLI,R3	13		
0988	27FD	1F	45	01		ECTA,UN	ERROR		
0989	2802				*				
0990	2802	3F	2E	CA	TAPEC	ESTA,UN	ACK		STORE TO TAPE

[illegible]

LINE	ADDER	B1	B2	B3	B4	LAPEL	OPCODE	OPERAND	COMMENTS
1246	2E9D	44	41	52	45				
1247	2E91	41	52	42	42				
1248	2E95	44	54						
1249	2E97	4F	41	4F	4F	OPCD2	ALIT	'0000TTTDDDDUUUUUANNNGO000000000RCCCCRRRIIDDF'	
1250	2E9E	54	54	54	44				
1251	2E9F	44	44	44	55				
1252	2B53	55	55	55	41				
1253	2B57	4F	4F	4F	4E				
1254	2B5B	4F	4F	4F	4F				
1255	2B5F	4F	4F	4F	4F				
1256	2B63	4F	4F	4F	4F				
1257	2B07	52	52	43	43				
1258	2F02	43	43	52	52				
1259	2B0F	49	49	44	44				
1260	2B53	42							
1261	2B14	50	53	53	53		ALIT	'XSSSSSSSEERFRERERACMPPPPPPPPPROACENLRUIA'	
1262	2B18	53	53	53	42				
1263	2BDC	53	45	45	52				
1264	2B10	45	52	45	52				
1265	2B14	45	41	4F	4D				
1266	2F18	50	50	50	50				
1267	2F1C	50	50	50	50				
1268	2F22	50	50	52	51				
1269	2BFA	41	43	45	4E				
1270	2B19	4C	52	4C	55				
1271	2BFC	46	41						
1272	2BFE	44	44	44	44	OPCD3	ALIT	'DDDDRRRDEDDDEEERDDDDRRRRRRRRMMMLTIFFNNERRRR'	
1273	2C02	52	52	52	44				
1274	2C06	44	44	44	42				
1275	2C0A	42	42	42	52				
1276	2C1F	44	44	44	44				
1277	2C12	52	52	52	52				
1278	2C16	52	52	52	52				
1279	2C1A	41	4C	41	4C				
1280	2C15	52	4C	54	54				
1281	2C22	46	46	4E	4E				
1282	2C26	52	52	52	52				
1283	2C2A	52							
1284	2C75	41	54	54	46		ALIT	'ATTTFNNSKTTTDTTLPISSSSSSSSSSSUTOSDINKMSP'	
1285	2C2F	4E	4E	4E	53				
1286	2C33	54	54	54	54				
1287	2C37	44	54	44	54				
1288	2C3B	44	4C	50	45				
1289	2C3F	53	53	53	53				
1290	2C43	53	53	53	53				
1291	2C47	53	53	47	55				
1292	2C4B	54	47	53	44				
1293	2C4F	49	4E	4E	4D				
1294	2C53	53	50						
1295	2C5F	5A	49	52	41	OPCD4	ALIT	'ZIRAZBAZIRAZIRA ZIRAZIRAZIPAZIRA BAEABABABAR'	
1296	2C59	5A	52	41	5A				
1297	2C5D	49	52	41	5A				
1298	2C61	45	52	41	52				
1299	2C65	5A	49	52	41				
1300	2C69	5A	49	52	41				

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1101	296E	5A	49	52	41				
1102	2971	5A	49	52	41				
1103	2975	20	20	20	20				
1104	2979	52	41	52	41				
1105	298D	52	41	52	41				
1106	2991	52							
1107	2992	20	52	41	52	ALIT		'RARARARACEDDCCEET ULULULULUL AN TTSPPE'	
1108	2996	41	52	41	52				
1109	299A	41	43	41	44				
1110	299F	44	43	43	45				
1111	29A2	45	54	20	22				
1112	29A6	55	40	55	40				
1113	29FA	55	40	55	40				
1114	29FA	55	40	20	20				
1115	29A2	41	41	20	20				
1116	29A6	54	54	53	50				
1117	29AA	52	41						
1118	29AC	00	24	00	00	OPCD5	DATA	00,04,08,0C,00,08,CC,80,84,88,8C,A0,A4,AB,AC	
1119	29B2	00	00	00	00				
1120	2914	64	88	60	A0				
1121	29B6	A4	AB	AC					
1122	29B8	94	40	44	40	DATA		94,40,44,48,4C,60,64,68,6C,70,74,78,7C,E0,E4	
1123	29B1	40	60	64	68				
1124	29C3	6C	20	24	28				
1125	29C7	2C	E0	F4					
1126	29CA	E0	10	50	D0	DATA		E0,EC,50,D0,18,1C,98,9C,58,5C,D8,DC,F8,FC,9E	
1127	29D1	10	10	50	9C				
1128	29D2	50	50	D0	DC				
1129	29D3	76	FC	9B					
1130	29D6	9F	30	30	B8	DATA		9F,3B,3C,B8,BC,78,7C,BB,BF,14,34,F0,72,20,30	
1131	29DD	EC	78	7C	BB				
1132	2911	EF	14	34	F0				
1133	2915	70	50	30					
1134	291B	D4	54	40	C0	DATA		D4,54,40,C0,F4,92,93,12,13,74,75,76,77,F4,B5	
1135	291C	F4	92	93	12				
1136	291E	13	74	75	76				
1137	2914	77	B4	B5					
1138	2917					*			
1139	2917					*			
1140	2917	00				PASS	RES	1	
1141	2918	00	00			LTBL	RES	2	
1142	291A	00				OUTOFF	RES	1	
1143	291B	00				DISPON	RES	1	
1144	291C	00				BPFC	RES	1	
1145	291D	00				COMAST	RES	1	
1146	291E	00				BETP	RES	1	
1147	291F	00				SPTR	RES	1	
1148	2A00	00	00			CURA	RES	2	
1149	2A02	00				DUMA	RES	1	
1150	2A03	00				DUM2	RES	1	
1151	2A04	00				TMFA	RES	1	
1152	2A05	00				TEMP2	RES	1	
1153	2A06	00	00			BSA1	RES	2	
1154	2A08	00	00			CBGA	RES	2	
1155	2A0A	00	00			CEGST	RES	2	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1156	2A0C	00	00			PAGE	RES	2	
1157	2A0E	00				BUMPON	RES	1	
1158	2A0F	00				DISPIN	RES	1	
1159	2A10	00				BLESIN	RES	1	
1160	2A11	00				TAPEON	RES	1	
1161	2A12	00	00			SECH	RES	2	
1162	2A14	00	00			CEPTR	RES	2	
1163	2A16	00	00			LINE	RES	2	
1164	2A18	00	00	00	00	TITRUF	RES	51	
1165	2A1C	00	00	00	00				
1166	2A20	00	00	00	00				
1167	2A24	00	00	00	00				
1168	2A28	00	00	00	00				
1169	2A2C	00	00	00	00				
1170	2A30	00	00	00	00				
1171	2A34	00	00	00	00				
1172	2A38	00	00	00	00				
1173	2A3C	00	00	00	00				
1174	2A42	00	00	00	00				
1175	2A44	00	00	00	00				
1176	2A48	00	00	00	00				
1177	2A4C	00	00	00	00				
1178	2A50	00	00	00	00				
1179	2A54	00	00	00	00				
1180	2A58	00	00	00	00				
1181	2A5C	00	00	00	00				
1182	2A60	00	00	00	00				
1183	2A64	00	00	00	00				
1184	2A68	00							
1185	2A69					BYTSTG	RES	100	
1186	2B69					OROP	ECU	40	
1187	2B69					ICUP	ECU	40	
1188	2B69					DATAP	ECU	40	
1189	2B69					ACONP	ECU	40	
1190	2B69					RESP	ECU	40	
1191	2B69					FNIP	ECU	50	
1192	2B69					ALITP	ECU	51	
1193	2B69					PRATP	ECU	52	
1194	2B69					FIKSP	ECU	53	
1195	2B69					BUMPP	ECU	54	
1196	2B69					DISPP	ECU	55	
1197	2B69					TAPEP	ECU	56	
1198	2B69					TOPCCM	ECU	56	
1199	2B69					*			
1200	2B69					*			
1201	2F59	3F	21	92		ASM	ISTA,UN	ERASE	
1202	2B6C	20				PASS1	IC02,F0		
1203	2B6D	00	00	F7		STRA,R0	PASS		
1204	2B70	00	00	7C		STRA,R0	BLESIN		
1205	2B73	00	10	80		STRA,R0	PC		
1206	2B75	00	10	81		STRA,R0	PC+1		
1207	2B78	00	00	F9		STRA,R0	LTBL+1		
1208	2B7C	00	0A	62		STRA,R0	TITRUF+50		
1209	2B7F	00	0F	14		STRA,R0	ERRS		
1210	2B82	3F	22	59		BSTA,UN	BEGIN		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1211	2B85	0C	08	04			LODA,R0	1B5T	
1212	2B88	0C	09	F8			STRA,R0	LTBL	
1213	2B8B	04	FF				LOCI,R0	FF	
1214	2B8D	0C	0A	0E			STRA,R0	BUMFON	
1215	2B92	0C	09	FF			STRA,R0	SPTR	
1216	2B93	0C	09	FF			STRA,R0	SPTR	
1217	2B98	0C	0E	07			STRA,R0	SPTR	
1218	2B99	0C	09	F8			STRA,R0	*LTBL	
1219	2B9C	05	11				LODI,R1	11	
1220	2B9F	3F	46	C7			BSTA,UN	PSTRNG	
1221	2BA1	3F	22	59			BSTA,UN	FECH	
1222	2BA4	3F	22	21		LOOP	BSTA,UN	NEXT	
1223	2BA7	2C	0A	18			LODA,R0	TITBUF	
1224	2BAA	E4	2A				COMI,R0		
1225	2BAC	18	7C				BCTR,EQ	LOCP	
1226	2BAE	3F	2E	15			BSTA,UN	FIND	
1227	2BB1	E5	56				COMI,R1	TOPCOM	
1228	2BB3	19	6F				BCTR,GT	LOCP	
1229	2BB5	E5	50				COMI,R1	ENIP	
1230	2BB7	1C	30	73			BSTA,EQ	PASS2	
1231	2BBA	E5	4B				COMI,R1	ORGP	
1232	2BBE	3C	2D	0F			BSTA,EQ	ORG	
1233	2BBF	0C	0A	18			LODA,R0	TITBUF	
1234	2BC2	E4	20				COMI,R0		
1235	2BC4	1C	2C	0E			BCTR,EQ	NOLB	
1236	2BC7	04	FF				LODI,R0	FF	
1237	2BC9	0C	0F	F4			STRA,R0	TMPS2	
1238	2BCD	04	06				LODI,R0	06	
1239	2BCF	0C	0F	F3			STRA,R0	RZPCS	
1240	2BD1	3F	32	16			BSTA,UN	TBL2	
1241	2BD4	3C	2C	A4			BSTA,EQ	FRMT	
1242	2BD7	07	FF				LODI,R3	FF	
1243	2BDB	0E	05	FF			LODI,R2	SPTR	
1244	2BDE	05	06				LODI,R1	06	
1245	2BDE	27	2A	18		NITL	LODA,R3	TITBUF,+	
1246	2BE1	0E	A9	F8			STRA,R2	*LTBL,+	
1247	2BE4	F9	78				STRA,R1	NITL	
1248	2BE6	0C	19	8E			SCDA,R0	FC	
1249	2BE9	0E	A9	F8			STRA,R2	*LTBL,+	
1250	2BEC	0C	19	E1			LODA,R0	PC+1	
1251	2BEF	0E	A9	F8			STRA,R2	*LTBL,+	
1252	2BF2	A6	FF				COMI,R2	FF	
1253	2BF4	08	12				BCTR,EQ	ENDLB	
1254	2BF6	3F	2C	58			BSTA,UN	ALIT	
1255	2BF8	1A	0B				BCTR,LT	ENDLB	
1256	2BF9	05	13				LODI,R1	13	
1257	2BF9	3F	46	C7			BSTA,UN	PSTRNG	
1258	2C02	3F	46	F7			BSTA,UN	PAUSE	
1259	2C03	1F	20	30			BCTR,UN	EDITOR	
1260	2C06	0E	09	FF		ENDLB	STRA,R2	SPTR	
1261	2C08	04	FF				LODI,R0	FF	
1262	2C0B	0E	A9	F8			STRA,R2	*LTBL,+	
1263	2C0E	0D	0E	14		NOLB	LODA,R1	OPPOS	
1264	2C11	0C	0E	13			LODA,R0	OPCODE	SETUP FOR ADDEPC ROUTINE
1265	2C14	E5	4B				COMI,R1	ORGP	

FILE 'ALP' AS ASSEMBLED BY SYSTEM ON 11-23-78

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LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1266	2C16	1F	2C	0E			BCTR,LT	ADPPC	
1267	2C19	E5	4C				COMI,R1	ICUP	
1268	2C1B	08	28				BCTR,EQ	EQU1	
1269	2C1D	3F	2F	15			BSTA,UN	GETADD	
1270	2C20	0E	09	FF			LODA,R2	SPTR	
1271	2C23	16	FF				COMI,R2	FF	
1272	2C25	08	09				BCTR,EQ	NOTZ	
1273	2C27	0C	09	F8			LODA,R0	LTBL	
1274	2C2A	A4	01				SUBI,R0	1	
1275	2C2D	0C	09	F8			STRA,R0	LTBL	
1276	2C2F	A6	22			NOTZ	SUBI,R2	2	
1277	2C31	0C	10	14			LODA,R0	OPER2	
1278	2C34	0E	A9	F8			STRA,R2	*LTBL,+	
1279	2C37	0C	10	15			LODA,R0	OPER3	
1280	2C3A	0E	A9	F8			STRA,R2	*LTBL,+	
1281	2C3D	F8	FF				COMI,R2	FF	
1282	2C3F	3C	2C	98		ALBACK	BSTA,EQ	ALIT	
1283	2C42	1F	2B	A4			BCTR,UN	LOOP	
1284	2C45	E5	4D			EQU1	COMI,R1	DATAF	
1285	2C47	08	07				BCTR,EQ	DATA1	
1286	2C49	3F	2C	B6			BSTA,UN	FINDCM	
1287	2C4C	03					LODI,R3		
1288	2C4E	1F	2C	91			BCTR,UN	EASY	
1289	2C50	E5	47			DATA1	COMI,R1	RESP	
1290	2C52	08	13				BCTR,EQ	RES1	
1291	2C54	3F	2F	15			BSTA,UN	GETADD	
1292	2C57	0C	10	14			LODA,R0	OPER2	
1293	2C5A	0C	19	80			ADDA,R0	PC	
1294	2C5E	44	7F				ANDI,R0	7F	
1295	2C61	0C	19	80			STRA,R0	PC	
1296	2C62	0C	13	15			LODA,R0	OPER3	
1297	2C65	1B	2A				BCTR,UN	EASY	
1298	2C67	1F	4E			RES1	COMI,R1	ACONP	
1299	2C69	08	07				BCTR,EQ	ACON1	
1300	2C6B	3F	2C	B6			BSTA,UN	FINDCM	
1301	2C6E	E2					LODI,R3		
1302	2C6F	E9					LODI,R0		
1303	2C72	E5	51				BCTR,UN	EASY	
1304	2C74	0C	2B	A4		ACON1	COMI,R1	ALITP	
1305	2C77	0E	11				BCTR,EQ	LOCP	
1306	2C79	0D	2A	18			LODI,R1	11	
1307	2C7B	0C	0C	97			STRA,R0	TITBUF,+	
1308	2C7D	0C	0C	97		NCALE1	LODA,R1	TITBUF,+	
1309	2C7F	0E	2A	18			BCTR,EQ	ALFND1	
1310	2C82	E5	05				COMI,R0	ALDEL	
1311	2C84	0C	0C	97			BCTR,EQ	NCALE1	
1312	2C87	08	76				BCTR,EQ	NCALE1	
1313	2C8B	A5	13			ALFND1	SUBI,R1	13	
1314	2C8B	01					LODI,R1		
1315	2C8C	1F	23				BCTR,UN	EASY	
1316	2C8E	3F	2C	DA		ADDEPC	BSTA,UN	ADLM	
1317	2C91	3F	2C	F5		EASY	BSTA,UN	APC	
1318	2C94	1F	2B	A4			BCTR,UN	LOOP	
1319	2C97					*			
1320	2C97					*			

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1321	2C97					*			
1322	2C97					*AIDEL	RES	1	
1323	2C97	02							
1324	2C98					*			
1325	2C98	04	01			ALIT	LODI,R2	1	
1326	2C9A	0C	09	F8			ADDA,R2	LTBL	
1327	2C9E	0C	09	F8			STRA,R2	LTBL	
1328	2CA2	0C	00	05			COMA,R2	OBST	
1329	2CA3	17					RETC,UN		
1330	2CA4					*			
1331	2CA4	05	15			ERRMT	LODI,R1	15	
1332	2CA6	7F	45	C7			BSTA,UN	PSTRNG	
1333	2CA9	05	7F				LODI,R1	FF	
1334	2CAE	06	06				LODI,R2	6	
1335	2CAD	0D	2A	18		ERRMT2	LODA,R1	TITBUF,+	
1336	2CB2	3F	45	8D			BSTA,UN	WRT	
1337	2CB3	FA	78				BIRR,R2	ERRMT2	
1338	2CB5	17					RETC,UN		
1339	2CB6					*			
1340	2CB6	07	01			FINDCM	LODI,R3	1	
1341	2CB8	05	12				LODI,R1	12	
1342	2CBA	0D	2A	18		DAT1A	LODA,R1	TITBUF,+	
1343	2CBD	14					RETC,EC		
1344	2CBE	F4	20				COMI,R2		
1345	2CC0	14					RETC,EC		
1346	2CC1	F4	20				COMI,R2		
1347	2CC3	98	75				BCFR,EQ	DAT1A	
1348	2CC5	07	01				ADDI,R3	1	
1349	2CC7	1B	71				BCTR,UN	DAT1A	
1350	2CC9					*			
1351	2CC9	05	13			OFFON	LODI,R1	13	
1352	2CCF	0D	6A	18			LODA,R1	TITBUF,1	
1353	2CCF	3F	47	8C			BSTA,UN	LTCU	
1354	2CD1	F4	46				COMI,R2	'F'	
1355	2CD3	18	22				BCTR,EQ	OFFF	
1356	2CD5	20					FORZ,R2		
1357	2CD6	17					RETC,UN		
1358	2CD7	04	FF			OFFFF	LODI,R2	FF	
1359	2CD9	17					RETC,UN		
1360	2CEA					*			
1361	2CEA	52				ADDELN	ERR,R2		
1362	2CEB	52					ERR,R2		
1363	2CEC	E4	05				COMI,R2	5	
1364	2CEE	16	08				BCTR,EQ	SUBLN	
1365	2CF3	E4	01				COMI,R2	0D	
1366	2CF2	18	04				BCTR,EQ	SUBLN	
1367	2CE4	E4	25				COMI,R2	25	
1368	2CF6	98	01				BCFR,EQ	NOCL	
1369	2CE8	20				SUBLN	FORZ,R2		
1370	2CE9	C3				NOCL	STRZ,R3		
1371	2CEA	47	07				ANDI,R3	7	
1372	2CEC	0E	0E				STRZ,R3	TYPE	
1373	2CEE	44	03				ANDI,R2	3	
1374	2CF2	E4	01				COMI,R2	1	
1375	2CF2	19	02				BCTR,GT	SIRE	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1376	2CF4	64	21				ADDI,R2	1	
1377	2CF6	02	22			SIRE	STRZ,R2	LENT	
1378	2CF8	17					RETC,UN		
1379	2CF9					*			
1380	2CF9	02				TYPE	RES	1	
1381	2CFA	02				LENT	RES	1	
1382	2CFE					*			
1383	2CFE	0C	19	61		APC	ADDA,R2	PC+1	
1384	2CFE	0C	19	61			STRA,R2	PC+1	
1385	2D01	77	0E				PSSL	WC	
1386	2D03	20					FORZ,R2		
1387	2D04	8C	19	80			ADDA,R2	PC	
1388	2D07	44	7F				ANDI,R2	7F	
1389	2D09	0C	19	80			STRA,R2	PC	
1390	2D2C	75	03				CPSL	WC	
1391	2D0E	17					RETC,UN		
1392	2D0F					*			
1393	2D0F	3F	2F	15		ORG	BSTA,UN	GETADD	
1394	2D12	0C	12	14			LODA,R2	OPER2	
1395	2D15	0C	19	80			STRA,R2	PC	
1396	2D18	0C	18	15			LODA,R2	OPER3	
1397	2D18	0C	19	61			STRA,R2	PC+1	
1398	2D1F	17					RETC,UN		
1399	2D1F					*			
1400	2D1F	00	00			NEITS	RES	2	
1401	2D21					*			
1402	2D21	70				NEIT	REDD,R2		
1403	2D22	44	7F				ANDI,R2	7F	
1404	2D24	14	1F				COMI,R2	ESC	
1405	2D26	1C	22	30			BCTR,EQ	EDITOP	
1406	2D29	07	FF				LODI,R3	FF	
1407	2D2B	0D	09	FF			LODA,R1	BCTR	
1408	2D2F	0D	AA	00		NEIT4	LODA,R1	*CURA,+	
1409	2D31	01	0A	0E			LODA,R2	BUMPON	
1410	2D34	3C	47	2C			BSTA,EQ	LTCU	
1411	2D37	E7	2F				COMI,R3	2F	
1412	2D39	3E	47	6C			BSTA,LT	LTCU	
1413	2D3C	E7	FF				COMI,R3	FF	
1414	2D3F	3C	47	6C			BSTA,EQ	LTCU	
1415	2D41	CF	2A	18			STRA,R3	TITBUF,+	
1416	2D44	02					LODZ,R2		
1417	2D45	1E	2D	6D			BCTR,LT	NBI	
1418	2D48	15	FF				COMI,R1	FF	
1419	2D4A	98	2D				BCFR,EQ	NITCK	
1420	2D4C	0E	0A	00			LODA,R2	CURA	
1421	2D4F	86	01				ADDI,R2	01	
1422	2D51	1F	00	06			COMA,R2	ENDRAM	
1423	2D54	18	17				BCTR,EQ	NBI	
1424	2D56	CE	0A	00			STRA,R2	CURA	
1425	2D59	E4	0D			NITCK	COMI,R2	CR	
1426	2D5E	18	06				BCTR,EQ	NITTY	
1427	2D5D	E7	52				COMI,R3	52	
1428	2D5F	1A	4D				BCTR,LT	NIT4	
1429	2D61	07	4F				LODI,R3	4F	
1430	2D63	1B	49				BCTR,UN	NIT4	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1431	2D6E	20				NEXT	ECR1,R0		
1432	2D6E	CF	6A	18			STRA,R3		TXTBUF,I
1433	2D6E	CD	09	FE			STRA,R1		BPTR
1434	2D6C	17					RETC,UN		
1435	2E6D					*			
1436	2E6D					*			
1437	2D6D	3F	2D	7D		NBI	BSTA,UN		NEWBLK
1438	2D70	3F	22	59			BSTA,UN		BEGIN
1439	2D73	0A	FF				LODI,R1		FF
1440	2D75	CD	09	FE			STRA,R1		BPTR
1441	2D78	1F	2D	21			BSTA,UN		NEXT
1442	2E7E					*			
1443	2E7E					*			
1444	2E7B	00				R2STC	RIS		1
1445	2D7C	02				BLKSIN	RIS		1
1446	2D7D					*			
1447	2E7D	CA	7C			NEWBLK	STPR,R2		R2STC
1448	2D7F	05	1E				LODI,R1		1E
1449	2E81	3F	46	C7			BSTA,UN		PSTRNG
1450	2E84	3F	46	F7			BSTA,UN		PAUSE
1451	2E87	F4	1				COMI,R0		ESC
1452	2D89	1C	20	3C			BSTA,EQ		EDITOR
1453	2D8C	3F	22	59			BSTA,UN		BEGIN
1454	2D8F	3F	2D	9F			BSTA,UN		LOADA
1455	2D92	6C	27	FE			BSTA,EC		SCERR
1456	2D95	3F	2E	0A			BSTA,UN		AOI
1457	2D98	F4	21				LODI,R0		01
1458	2D9A	08	60				STPR,R0		BLYSIN
1459	2D9C	CA	5D				LODR,R2		R2STC
1460	2D9E	17					RETC,UN		
1461	2E9F					*			
1462	2D9F								
1463	2D9F	3F	22	64		LOADA	BSTA,UN		MTDA
1464	2E9F	20				WAIT	ECR2,R0		
1465	2DA3	CC	88	43			TRA,R0		*SUMK
1466	2DA6	3F	22	E9			BSTA,UN		SERI
1467	2DA9	F7	3B				COMI,R3		
1468	2DAE	6E	75				BCTR,EC		WAIT
1469	2DAD	25	FF				LODI,R1		FF
1470	2DAF	3F	22	E9		NAML	BSTA,UN		SERI
1471	2DE2	CF	20	1E			LOCA,R1		NAM'E,+
1472	2DE5	18	03				BCTR,EO		OVIRSI
1473	2DE7	E3					COMI,R3		
1474	2DE6	68	68				BCTR,EC		WAIT
1475	2EFA	15	07			OVERSI	COMI,R1		07
1476	2DE0	68	71				BCTR,EC		NAML
1477	2DBE	3F	22	E9			BSTA,UN		SERI
1478	2DC1	2C	88	43			LOCA,R0		*SUMK
1479	2DC4	16					RETC,LT		
1480	2DC5	15					RETC,GT		
1481	2DC6	CD	CA	23			LOCA,R1		DUM2
1482	2DC9	0C	2A	23			STRA,R0		DUM2
1483	2DCC	0C	20	2E			STRA,R0		TMPS
1484	2DCF	3F	02	E9		ASCII	BSTA,UN		SERI
1485	2DD2	23					LODZ,R3		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1486	2DD3	CD	EA	02			STRA,R1		*DUMA,I
1487	2DD6	1A	28				BCTR,LT		ENDING
1488	2D18	19	12				PIPR,R1		LL1
1489	2DDA	3F	21	D9			BSTA,UN		AIDA
1490	2DDD	1A	01				BCTR,LT		LL1
1491	2DDF	3F	23	73			BSTA,UN		SIDA
1492	2DE2	0A	FF				LODI,R1		FF
1493	2DE4	04	3C				LODI,R0		ESC
1494	2DE6	CD	EA	02			STRA,R1		*DUMA,I
1495	2E10	1F	24	12			BSTA,UN		TMF
1496	2DE0	2F	60	2E		LL1	LOCA,R2		TMPS
1497	2DE3	66	01				ADDI,R2		01
1498	2DE1	01	00	2E			STRA,R2		TMPS
1499	2E74	96	49				BCTR,EO		ASCII
1500	2E76					*			
1501	2E76	3F	22	E9		ENDTP	BSTA,UN		SERI
1502	2E79	0C	2A	23			STRA,R1		DUM2
1503	2E7C	0F	98	43			LOCA,R3		*SUMK
1504	2E7F	1C	2D	A2			BSTA,EC		WAIT
1505	2E72	17					RETC,UN		
1506	2E73					*			
1507	2E73	3F	02	E9		ENDING	BSTA,UN		SERI
1508	2E76	2C	88	43			LOCA,R0		*SUMK
1509	2E79	17					RETC,UN		
1510	2E7A					*			
1511	2E7A	05	1F			AOI	LODI,R1		1F
1512	2E7C	3F	46	CA			BSTA,UN		PRING
1513	2E7F	3F	46	2F			BSTA,UN		FRASI
1514	2E12	17					RETC,UN		
1515	2E13					*			
1516	2E13					*			
1517	2E13	00				OPCODE	RIS		1
1518	2E14	02				OPPOS	RIS		1
1519	2E15					*			
1520	2E15	25	FF			FIND	LODI,R1		FF
1521	2E17	07	06			FIND1	LODI,R3		6
1522	2E19	0F	2A	18			LOCA,R3		TXTBUF,+
1523	2E1C	ED	28	50			COMA,R1		OPCD1,+
1524	2E1F	98	24				BCTR,EC		FIND2
1525	2E21	0F	2A	18			LOCA,R3		TXTBUF,+
1526	2E24	F1	66	A7			COMA,R1		OPCD2,1
1527	2E27	98	1C				BCTR,EC		FIND2
1528	2E29	0F	2A	18			LOCA,R3		TXTBUF,+
1529	2E2C	F1	66	F1			COMA,R1		OPCD3,1
1530	2E2F	98	14				BCTR,EC		FIND2
1531	2E31	0C	69	55			LOCA,R1		OPCD4,1
1532	2E34	14	20				COMI,R0		
1533	2E36	16	05				BCTR,EC		FIND3
1534	2E38	1F	2A	18			COMA,R3		TXTBUF,+
1535	2E3B	98	08				BCTR,EC		FIND2
1536	2E3D	0D	69	AC		FIND3	LOCA,R1		OPCD5,1
1537	2E40	08	51				STPR,R0		OPCD6
1538	2E42	02	50				STPR,R1		OPPOS
1539	2E44	17					RETC,UN		
1540	2E45	15	58			FIND2	COMI,R1		TOPCOM

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1541	2147	00	4E				BCFR,GT	FIND1	
1542	2149	08	45				STAR,F1	OPPOS	
1543	214E	24	00				LODI,R0	2	OPCODE ERROR
1544	214D	1B	19				BCTR,UN	ERRW	
1545	214F								
1546	214F	24	02				EPFMO	LODI,R0	2
1547	2151	1E	1E				BCTR,UN	ERRW	CPIFAND ERROR
1548	2153	04	03				ERRMR	LODI,R0	3
1549	2151	1E	1E				BCTR,UN	ERRW	REGISTER ERROR
1550	2157	04	04				ERRMD	LODI,R0	4
1551	2156	1E	0D				BCTR,UN	ERRW	DISPLACEMENT ERROR
1552	215B	04	05				ERRMF	LODI,R0	5
1553	215D	1E	09				BCTR,UN	ERRW	PAGING ERROR
1554	215F								
1555	215F	02					ERRPTR	RES	1
1556	2160	00	00	00	00		ERRSTK	RES	8
1557	2164	00	00	00	00				
1558	2166								
1559	2168	0A	75				ERRW	LODR,R2	ERRPTR
1560	216A	0C	07					COMI,R2	7
1561	216C	14						PTC,R0	
1562	216D	0F	2F	60				STAR,R2	ERRSTK,+
1563	2170	CA	0D					STAR,R2	ERRPTR
1564	2172	0C	0F	14				LODI,R0	ERRS
1565	2175	04	07					ADDI,R2	07
1566	2177	94						PAR,R0	
1567	2178	0C	0F	14				STAR,R0	ERRS
1568	217E	0C	09	F7				LODI,R0	PASS
1569	2181	14						PTC,R0	
1570	2187	20						FORZ,R0	
1571	218C	0C	09	F2				STAR,R0	DISPON
1572	218C	17						NETC,UN	
1573	2184								
1574	2184	0E	0F	5F			ERRP	LODI,R2	ERRPTR
1575	2187	1E						PTC,LT	
1576	2188	0E	0E	00				LODI,R2	ERRSTK,I
1577	218E	A6	01					SUPI,R2	1
1578	219D	0E	2E	5F				STAR,R2	ERRPTR
1579	219D	C2						STAR,R2	
1580	2191	3F	32	46				BSTA,UN	PLN
1581	2194	05	4E					LODI,R1	PMSG4-PRTBUF
1582	2196	3F	3C	4B				BSTA,UN	BLKPRT
1583	2199	0F	00					LODI,R1	0
1584	219B	07	FF					LODI,R3	FF
1585	219D	01					ERRW4	LODI,R1	
1586	219E	1E						COMI,R2	
1587	219F	1E	09					BCTR,EC	ERRW2
1588	21A1	0F	38	4D			ERRW3	LODI,R3	MSG16,+
1589	21A4	9A	78					BCFR,LT	ERRW3
1590	21A6	05	01					ADDI,R1	1
1591	21AB	1E	73					BCTR,UN	ERRW4
1592	21AA	0F	38	4D			ERRW2	LODI,R3	MSG16,+
1593	21AD	1A	05					BCFR,LT	ERRW5
1594	21AF	3F	3F	72				BSTA,UN	FRNT
1595	21B2	1B	76					BCTR,UN	ERRW2

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1596	21B4	2F	57				ERRW5	LODI,R1	PMSG5-PRTBUF
1597	21B6	3F	36	4B				BSTA,UN	BLKPRT
1598	21B9	0C	13	F2				LODI,R0	PLINE
1599	21BC	04	01					ADDI,R0	1
1600	21BE	0C	13	F2				STAR,R0	PLINE
1601	21C1	E4	36					COMI,R2	36
1602	21C3	3D	35	09				BSTA,GT	HEADIN
1603	21C6	1F	2E	24				BCTA,UN	ERRP
1604	21C9								
1605	21C9								
1606	21C9	2C	29	FA			CHNPR	LODI,R0	CUTOFF
1607	21CC	14						RETG,EQ	
1608	21C1	0C	09	F2				LODI,R0	DISPON
1609	21D0	17						RETG,UN	
1610	21D1								
1611	21D1								
1612	21D1	4F	50	43	4F	EMSG2	ALIT		'OPCODE'
1613	21D5	44	45						
1614	21D7	FF					DATA	FF	
1615	21D8	4C	41	42	45		ALIT		'LABEL USED TWICE'
1616	21D8	4C	22	0F	F3				
1617	21E0	45	44	20	54				
1618	21E4	57	49	43	45				
1619	21E8	FF					DATA	FF	
1620	21E9	4F	50	4F	F2		ALIT		'OPERAND'
1621	21FD	41	4E	44					
1622	21F2	FF					DATA	FF	
1623	21F1	52	45	47	49		ALIT		'REGISTER FIELD'
1624	21F5	53	54	45	52				
1625	21F6	20	46	49	45				
1626	21FD	4C	44						
1627	21FF	FF					DATA	FF	
1628	21F0	44	49	53	50		ALIT		'DISPLACEMENT'
1629	21F4	4C	41	43	45				
1630	21F8	41	45	4E	54				
1631	21F0	FF					DATA	FF	
1632	1F2E	50	41	47	49		ALIT		'PAGING'
1633	21F1	4E	47						
1634	21F3	FF					DATA	FF	
1635	21F4								
1636	21F4	20					ERRS	FFS	1
1637	21F5								
1638	21F5	0B	11				GETADD	LODI,R1	11
1639	21F7	0E	0F	F4			GETALZ	STAR,R1	TMPSE
1640	21FA	20						FORZ,R2	
1641	21B3	0C	0F	E3				STAR,R2	OPSTG
1642	21F8	0C	10	14				STAR,R2	OPFRT
1643	21F1	0C	10	15				STAR,R2	OPFRT
1644	21F4	3F	0F	EC			ADL2A	BSTA,UN	FTAL
1645	21F7	0C	0F	EB				LODI,R0	OPSTG
1646	21FA	1C	2E	4D				BCTA,EC	ALCADD
1647	21F5	F4	2B					COMI,R0	2B
1648	21F7	1B	1C					BCTR,EC	ADLADD
1649	21F1	E4	2D					COMI,R2	2D
1650	21F3	5B	2E					BCFE,EC	SUBADD

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
1651	2F35	0C	10	15			LODA,R0	OPER3	
1652	2F36	AC	10	13			STRA,R0	OPER1	
1653	2F37	CC	10	15			STRA,R0	OPER3	
1654	2F38	CC	10	14			LODA,R0	OPER2	
1655	2F41	77	08				FPSL	WC	
1656	2F43	AC	10	12			SUBA,R0	CPIPP	
1657	2F46	CC	10	14			STRA,R0	OPER2	
1658	2F49	75	08				CPSL	WC	
1659	2F4B	13	16				ECTR,UN	SUBADD	
1660	2F4E	0C	10	15		ALIADD	LODA,R0	OPER3	
1661	2F52	CC	10	13			ALDA,R0	OPFP1	
1662	2F53	CC	10	15			STRA,R0	OPER3	
1663	2F56	77	08				FPSL	WC	
1664	2F58	CC	10	14			LODA,R0	OPER2	
1665	2F5B	CC	10	12			ADDA,R0	OPER0	
1666	2F5E	CC	10	14			STRA,R0	OPER2	
1667	2F61	75	08				CPSL	WC	
1668	2F63	2D	2F	F3		SUBADD	LODA,R1	R2POS	
1669	2F6C	CC	0F	F4			STRA,R1	TMPS2	
1670	2F69	2D	6A	18			LODA,R1	TXTEUF,I	
1671	2F6C	10	0D				ECTR,EO	CKHIG	
1672	2F6E	F4	2C				COMI,R0		
1673	2F70	10	09				ECTR,EO	CKHIG	
1674	2F72	F4	2C				COMI,R0		
1675	2F74	10	05				ECTR,EO	CKHIG	
1676	2F76	06	13				STER,R0	OPSTG	
1677	2F78	17	2F	24			ECTA,UN	AD12A	
1678	2F7B	05	11			CKHIG	LODI,R1	11	
1679	2F7D	2D	6A	18			LODA,R1	TXTEUF,I	
1680	2F80	F4	5F				COMI,R0		
1681	2F82	15					RETC,GT		
1682	2F83	15					RETC,LT		
1683	2F84	CC	10	14			LODA,R0	OPER2	
1684	2F87	CC	10	15			STRA,R0	OPER3	
1685	2F8A	17					RETC,UN		
1686	2F8B					*			
1687	2F8B	02				OPSTG	RES	1	
1688	2F9C					*			
1689	2F9C	0C	0F	F4		EVAL	LODA,R1	TMPS2	
1690	2F9F	2D	6A	18		LU	LODA,R1	TXTEUF,+	
1691	2F92	10	10				ECTR,EO	STRR2	
1692	2F94	F4	20				COMI,R0		
1693	2F96	10	2C				ECTR,EO	STRR2	
1694	2F98	F4	2D				COMI,R0	2D	
1695	2F9A	10	08				ECTR,EO	STRR2	
1696	2F9C	F4	2E				COMI,R0	2F	
1697	2F9F	10	24				ECTR,EO	STRR2	
1698	2FA0	F4	2C				COMI,R0		
1699	2FA2	08	0E				ECTR,EO	LU	
1700	2FA4	CC	0F	F3		STRR2	STRA,R1	R2PCS	
1701	2FA7	0D	2F	F4			LODA,R1	TMPS2	
1702	2FAA	2D	6A	18			LODA,R1	TXTEUF,+	
1703	2FAD	F4	24				COMI,R0		
1704	2FAF	06	2C				ECTR,EO	CKASCI	
1705	2FB1	2C	19	80			LODA,R0	PC	

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
1726	2FB4	CC	10	12			STRA,R0	OPER0	
1727	2FB7	CC	10	01			LODA,R0	PC+1	
1728	2FBA	CC	10	13			STRA,R0	OPER1	
1729	2FED	17					RETC,UN		
1730	2FE1	20				CKASCI	EORZ,R0		
1731	2F8F	CC	10	12			STRA,R0	OPER0	
1732	2FC2	CC	10	13			STRA,R0	OPER1	
1733	2FC5	0D	6A	18			LODA,R1	TXTEUF,I	
1734	2FC8	F4	27				COMI,R0		
1735	2FCA	08	2C				ECTR,EO	LOOKUP	
1736	2FCC	0D	2A	18			LODA,R1	TXTEUF,+	
1737	2FCF	CC	10	13			STRA,R0	OPER1	
1738	2FD7	05	02				ADDI,R1	2	
1739	2FD4	CC	0F	F3			STRA,R1	R2POS	
1740	2FD7	17					RETC,UN		
1741	2FDB	37	30	16		LOOKUP	ESTA,UN	TBL2	
1742	2FDB	14					RETC,EO		
1743	2FDC	09	16				LODF,R1	TMPS2	
1744	2FE1	0D	2A	18		BYTE2	LODA,R1	TXTEUF,+	
1745	2FE1	3F	47	0C			ESTA,UN	LOCU	
1746	2FE4	F9	0D				COMI,R1	R2POS	
1747	2FE6	14					RETC,EO		
1748	2FE7	07	13				LODI,R1	10	
1749	2FE9	1F	56	AC		BL2	COMA,R3	HITBL,-	
1750	2FE0	10	27				ECTR,EO	HEXMAT	
1751	2FE1	05	75				BPBR,R3	BL2	
1752	2FE2	1F	2E	47			ECTR,UN	ERRMO	
1753	2FE3					*			
1754	2FE3	00				R2POS	RES	1	
1755	2FE4	00				TMPS2	RES	1	
1756	2FE5					*			
1757	2FE5	0E	7D			HEXMAT	STER,R3	TMPS2	
1758	2FE7	08	19				LOIR,R0	OPER0	
1759	2FE8	03	18				LOIR,R3	OPER1	
1760	2FEF	77	08				FPSL	WC	
1761	2FF0	03					FRL,R3		
1762	2FF1	17					FRL,R2		
1763	2FF3	13					FRL,R3		
1764	3027	10					FRL,R0		
1765	3021	03					FRL,R3		
1766	3022	10					FRL,R0		
1767	3023	13					FRL,R3		
1768	3024	10					FRL,R2		
1769	3025	75	08				CPSL	WC	
1770	3027	47	F0				ANDI,R3	F0	
1771	3029	6F	69				ICRR,R3	TMPS2	
1772	302E	08	06				STER,R3	OPER1	
1773	302D	08	03				STER,R0	OPER0	
1774	302F	1F	2F	DE			ECTR,UN	BYTE2	
1775	3012					*			
1776	3012	02				OPER0	FIS	1	
1777	3013	02				OPER1	FIS	1	
1778	3014	02				OPER2	FIS	1	
1779	3015	02				OPER3	FIS	1	
1780	3016					*			

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1761	3216	7F	23	99		TBL2	BSTA,UN	IPALD	
1762	3219	27	FF				LODI,R3	FF	
1763	321B	03	57			TBL2A	LODR,R1	TMPS2	
1764	3217	2F	AA	24		TBL3	LOIA,R3	*TMPA,+	
1765	3223	16					PETC,LT		
1766	3221	17	21				SUPI,R3	1	
1767	3223	CD	2A	18			LOIA,R1	TXTBUF,+	
1768	3225	2F	47	8C			BSTA,UN	LTOU	
1769	3229	1F	0F	F3			COMA,R1	R2POS	
1770	322C	18	10				ECTR,EQ	STROP	
1771	322F	1F	AA	24			COMA,R3	*TMPA,+	
1772	3231	18	6A				ECTR,EQ	TBL3	
1773	3233	47	F6			TBL4	ANDI,R3	F8	
1774	3235	E7	E7				ADDI,R3	7	
1775	3237	17	FF				COMI,R3	FF	
1776	3239	3C	23	CC			BSTA,EQ	A1TA	
1777	323C	18	5D				ECTR,UN	TBL2A	
1778	323E	03				STROP	LODZ,R3		
1779	323F	44	07				ANDI,R3	7	
1780	3241	E4	25				COMI,R3	5	
1781	3243	9A	29				BCFR,LT	ADDIN	
1782	3245	0F	AA	24			LOIA,R3	*TMPA,+	
1783	3248	E4	20				COMI,R3		
1784	324A	68	67				BCFR,EQ	TBL4	
1785	324C	1B	70				BCFR,UN	STROP	
1786	324E	0F	AA	24		ADDIN	LOIA,R3	*TMPA,+	
1787	3251	CC	12	12			STPA,R3	OPER0	
1788	3254	07	AA	24			LODA,R3	*TMPA,+	
1789	3257	CC	10	13			STRA,R2	OPER1	
1790	325A	20					EORZ,R3		
1791	325B	17					RETC,UN		
1792	325C					*CK2	LODI,R3	1	
1793	325E	04	01				ADDA,R3	CCMAST	
1794	325F	0C	09	FD			STRA,R3	CCMAST	
1795	3261	CC	29	FD			LODA,R1	R2POS	
1796	3264	2D	07	F3			LODA,R1	TXTBUF,1	
1797	3267	0D	6A	18			COMI,R3		
1798	326A	E4	2C				RETC,LT		
1799	326C	16					RETC,GT		
1800	326D	15					BSTA,UN	GFTAD2	
1801	326F	3F	2F	17			EORZ,R3		
1802	3271	20					ETC,UN		
1803	3272	17							
1804	3273					*			
1805	3273					*			
1806	3273					*			
1807	3273								
1808	3273	04	FF			PASS2	LODI,R3	FF	
1809	3275	CC	09	FD			STRA,R3	PASS	
1810	3278	20				PASS2A	EORZ,R3		
1811	3279	CC	0A	0F			STRA,R3	DISPLN	
1812	327C	CC	18	80			STRA,R3	PC	
1813	327F	CC	19	81			STRA,R3	PC+1	
1814	3282	CC	0A	16			STRA,R2	LINE	
1815	3285	CC	0A	17			STRA,R2	LINE+1	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1816	3288	CC	0A	15			STRA,R2	OBPTR+1	
1817	328B	CC	0A	2C			STRA,R2	PAGE	
1818	328E	CC	0A	0D			STRA,R2	PAGE+1	
1819	3291	CC	09	FC			STRA,R2	BPPC	SETUP FOR HEXOS
1820	3294	04	FF				LODI,R3	FF	
1821	3296	CC	09	FA			STRA,R2	OUTOFF	
1822	3299	CC	09	FB			STRA,R2	LISPOW	
1823	329C	CC	09	FE			STRA,R2	BPTR	
1824	329F	CC	02	05			LODA,R2	OBST	
1825	32A2	CC	0A	14			STRA,R3	OBPTR	
1826	32A5	04	FF				LODI,R3	FF	
1827	32A7	CC	0A	11			STRA,R2	TAPEON	
1828	32AA	CC	0A	10			STRA,R2	BLKSON	
1829	32AD	24	22				LODI,R3	2	
1830	32AF	CC	13	F1			STPA,R3	HEYOST	
1831	32B2	3F	34	20			BSTA,UN	HEXOS	
1832	32B5	05	12				LODI,R1	12	
1833	32B7	3F	46	C7			BSTA,UN	PSTRNG	
1834	32BA	3F	46	3C			BSTA,UN	EROLD	
1835	32BD	3F	22	59			BSTA,UN	BEGIN	
1836	32C0	CC	02	7C			LOIA,R3	BLKIN	
1837	32C3	CC	02	7D			BSTA,EQ	NIWELI	
1838	32C6	20				P2NXT	EORZ,R3		
1839	32C7	CC	09	FD			STRA,R2	COMAST	
1840	32CA	CC	09	FC			STRA,R3	BPPC	
1841	32CD	CC	12	20			STRA,R3	RESBUF+2	
1842	32D0	04	FF				LODI,R3	FF	
1843	32D2	CC	13	F2			STRA,R2	BYTSP	
1844	32D5	CC	0F	5F			STRA,R2	ERRRTR	
1845	32D8	3F	2D	21			BSTA,UN	WEIT	
1846	32DB	CC	0A	18			LODA,R3	TXTBUF	
1847	32DE	E4	2A				COMI,R3	*	
1848	32E0	1C	33	78			BCTA,EQ	NEXTL2	
1849	32E3	3F	2E	15			BSTA,UN	FIND	
1850	32E6	1F	56				COMI,R1	TCPCOM	
1851	32E8	1D	33	78			BCTA,GT	NEXTL2	
1852	32EB	E4	4C				COMI,R1	EQUF	
1853	32ED	1C	33	78			BCTA,EQ	NEXTL2	
1854	32F0	1F	52				COMI,R1	ENDP	
1855	32F2	1C	35	15			BCTA,EQ	P2END	
1856	32F5	1E	53				COMI,R1	BLKSP	
1857	32F7	98	09				BCFR,EQ	BLKS2	
1858	32F9	3F	2C	C9			BSTA,UN	OFFCN	
1859	32FC	CC	0A	10			STRA,R3	BLKSON	
1860	32FF	1F	72	C6			BCTA,UN	P2NXT	
1861	3102	1F	56			BLKS2	COMI,R1	TAPEP	
1862	3124	99	09				BCFR,EQ	TAPE2	
1863	3105	3F	2C	C9			BSTA,UN	OFFCN	
1864	3129	CC	0A	11		TAPE2	STPA,R3	TAPEON	
1865	312C	1F	30	C6			BCTA,UN	P2NXT	
1866	312F	1E	55				COMI,R1	DISPP	
1867	3131	99	15				BCFR,EQ	BUMF2	
1868	3133	3F	2C	C9			BSTA,UN	OFFCN	
1869	3136	CC	09	FE			STRA,R3	DISPON	
1870	3139	1F	30	C6			BCTA,LT	P2NXT	

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
1871	3110	3F	45	C9			BSTA,UN	LFCR	
1872	311F	00	09	FA			LODA,R2	OUTOFF	
1873	3122	3F	3F	P9			BSTA,LT	HEALIN	
1874	3125	1F	32	C6			BCTA,UN	P2NIT	
1875	3128	E5	54			BUMF2	COMI,R1	BUMSP	
1876	312A	08	06				BCTP,EO	TISPE	
1877	312C	3F	2C	C9			BSTA,UN	OFFON	
1878	312F	00	0A	0E			STRA,R0	BUMFOM	
1879	3132	1F	32	C6			BCTA,UN	P2NIT	
1880	3135	1F	4B			DISP2	COMI,R1	CRCP	
1881	3137	06	29				PCFP,EO	ORC2	
1882	3139	3F	2D	07			BSTA,UN	CRG	
1883	313C	3F	34	20			BSTA,UN	HIXOS	
1884	313F	1F	33	78			BCTA,UN	HEATLZ	
1885	3142	E5	52			CRG2	COMI,R1	PRNTF	
1886	3144	08	1F				PCFP,EO	PRNT2	
1887	3145	3F	2C	C9			BSTA,UN	OFFON	
1888	3149	00	09	FA			STRA,R0	OUTOFF	
1889	314C	18	08				BCTP,EO	PRNT1	
1890	314E	24	F0				LODI,R0	F0	
1891	3150	3F	20	0A			BSTA,UN	DPRINT	
1892	3153	1F	32	C6			BCTA,UN	P2NIT	
1893	3156	04	F0			PRNT1	LODI,R0	F0	
1894	3158	3F	20	0A			BSTA,UN	DPRINT	
1895	315B	00	09	FA			LODA,R2	DISPON	
1896	315E	3F	35	B5			BSTA,UN	HEADIN	
1897	3161	1F	32	C6			BCTA,UN	P2NIT	
1898	3164	E5	4B			PRNT2	COMI,R1	ORCP	
1899	3166	1E	32	7E			BCTA,LT	P2	
1900	3169	E5	51				COMI,R1	ALITP	
1901	316B	00	23				PCFP,EO	ALIT2	
1902	316D	05	11				LODI,R1	11	
1903	316F	2D	2A	18			LODA,R1	TITBUF,+	
1904	3172	00	00	97			STRA,R0	ALDEL	
1905	3175	0D	2A	18		NOALIZ	LODA,R1	TITBUF,+	
1906	3178	18	10				BCTP,EO	ALDN2	
1907	317A	FC	0C	97			COMA,R0	ALDEL	
1908	317D	18	2B				BCTP,EO	ALDN2	
1909	317F	01	0F	F3			STRA,R1	R2POS	
1910	3182	3F	33	F3			BSTA,UN	HEXOUT	
1911	3185	01	0F	F3			LODA,R1	R2POS	
1912	3186	1F	6B				BCTP,UN	NCALE2	
1913	318A	AE	13			ALDN2	SUBI,R1	13	
1914	318C	01					LODI,R1		
1915	318D	1F	33	79			BCTA,UN	NEXTL	
1916	3190	3F	2F	15		ALIT2	BSTA,UN	GETAED	
1917	3193	0D	0E	14			LODA,R1	OPPOS	
1918	3196	E5	4D				COMI,R1	DATAP	
1919	3199	06	11				PCFP,EO	LATA2	
1920	319A	0C	10	15		DAT2A	LODA,R0	OPERS	
1921	319D	3F	33	F3			BSTA,UN	HEXOUT	
1922	31A2	3F	30	5C			BSTA,UN	CKA2	
1923	31A3	18	7E				BCTP,EO	LAT2A	
1924	31A5	2C	09	FD			LODA,R0	COMAST	
1925	31A9	1F	33	79			BCTA,UN	NEXTL	

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
1926	31AB	E5	4E			DATA2	COMI,R1	ACONP	
1927	31AD	08	18				BCTP,EO	ACON2	
1928	31AF	0C	10	14		ACON2A	LODA,R0	OPER2	
1929	31B2	3F	33	F3			BSTA,UN	HEXOUT	
1930	31B5	0C	10	15			LODA,R0	OPERS	
1931	31B9	3F	33	F3			BSTA,UN	HEXOUT	
1932	31BF	3F	30	5C			BSTA,UN	CKI2	
1933	31B1	18	6F				PCFP,EO	ACON2A	
1934	31C0	0C	29	FD			LODA,R0	COMAST	
1935	31C3	10					REL,R0		
1936	31C4	1F	33	79			BCTA,UN	NEXTL	
1937	31C7	E5	4F			ACON2	COMI,R1	PESP	
1938	31C9	0C	32	16			PCFA,EO	ADDP2	
1939	31CC	2C	10	14			LODA,R0	OPER2	
1940	31CF	18	2D				BCTP,EO	RES4	
1941	31D1	0C	19	00			LODA,R0	PC	
1942	31D4	0C	12	1E			STRA,R0	RESBUF	
1943	31D7	0C	19	01			LODA,R0	PC+1	
1944	31DA	0C	12	1F			STRA,R0	RESBUF+1	
1945	31DD	24	FF				LODI,R0	FF	
1946	31DF	0C	12	20			STRA,R0	RESBUF+2	
1947	31E2	0C	10	15			LODA,R0	OPERS	
1948	31E5	0C	19	01			ADDA,R0	PC+1	
1949	31E8	0C	19	01			STRA,R0	PC+1	
1950	31EB	77	08				PFSI	WC	
1951	31ED	0C	10	14			LODA,R0	OPER2	
1952	31F0	0C	19	00			ADDA,R0	PC	
1953	31F3	0C	19	00			STRA,R0	PC	
1954	31F6	75	2B				CFSL	WC	
1955	31F8	3F	34	20			BSTA,UN	HIXOS	
1956	31F1	1F	33	79			BCTA,UN	NEXTL	
1957	31F1	0D	10	15		RES4	LODA,R1	OPERS	
1958	3221	1C	33	79			BCTA,EO	NEXTL	
1959	3224	0D	12	1D		RES3	STRA,R1	RESSTG	
1960	3227	22					ECRZ,R0		
1961	3228	3F	33	F3			BSTA,UN	HEXOUT	
1962	322E	01	12	1E			LODA,R1	RESSTG	
1963	322E	FG	74				BCTP,R1	RES3	
1964	3210	0C	13	15			LODA,R0	OPERS	
1965	3213	1F	33	79			BCTA,UN	NEXTL	
1966	321E	2C	2C	FA		ADDP2	LODA,R0	LENT	
1967	3219	1F	33	79			BCTA,UN	NEXTL	
1968	321C					*			
1969	321C					*			
1970	321C	02				RESSTG	RES	1	
1971	321E	02				RESSTG	RES	1	
1972	321E	02	00	00		RESBUF	RES	3	
1973	3221					*			
1974	3221	3F	32	46		PRTLN	BSTA,UN	PLN	
1975	3224	08	7A				LODA,R0	RESBUF+2	
1976	3225	18	0F				BCTP,EO	PRNTS	
1977	322E	0C	12	1E			LODA,R0	RESBUF	
1978	322F	3F	35	5E			BCTA,UN	PRINT	
1979	3231	0C	12	1F			LODA,R0	RESBUF+1	
1980	3231	3F	35	59			BSTA,UN	PRINT	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
1961	3224	1F	35	6E			ECTA,UN	FPBL	
1962	3227	0C	19	68		PRNT3	LODA,P2	PC	
1963	323A	3F	35	58			BSTA,UN	PRINT	
1964	323D	2C	19	61			LODA,R2	PC+1	
1965	3242	3F	35	58			BSTA,UN	PRINT	
1966	3243	1F	35	6E			ECTA,UN	FPBL	
1967	3246					*			
1968	3246	2C	0A	17		PLN	LODA,P2	LINE+1	
1969	3249	84	67				ADDI,R2	67	
1970	324B	94					DAP,R2		
1991	324C	0C	0A	17			STRA,R2	LINE+1	
1992	3247	77	08				PPSL	WC	
1993	3241	74	66				LODI,R2	66	
1994	3243	6C	0A	16			ADDA,R2	LINE	
1995	3245	94					DAR,R2		
1996	3247	0C	0A	16			STRA,R2	LINE	
1997	324A	75	08				CPSL	WC	
1998	324C	3F	35	58			BSTA,UN	PRINT	
1999	324F	0C	0A	17			LODA,R2	LINE+1	
2000	3242	3F	35	58			BSTA,UN	PRINT	
2001	3245	3F	35	6E			BSTA,UN	FPBL	
2002	3248	1F	35	6E			ECTA,UN	FPBL	
2003	324E					*			
2004	324B	0C	0F	F4		CC	STRA,R1	TMPS2	
2005	324B	85	03				ADDI,P1	3	
2006	324C	0C	0F	F3			STRA,R1	R2FOS	
2007	3243	3F	30	16			BSTA,UN	TEL2	
2008	3246	3F	2F	53			BSTA,IT	ERRR	
2009	3245	0C	12	13			LODA,R2	OPER1	
2010	324C	1F	24				ECTR,UN	SPEC1	
2011	324E					*			
2012	324E	25	0A			P2	LODI,R1	A	
2013	324E	0D	0A	18			LODA,R1	TITBUF,I	
2014	3245	E4	2C				COMI,R2		
2015	3245	16	04				ECTR,PC	P2A	
2016	3247	25	2C				LODI,R1	C	
2017	3245	1E	02				ECTR,UN	P2B	
2018	3245	05	08			P2A	LODI,P1	B	
2019	324D	07	0C			P2B	LODI,R3	2C	
2020	324F	2D	0A	18			LODA,R1	TITBUF,I	
2021	324E	A5	01				SUBI,P1	1	
2022	3244	F4	23				COMI,R2		
2023	3246	16	08				ECTR,PC	SPEC2	
2024	3248	F4	32				COMI,PC	'0'	
2025	324A	1A	41				ECTR,LT	CC	
2026	324C	F4	33				COMI,R2	'3'	
2027	324F	19	4B				ECTR,CT	CC	
2028	3248	44	23			SPEC2	ANDI,R2	3	
2029	3242	6C	21	13		SPEC1	LODA,R2	OPCODE	
2030	3245	3F	33	F3			BSTA,UN	HEXOUT	
2031	3245	0C	0E	13			LODA,R2	OPCODE	
2032	3245	3F	2C	1A			BSTA,UN	ADDLN	
2033	3245	0C	2C	F9			LODA,R2	TYPE	
2034	3241	44	03				ANDI,R2	3	
2035	3243	1C	32	16			ECTA,PC	ADDF2	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2036	3246	F4	21				COMI,R2	1	
2037	3248	98	0C				ECTR,PC	ADDR	
2038	324A	3F	2F	15			BSTA,UN	GETADD	
2039	324D	0C	18	15			LODA,R2	OPER3	
2040	324C	3F	33	F3			BSTA,UN	HEXOUT	
2041	3243	1F	32	16			ECTA,UN	ADDF2	
2042	3246	3F	2F	15		ADDR	BSTA,UN	GETADD	
2043	3249	2C	0C	F9			LODA,R2	TYPE	
2044	324C	F4	23				EMI,R2	3	
2045	324E	1C	33	22			ECTA,EC	ABSER	
2046	3241	04	02				LODI,R2	2	
2047	3243	3F	35	A7			BSTA,UN	AFCTA	
2048	3246	2C	01	13			LODA,R2	OPCODE	
2049	3249	F4	BB				COMI,R2	BB	
2050	324B	18	04				ECTR,PC	ZERORL	
2051	324D	F4	98				COMI,R2	98	
2052	324F	98	07				ECTR,EC	NOZERO	
2053	3241	28				ZERORL	ECTR,R2		
2054	3242	0C	0A	24			STRA,R2	TMFA	
2055	3245	0C	0A	25			STRA,R2	TMFA+1	
2056	3248	0C	18	14		NOZERO	LODA,R2	CFIR2	
2057	324B	2C	0A	04			FORA,R2	TMFA	
2058	324E	44	67				ANDI,R2	6C	
2059	3242	0C	21	52			BSTA,IC	ERRMP	
2060	3243	21	19	15			LODA,P1	OPER3	
2061	3245	AC	0A	05			SUBA,P1	TMFA+1	
2062	3249	77	08				PPSL	WC	
2063	324E	0C	18	14			LODA,R2	CFIR2	
2064	324F	AC	0A	04			SUBA,R2	TMFA	
2065	3241	75	08				CPSL	WC	
2066	3243	18	05				ECTR,EC	TE2	
2067	3245	F4	F1				EMI,R2	FF	
2068	3247	9C	2E	57			BSTA,EC	ERRMD	
2069	324A	01				TB2	LODI,R1		
2070	324B	F4	08				EMI,R2	CB	
2071	324D	18	08				ECTR,EC	TIZ	
2072	324F	24	F1				FORI,R2	FF	
2073	3241	F4	08				EMI,R2	CB	
2074	3243	F5	3E	F7			BSTA,EC	ERRMD	
2075	3246	01					LODI,P1		
2076	3247	03				TT2	STPZ,R3		
2077	3248	3F	25	07			BSTA,UN	INDIR	
2078	324B	03					LODI,R3		
2079	324C	3F	33	F3			BSTA,UN	HEXOUT	
2080	3241	1F	32	16			ECTA,UN	ADDF2	
2081	3242	0F	12	14		ABSER	LODA,R3	CFIR2	
2082	3245	3F	35	07			BSTA,UN	INDIR	
2083	3248	0C	0C	F9			LODA,R2	TYPE	
2084	3245	F4	23				COMI,R2	3	
2085	3247	18	07				ECTR,EC	ABS	
2086	324F	03					LODI,R3		
2087	3242	3F	33	F3			BSTA,UN	HEXOUT	
2088	3243	1F	33	6E			ECTA,UN	BITIT	
2089	3245	23				ABS	LODI,P3		
2090	3247	2C	19	0C			FORA,R2	PC	

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
2051	333A	44	60				ANDI,R0	60	
2052	333C	8C	2E	5B			RSPA,EQ	FFRMP	
2053	333F	47	9F				ANDI,R3	9F	
2054	3341	81	8F	F3			LODA,R1	R2PCS	
2055	3344	8E	6A	18			LODA,R1	TXTBUF,I	
2056	3347	18	21				ECTR,EQ	NOIND	
2057	3349	14	2C				COMI,R0		
2058	334B	8C	1D				ECTR,EQ	NOIND	
2059	334D	8D	2A	1B			LODA,R1	TXTBUF,+	
2100	3350	3F	47	8C			BSTA,UN	LT0U	
2101	3353	14	2E				COMI,R0	2E	
2102	3355	8E	24				ECTR,EQ	NOPLUS	
2103	3357	87	23				IORI,R3	20	
2104	3359	13	8F				ECTR,UN	NOIND	
2105	335B	14	2D			NOPLUS	COMI,R0	2D	
2106	335D	86	04				ECTR,EQ	NOMINU	
2107	335F	87	40				IORI,R3	40	
2108	3361	13	87				ECTR,UN	NOIND	
2109	3363	14	46			NOMINU	COMI,R0	'1'	
2110	3365	3C	2E	4F			BSTA,EQ	ERRMO	
2111	3368	87	60				IORI,R3	60	
2112	336A	83				NOIND	LODZ,R3		
2113	336C	3F	33	F3			BSTA,UN	HEXCUT	
2114	336E	8C	18	15		BTTF	LODA,R0	OPER3	
2115	3371	3F	33	F3			BSTA,UN	HEXCUT	
2116	3374	1F	32	16			BSTA,UN	ADDF2	
2117	3377								
2118	3377	80				NEXTLS	RES	1	
2119	3378								
2120	3378	20				NEXTLZ	IORZ,R0		
2121	3379	08	7C			NEXTL	STER,R0	NEXTLS	
2122	337B	84	0E				LODI,R0	CR	
2123	337D	3F	35	72			BSTA,UN	PRNT	
2124	3380	24	0A				LODI,R0	LF	
2125	3382	3F	35	70			BSTA,UN	PRNT	
2126	3385	3F	2E	C9			BSTA,UN	CHKPR	
2127	3388	8C	33	E6			ECTA,EQ	NEXTL4	
2128	338B	3F	2E	84			BSTA,UN	ERRP	
2129	338E	3F	32	21			BSTA,UN	PRTLN	
2130	3391	8E	FF				LODI,R2	FF	
2131	3393	3F	34	F1			BSTA,UN	PRTEB	
2132	3396	0F	29	FC			LODA,R3	BPPC	
2133	3399	17	03			BL3	COMI,R3	3	
2134	339B	19	0B				ECTR,ST	PRILM	
2135	339D	3F	35	6F			BSTA,UN	PRBL	
2136	33A2	3F	35	6E			BSTA,UN	PRBL	
2137	33A3	3F	35	6E			BSTA,UN	PRBL	
2138	33A6	D5	71				BIRR,R3	BL3	
2139	33A8	8E	FF			PRTLN	LODI,R1	FF	
2140	33AA	8C	2A	18		PRINX	LODA,R1	TXTBUF,+	
2141	33AD	16	05				ECTR,EQ	GOON2	
2142	33AF	3F	35	70			BSTA,UN	PRNT	
2143	33B2	1F	76				ECTR,UN	PRINX	
2144	33B4	85	03			GOON2	LODI,R2	3	
2145	33B6	8C	13	F0		GOON	LODA,R0	PLINE	

FILE 'ALP' AS ASSEMBLED BY SYSTEM ON 11-23-78

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LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
2146	33B9	84	21				ADDI,R0	1	
2147	33BB	8C	13	F0			STRA,R0	PLINE	
2148	33BE	14	3C				COMI,R0	3C	
2149	33C0	3E	3E	B9			BSTA,ST	READIN	
2150	33C3	8C	29	FC			LODA,R0	BPPC	
2151	33C6	14	25				COMI,R0	5	
2152	33C8	1A	1F				ECTR,LT	NEXTL6	
2153	33CA	A4	04				SUPI,FC	4	
2154	33CC	8C	09	FC			STRA,R0	BPPC	
2155	33CF	04	04				LODI,R0	4	
2156	33D1	3F	2C	FB			BSTA,UN	APC	
2157	33D4	04	0D				LODI,R2	CR	
2158	33D6	3F	35	70			BSTA,UN	PRNT	
2159	33D9	04	2A				LODI,R0	LF	
2160	33DB	3F	35	70			BSTA,UN	PRNT	
2161	33DE	1F	32	21			BSTA,UN	PRTLN	
2162	33E1	3F	34	F1			BSTA,UN	PRTEB	
2163	33E4	1E	6C				ECTR,UN	GOON	
2164	33E6	8C	13	77		NEXTL4	LODA,R0	NEXTLS	
2165	33E9	3F	2C	FB		NEXTL6	BSTA,UN	APC	
2166	33EC	1F	3C	C6			BSTA,UN	F2NIT	
2167	33EF								
2168	33EF	82				BLISO	RES	1	
2169	33F0	80				PLINE	RES	1	
2170	33F1	80				HEXOST	RES	1	
2171	33F2	80				BYTSP	RES	1	
2172	33F3								
2173	33F3								
2174	33F3								
2175	33F3								
2176	33F3	0F	0A	10		HEXCUT	LODA,R3	BLXSON	
2177	33F6	9A	0B				ECTR,EQ	NODIRL	
2178	33F8	01					STER,R1		
2179	33F9	8C	09	FC			LODA,R0	BPPC	
2180	33FC	3F	34	C6			BSTA,UN	APCDA	
2181	33FF	01					LODZ,R1		
2182	3400	8C	6A	C2			STRA,R0	*DUMA	
2183	3403	0E	13	F1		NODIRL	LODA,R2	HEXCUT	
2184	3406	0F	AA	14			STRA,R2	*CHPTR,+	
2185	3409	0E	13	F1			STRA,R2	HEXCUT	
2186	340C	2D	13	F2			LODA,R1	BYTSP	
2187	340F	8D	2A	69			STRA,R1	BYTSTG,+	
2188	3412	0E	17	F2			STRA,R1	BYTSP	
2189	3415	8D	29	FC			LODA,R1	BPPC	
2190	3418	85	01				ADDI,R1	01	
2191	341A	8C	09	FC			STRA,R1	BPPC	
2192	341D	16	FF				COMI,R2	FF	
2193	341F	16					BITC,LT		
2194	3422								
2195	3422	0F	0A	11		HEXOS	LODA,R2	*APFON	
2196	3423	16					BITC,LT		
2197	3424	0E	13	F1			LODA,R2	HEXCUT	
2198	3427	16	02				COMI,R2	2	
2199	3429	1C	34	AB			ECTA,EQ	HEXOS	
2200	342C	22					LODZ,R2		

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
2201	342D	14	03				SUBI,R0	3	
2202	342F	08	02				PCIF,R0	HEIOS1	
2203	3431	04	01				LODI,R0	01	
2204	3433	05	02			HEIOS1	LODI,R1	2	
2205	3435	01	EA	14			STRA,R1	*OBPTR,I	
2206	3436	00	0A	14		HEIOS2	LODA,R0	OBPTR	
2207	343B	04	01				ADDI,R0	1	
2208	343D	00	0A	14			STRA,R0	OBPTR	
2209	3440	00	02	06			COMA,R0	ENDRAM	
2210	3443	1E	34	AE			ECTA,LT	HEIOS	
2211	3446	05	10			BINOT	LODI,R1	10	BINARY OUT PUT
2212	3448	3F	46	07			PSTA,UN	FSTENG	
2213	344E	3F	46	F7			PSTA,UN	PAUSE	
2214	3441	14	1B				COMI,R0	ESC	
2215	3450	10	20	30			BCTA,R0	EDITOR	
2216	3453	3F	34	E6			PSTA,UN	BINADD	
2217	3456	20				NBO	EORZ,R0		
2218	3457	00	05	43			TFA,R0	*SUMI	
2219	345A	07	3A				LODI,R3	1	part? 08 nam THPE
2220	345C	3F	02	4F			BSTA,UN	SERO	
2221	345F	05	FF				LODI,R1	FF	
2222	3461	01	AA	14		HEADO	LODA,R1	(*OBPTR,+	
2223	3464	03					STRA,R3		
2224	3465	3F	02	4F			BSTA,UN	SERO	
2225	3468	15	02				COMI,R1	02	
2226	346A	08	75				PCIF,R0	HEADC	
2227	346C	0F	08	43			LODA,R3	*SUMI	
2228	346F	3F	02	4F			BSTA,UN	SERO	
2229	3472	3F	02	78			BSTA,UN	TPLAY	
2230	347F	00	06	43			STRA,R0	*SUMI	
2231	347E	0D	EA	14			LODA,R1	*OBPTR,I	
2232	347E	04	03				ADDI,R2	03	
2233	347E	00	00	2E			STRA,R0	TPMS	
2234	3482	2D	AA	14		BITSO	LODA,R1	*OBPTR,+	
2235	3483	03					STRA,R3		
2236	3484	3F	02	4F			PSTA,UN	SERO	
2237	3487	1E	02	2E			COMA,R1	TPMS	
2238	348A	08	74				PCIF,R0	BITSO	
2239	348C	0F	08	43			LODA,R3	*SUMI	
2240	348F	3F	02	4F			BSTA,UN	SERO	
2241	3492	00	00	2E			LODA,R0	TPMS	
2242	3495	14	03				COMI,R0	03	
2243	3497	1E	0E				BCTP,R0	BITSO	
2244	3499	3F	34	DA			PSTA,UN	A1FT	
2245	349C	1E	34	56			BCTA,LT	NBO	
2246	349F	3F	34	16		BITSO	PSTA,UN	BINADD	
2247	34A2	3F	2E	7A			BSTA,UN	ACY	
2248	34A5	00	00	05			LODA,R0	OBST	
2249	34A8	00	0A	14			STRA,R0	OBPTR	
2250	34AB	00	05	FC		HEIOS3	LODA,R0	BPPC	
2251	34AE	3F	3E	A7			BSTA,UN	APCTA	
2252	34B1	06	FF				LODI,R2	FF	
2253	34B3	00	0A	04			LODA,R0	TPMA	
2254	34B6	0E	AA	14			STRA,R2	*OBPTR,+	
2255	34B9	00	0A	05			LODA,R0	TPMA+1	

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
2256	34FC	0E	AA	14			STRA,R2	*OBPTR,+	
2257	34FF	2A					EORZ,R0		
2258	3400	0E	AA	14			STRA,R2	*OBPTR,+	
2259	3403	0E	13	F1			STRA,R2	HEIOS1	
2260	3406	17					RETC,UN		
2261	3407	17							
2262	3408								
2263	340B	00	19	81		APCDA	ADDA,R0	PC+1	
2264	340E	00	0A	03			STRA,R0	EUM2	
2265	340F	77	08				PPSL	WC	
2266	34D0	20					EORZ,R0		
2267	34D1	00	19	80			ADDA,R0	PC	
2268	34D4	00	0A	02			STRA,R0	EUMA	
2269	34D7	75	08				CPSL	WC	
2270	34D9	17					RETC,UN		
2271	34DA								
2272	34DA								
2273	34DA	00	0A	14		A1HT	LODA,R2	OBPTR	
2274	34DD	04	01				ADDI,R0	01	
2275	34DF	00	0A	14			STRA,R0	OBPTR	
2276	34E2	00	00	06			COMA,R0	ENDRAM	
2277	34F5	17					RETC,UN		
2278	34F6								
2279	34F6								
2280	34F6	00	00	05		BINADD	LODA,R0	OBST	
2281	34F6	00	0A	14			STRA,R0	OBPTR	
2282	34F0	22					EORZ,R0		
2283	34ED	00	0A	15			STRA,R0	OBPTR-1	
2284	34F0	17					RETC,UN		
2285	34F1								
2286	34F1								
2287	34F1	2D	09	FC		PRTDB	LODA,R1	BPPC	
2288	34F4	14					RETC,R0		
2289	34F5	15	04				COMI,R1	4	
2290	34F7	1A	02				BCTP,LT	NEXTLS	
2291	34F9	05	04				LODI,R1	4	
2292	34FE	0E	2A	69		NEXTLS	LODA,R2	BITSTG,+	
2293	34F1	3F	3E	56			PSTA,UN	PRINT	
2294	34F1	3F	3E	6E			PSTA,UN	PRBL	
2295	3504	12	75				STRA,R1	NEXTLS	
2296	3506	17					RETC,UN		
2297	3507								
2298	3507	47	7F			INDIR	ANDI,R3	7F	
2299	3509	25	11				LODI,R1	11	
2300	350B	00	0A	1B			LODA,R1	TITBUF,I	
2301	350B	14	2A				COMI,R0	*	
2302	3510	16					RETC,LT		
2303	3511	15					RETC,GT		
2304	3512	67	80				IOPI,R3	82	
2305	3514	17					RETC,UN		
2306	3515								
2307	3515	3F	45	C9		P2END	BSTA,UN	LYOR	
2308	351B	00	0A	11			LODA,R0	TAPION	
2309	351B	00	3E	3F			EORZ,R0	P2I2	
2310	351B	00	13	F1			LODA,R0	HEIOS1	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2311	3521	A4	23				SUBI,R0	03	
2312	3527	08	22				BCFP,FO	P2D1	
2313	3525	04	01				LODI,R2	01	
2314	3527	02	02			P2D1	LODI,R2	02	
2315	3529	0E	1A	14			STPA,R2	*OPPTR,I	
2316	3520	3F	34	DA			BSTA,UN	A1HT	
2317	3527	9A	08				BCFP,LT	NOZFR	
2318	3531	06	03				LODI,R2	03	
2319	3533	20					EOE2,P0		
2320	3534	0E	CA	14		ZERLP	STRA,R2	*ORPTR,-	
2321	3537	5A	0B				BRNR,R2	ZERLP	
2322	3535	3F	34	46		NOZER	BSTA,UN	BINCT	
2323	3530	3F	45	C9			BSTA,UN	LFCR	
2324	353F	0C	0F	14		P2D2	LODA,R0	ERRS	
2325	3542	3F	47	4F			BSTA,UN	EXOT	
2326	3545	05	14				LODI,R1	14	
2327	3547	3F	46	CA			BSTA,UN	PRING	
2328	354A	04	F0				LODI,P0	F0	
2329	3540	0C	09	7A			LODA,R1	CUTCFF	
2330	354F	3C	20	2A			BSTA,EO	DPRINT	
2331	3552	3F	46	F7			BSTA,UN	PAUSE	
2332	3555	1F	20	30			BSTA,UN	EDITOR	
2333	3558					*			
2334	3558	03				PRINT	STHZ,R3		
2335	3559	52					RFP,R0		
2336	355A	02					RFP,R0		
2337	355B	52					RFP,R0		
2338	355C	50					RFP,R0		
2339	355D	44	0F				ANDI,P0	0F	
2340	355F	0C	78	AC			LOIA,R2	BITEL,I	
2341	3562	3F	35	70			BSTA,UN	PRNT	
2342	3565	47	0F				ANDI,R3	0F	
2343	3567	0C	76	AC			LOIA,R3	BITEL,I	
2344	356A	3F	35	70			BSTA,UN	PRNT	
2345	356D	17					RPTC,UN		
2346	356E					*			
2347	356E	04	20			PRBL	LODI,R0		
2348	3570	77	12			PRNT	PPSL	RS	
2349	3572	2D	29	FA			LODA,R1	CUTOFF	
2350	3575	98	05				BCFP,FO	CNDISP	
2351	3577	3F	22	0A			BSTA,UN	DPRINT	
2352	357A	77	12				PPSL	RS	
2353	357C	2D	29	FB		CKDISP	LODA,R1	DISPON	
2354	357F	1A	2C				BCFP,LT	PRTRTN	
2355	3581	44	7F				ANDI,R0	7F	
2356	3583	14	0D				COMI,R0	CH	
2357	3585	98	24				BCFP,EO	DISP3	
2358	3587	3F	2E				BSTA,UN	LFCRST	
2359	3589	1F	23				BSTA,UN	PRTRTN	
2360	358B	3F	45	8D		DISP3	BSTA,UN	WRT	
2361	358E	78	12			PRTRTN	CYSL	RS	
2362	3592	17					ETC,UN		
2363	3591					*			
2364	3591	3F	45	C9		LFCRST	BSTA,UN	LFCR	
2365	3594	21	2A	0F			LODA,R0	DISPLN	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2366	3597	04	21				ADDI,R2	1	
2367	3598	0C	0A	0F			STPA,R0	DISPLN	
2368	359C	14	2F				COMI,R0	F	
2369	359F	16					RPTC,LT		
2370	359F	20					FORZ,R0		
2371	35A2	0C	0A	0F			STPA,R0	DISPLN	
2372	35A3	3F	45	F7			BSTA,UN	PAUSE	
2373	35A6	17					RPTC,UN		
2374	35A7					*			
2375	35A7	2C	19	01		APCTA	ADDA,R0	FC+1	
2376	35AA	0C	0A	05			STPA,R0	TMFA+1	
2377	35AD	77	08				PPSL	WC	
2378	35AF	22					FORZ,R0		
2379	35B0	8C	19	00			ADDA,R0	PC	
2380	35B3	0C	0A	04			STPA,R0	TMFA	
2381	35B6	75	08				CPSL	WC	
2382	35B8	17					RPTC,UN		
2383	35B9					*			
2384	35B9					*			
2385	35B9					*			
2386	35B9	25	22			HEADIN	LODI,R1	02	
2387	35BA	0D	13	F0			STRA,R1	PLINE	
2388	35BA	3F	36	4B			BSTA,UN	BLKPRT	
2389	35C1	2C	0A	0D			LOIA,R2	PAGF+1	
2390	35C4	54	67				ADDI,R0	67	
2391	35C6	54					PAR,R0		
2392	35C7	0C	0A	0D			STPA,R0	PAGE+1	
2393	35CA	77	28				PPSL	WC	
2394	35CC	2C	0A	0C			LODA,P0	PAGE	
2395	35CF	64	66				ADDI,R0	66	
2396	35D1	94					IAR,R0		
2397	35D2	0C	CA	2C			TRA,R2	PAGE	
2398	35D5	75	08				CPSL	WC	
2399	35D7	3F	35	58			BSTA,UN	PRINT	
2400	35DA	2C	0A	0D			LOIA,R2	PAGE+1	
2401	35DC	3F	35	58			BSTA,UN	PRINT	
2402	35DE	04	0A				LODI,R0	1F	
2403	35E0	3F	35	70			BSTA,UN	PRINT	
2404	35E1	04	2C				LODI,R2	CH	
2405	35E7	3F	35	70			BSTA,UN	PRINT	
2406	35EA	17					RPTC,UN		
2407	35EB					*			
2408	35EB					*			
2409	35EB	2C	0A	2A	0A	FPTBUF DATA		FORMF,LF,LF,LF,CP	
2410	35EB	2C							
2411	35F0	4C	49	45	45	ALIT		LINE ADDR B1 B2 B3 B4 LABEL OPCODE OPERAND	
2412	35F4	27	70	41	44				
2413	35F8	44	52	22	42				
2414	35FC	31	26	42	32				
2415	35FF	27	42	33	02				
2416	3604	47	34	20	4C				
2417	3608	41	42	45	4C				
2418	360C	26	22	42	52				
2419	3612	43	4F	44	45				
2420	3614	20	22	20	20				

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2421	3618	20	4F	50	45				
2422	361C	52	41	4E	44				
2423	3622	22	22	20	43		ALIT		COMMENTS PAGE
2424	3624	4F	40	47	4F				
2425	3626	41	54	53	20				
2426	362C	20	20	20	20				
2427	3630	20	20	20	50				
2428	3634	41	47	4F	20				
2429	363E	FF					DATA	FF	
2430	363D	2A	2A	2A	20	PMSC4	ALIT	***	
2431	363D	FF					DATA	FF	
2432	363E	20	4F	52	52	PMSC5	ALIT	ERROR ***	
2433	3642	4F	52	20	2A				
2434	3646	2A	2A						
2435	364E	2A	0D	FF			DATA	LF,CR,FF	
2436	364E					*			
2437	364B	0D	75	EB		BLKPRT	LOCAL	PRTBUY.I	
2438	364E	16				RETC,LT			
2439	364F	0F	3E	70		ESTA,UN		PRNT	
2440	3652	19	77			BIRR,R1		BLKPRT	
2441	3654	17				RETC,UN			
2442	3655					*			
2443	365E	3F	21	92		BUG	BSTA,UN	ERASE	
2444	365B	1F	42	90			BCTA,UN	DCOMD	
2445	365B	3F	21	92		DEBUG	BSTA,UN	FRASE	
2446	365E	1F	41	4C			BCTA,UN	AR	
2447	3661					*			
2448	3661					*****		LIST OF TABLES	
2449	3661					*			
2450	3661					*			
2451	3661	20				TAB1	DATA	INZERO-JADD1	
2452	3662	5F					DATA	INIM-JADD1	
2453	3663	65					DATA	INREL-JADD1	
2454	3664	20					DATA	INABS-JADD1	
2455	3665	1F				TAB2	DATA	OTZPRO-JADD2	
2456	3666	03					DATA	OUTIM-JADD2	
2457	3667	02					DATA	OUTREL-JADD2	
2458	3668	00					DATA	OUTABS-JADD2	
2459	3669	6C				TAB3	DATA	EX1-JADD3	
2460	366A	64					DATA	EX2-JADD3	
2461	366B	02					DATA	GREL-JADD3	
2462	366C	43					DATA	GABS-JADD3	
2463	366D					*			
2464	366D	00				TAB10	DATA	RETC-JEX0	
2465	366E	25					DATA	RETE-JEX0	
2466	366F	5E					DATA	RELE-JEX0	
2467	3670	12					DATA	CFS-JEX0	(PPS)
2468	3671	F7					DATA	DAR-JEX0	
2469	3672	34					DATA	TFS-JEX0	
2470	3673	92					DATA	WRTI-JEX0	
2471	3674	42					DATA	TMI-JEX0	
2472	3675					*			
2473	3675	10				TABX1	DATA	SPS-JEX1	
2474	3676	30					DATA	REDC-JEX1	
2475	3677	0E					DATA	RRR-JEX1	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2476	3678	36					DATA	REDD-JEX1	
2477	3679	20					DATA	LPS-JEX1	
2478	367A	75					DATA	WRTC-JEX1	
2479	367B	20					DATA	RRL-JEX1	
2480	367C	61					DATA	WRPD-JEX1	
2481	367D					*			
2482	367D	20				REDETE	DATA	REDE1-REDEK	
2483	367E	25					DATA	REDE1-REDEK	
2484	367F	0F					DATA	REDE1-REDEK	
2485	3680	19					DATA	REDE1-REDEK	
2486	3681					*			
2487	3681	00				REDTAB	DATA	RED0-RED0	
2488	3682	04					DATA	RED1-RED0	
2489	3683	04					DATA	RED1-RED0	
2490	3684	11					DATA	RED2-RED0	
2491	3685					*			
2492	3685	00				WRTETB	DATA	WRTEX-WRTEX	
2493	3686	0F					DATA	WRT11-WRT11	
2494	3687	06					DATA	WRT15-WRT15	
2495	3688	06					DATA	WRT15-WRT15	
2496	3689					*			
2497	3689	00				WRTTB	DATA	WRT11-WRT11	
2498	368A	05					DATA	WRT15-WRT11	
2499	368B	17					DATA	WRT4-WRT11	
2500	368C	17					DATA	WRT4-WRT11	
2501	368D					*			
2502	368D	72				MODTAB	DATA	DCOMD-OUT	
2503	368E	72					DATA	S1-OUT	
2504	368F	43					DATA	ST-OUT	
2505	3690	1F					DATA	TP-OUT	
2506	3691	62					DATA	SS-OUT	
2507	3692					*			
2508	3692	10				INVAL	DATA	10	INVALID OPCODES
2509	3693	11					DATA	11	
2510	3694	50					DATA	50	
2511	3695	91					DATA	91	
2512	3696	F6					DATA	B5	
2513	3697	B7					DATA	B7	
2514	3698	C4					DATA	C4	
2515	3699	C5					DATA	C5	
2516	369A	C6					DATA	C6	
2517	369B	C7					DATA	C7	
2518	369C					*			
2519	369C					*			
2520	369C	4A	4C	55	49	KEYTAB	ALIT	JULIOM..	
2521	36A0	4F	4D	2C	2F				
2522	36A4	FF				KEY0	DATA	FF	
2523	36A5	01					DATA	01	
2524	36A5	FF					DATA	FF	
2525	36A7	F0					DATA	F0	
2526	36A8	F1					DATA	F1	
2527	36A9	0F					DATA	0F	
2528	36AA	10					DATA	10	
2529	36AB	11					DATA	11	
2530	36AC					*			

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2531	36A0	32	31	32	33	EXTBL	ALIT	'0123456789ABCDEF'	
2532	36B0	34	35	36	37				
2533	36C4	38	39	41	42				
2534	36D0	43	44	45	46				
2535	36E0								
2536	36E0	02				ADRTAB	DATA	00	
2537	36D0	01					DATA	01	
2538	36D1	01					DATA	01	
2539	36D1	02					DATA	02	
2540	36C0								
2541	36C0								
2542	36C0	43	48			COMTE2	ALIT	'CH'	
2543	36C2	41	66				ACON	CH	
2544	36C4	43	4F				ALIT	'CO'	
2545	36C6	40	02				ACON	CO	
2546	36C8	44	49				ALIT	'DI'	
2547	36CA	43	68				ACON	DDIS	
2548	36CC	44	53				ALIT	'DS'	
2549	36CE	3F	75				ACON	DSEUG	
2550	36D0	49	4E				ALIT	'IN'	
2551	36D2	42	08				ACON	IN	
2552	36D4	52	41				ALIT	'PA'	
2553	36D6	43	59				ACON	DPAGE	
2554	36D8	50	43				ALIT	'PC'	
2555	36DA	43	41				ACON	PCIT	
2556	36DC	52	45				ALIT	'RE'	
2557	36DE	41	94				ACON	RF	
2558	36E0	41	41				ALIT	'AA'	
2559	36E2	41	46				ACON	AA	
2560	36E4	41	50				ALIT	'AF'	
2561	36E6	41	34				ACON	AP	
2562	36E8	41	52				ALIT	'AR'	
2563	36EA	41	40				ACON	AR	
2564	36EC	41	53				ALIT	'AS'	
2565	36EE	41	02				ACON	AS	
2566	36F0	49	50				ALIT	'IP'	
2567	36F2	42	0D				ACON	IP	
2568	36F4	49	52				ALIT	'IR'	
2569	36F6	42	05				ACON	IRIT	
2570	36F8	49	53				ALIT	'IS'	
2571	36FA	47	19				ACON	IS	
2572	36FC	4F	41				ALIT	'OA'	
2573	36FE	42	19				ACON	OA	
2574	3702	4F	53				ALIT	'OS'	
2575	3702	42	15				ACON	OS	
2576	3704	4F	52				ALIT	'OP'	
2577	3706	42	11				ACON	OR	
2578	3708	53	49				ALIT	'SI'	
2579	370A	43	0F				ACON	CSI	
2580	370C	53	54				ALIT	'ST'	
2581	370E	43	17				ACON	GST	
2582	3710	54	52				ALIT	'TR'	
2583	3712	43	49				ACON	CTR	
2584	3714	42	52				ALIT	'BR'	
2585	3716	3F	69				ACON	BR	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2586	3718	43	40				ALIT	'CL'	
2587	371A	3F	43				ACON	CLIT	
2588	371C	45	58				ALIT	'EX'	
2589	371E	3F	51				ACON	EX	
2590	3722	52	55				ALIT	'PU'	
2591	3722	43	60				ACON	PASS1	
2592	3724	45	44				ALIT	'FD'	
2593	3726	20	58				ACON	EDITOR	
2594	3728	FF					DATA	FF	
2595	3728								
2596	3728								
2597	3728								
2598	3728								
2599	3728	40	4F	50	55	MSG2	ALIT	'INPUT PORT'	
2600	372D	54	20	50	4F				
2601	3731	52	54	20					
2602	3734	FF					DATA	FF	
2603	3735	4F	55	54	50	MSG1	ALIT	'OUTPUT PORT'	
2604	3739	55	54	20	50				
2605	373D	4F	52	54	20				
2606	3741	FF					DATA	FF	
2607	3742	42	52	45	41	MSG2	ALIT	'BREAK POINT'	
2608	3746	43	20	50	4F				
2609	374A	49	4E	54	20				
2610	374E	FF					DATA	FF	
2611	374F	22	43	40	45	MSG3	ALIT	'CLEARED'	
2612	3753	41	52	45	44				
2613	3757	FF					DATA	FF	
2614	3758	53	54	41	43	MSG4	ALIT	'STACK= '	
2615	375C	45	3D	20					
2616	375F	FF					DATA	FF	
2617	3762	2F	49	4E	56	MSG5	ALIT	'INVALID COMMAND'	
2618	3764	41	42	49	44				
2619	3768	2F	43	4F	41				
2620	376C	41	41	4E	44				
2621	3770	FF					DATA	FF	
2622	3771	44	45	42	55	MSG6	ALIT	'DEBUG> '	
2623	3775	4F	3E	20					
2624	3778	FF					DATA	FF	
2625	3779	42	62	4F	47	MSG7	ALIT	'PROGRAM HALTED'	
2626	377D	52	41	4D	20				
2627	3781	48	41	40	54				
2628	3785	45	44						
2629	3787	FF					DATA	FF	
2630	3788	22	52	45	41	MSG8	ALIT	'REACHED AT '	
2631	378C	43	48	45	44				
2632	3792	3F	41	54	20				
2633	3794	FF					DATA	FF	
2634	3795	49	4E	56	41	MSG9	ALIT	'INVALID OPCODE'	
2635	3799	40	49	44	20				
2636	379D	4F	50	43	4F				
2637	37A1	44	45						
2638	37A3	FF					DATA	FF	
2639	37A4	20	43	43	3D	MSGA	ALIT	'CC= '	
2640	37A8	FF					DATA	FF	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2641	37A9	22	20	49	4E	MSG8	ALIT		'INVALID HEX VALUE'
2642	37AD	56	41	40	49				
2643	37E1	44	20	48	45				
2644	37E5	58	20	56	41				
2645	37E9	4C	55	45					
2646	37FC	FF					DATA	FF	
2647	37ED	42	4C	4F	43	MSGC	ALIT		'BLOCKS LEFT:'
2648	37C1	48	53	20	20				
2649	37C5	4C	45	46	54				
2650	37C9	3A	20	20					
2651	37C0	FF					DATA	FF	
2652	37C8	54	4F	47	20	MSGD	ALIT		'TOO MUCH'
2653	37E1	4D	55	43	48				
2654	37E5	FF					DATA	FF	
2655	37D0	4E	4F	54	20	MSGI	ALIT		'NOT FOUND'
2656	37DA	46	4F	55	4E				
2657	37E1	44							
2658	37DF	FF					DATA	FF	
2659	37E2	4D	4F	44	49	MSGF	ALIT		'MODIFY STRING '='
2660	37E4	46	59	20	53				
2661	37E8	54	52	49	4E				
2662	37E0	47	20	27					
2663	37F0	00	00	00	00	MNAME	RES	10	
2664	37F3	00	00	00	00				
2665	37F7	00	00	00	00				
2666	37FB	00	00	00	00				
2667	37FF	27	20	54	4F		ALIT		'=' TO '='
2668	3603	20	27						
2669	37E1	FF					DATA	FF	
2670	3600	53	55	4D	43	MSG10	ALIT		'SUMCHECK ERROR'
2671	360A	4E	45	43	4B				
2672	3601	20	45	52	52				
2673	3612	4F	52						
2674	3614	FF					DATA	FF	
2675	3615	50	41	53	53	MSG11	ALIT		'PASS 1'
2676	3619	20	31						
2677	3613	FF					DATA	FF	
2678	361C	50	41	53	53	MSG12	ALIT		'PASS 2'
2679	3620	20	32						
2680	3622	FF					DATA	FF	
2681	3623	53	59	4D	42	MSG13	ALIT		'SYMBOL OVERFLOW'
2682	3627	4F	4C	20	4F				
2683	362E	56	45	52	4E				
2684	362F	4C	4F	57					
2685	3632	FF					DATA	FF	
2686	3633	20	45	52	52	MSG14	ALIT		'ERRORS'
2687	3637	4F	52	53					
2688	363A	FF					DATA	FF	
2689	363E	44	55	50	4C	MSG15	ALIT		'DUPLICATE LABEL:'
2690	363F	46	43	41	54				
2691	3643	45	20	4C	41				
2692	3647	42	4C	45	3A				
2693	364B	20							
2694	364C	FF					DATA	FF	
2695	364D	4F	50	43	4F	MSG16	ALIT		'OPCODE'

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2696	3651	44	45						
2697	3613	FF					DATA	FF	
2698	3654	4C	41	42	4C	MSG17	ALIT		'LABEL USED TWICE'
2699	3658	45	2C	55	53				
2700	361C	45	44	20	54				
2701	3660	57	49	43	45				
2702	3664	FF					DATA	FF	
2703	3665	4F	50	45	52	MSG18	ALIT		'OPERAND'
2704	3669	41	43	44					
2705	366C	FF					DATA	FF	
2706	366D	52	45	47	49	MSG19	ALIT		'REGISTER FIELD'
2707	3671	53	54	45	52				
2708	3675	20	46	49	45				
2709	3679	4C	44						
2710	367B	FF					DATA	FF	
2711	367C	44	45	53	50	MSG1A	ALIT		'DISPLACEMENT'
2712	3680	4C	41	43	45				
2713	3684	4D	45	4E	54				
2714	3688	FF					DATA	FF	
2715	3689	50	41	47	45	MSG1B	ALIT		'PAGEING'
2716	368D	49	4E	47					
2717	3692	FF					DATA	FF	
2718	3691	42	49	4E	41	MSG1C	ALIT		'BINARY OUTPUT'
2719	369F	52	59	20	20				
2720	36C9	4F	55	54	50				
2721	36CD	55	54						
2722	36DF	FF					DATA	FF	
2723	36A0	43	4F	4D	4D	MSG1D	ALIT		'COMMAND:'
2724	36A4	41	4E	44	3A				
2725	36A8	20	20						
2726	36AA	FF					DATA	FF	
2727	36AB	44	41	54	41	MSG1E	ALIT		'DATA INPUT'
2728	36AF	20	49	4E	50				
2729	36B3	55	54						
2730	36B5	FF					DATA	FF	
2731	36B6	20	4F	42		MSG1F	ALIT		'OK'
2732	36B9	FF					DATA	FF	
2733	36BA								***** SIMULATOR *****
2734	36BA								
2735	36BA	05	09			INER	LCDA,R1	9	
2736	36BC	3F	46	07		ECTA,UN	ECTA,UN		'INVALID OPCODE'
2737	36BF	1F	20	4E		ECTA,UN	ECTA,UN		
2738	36C2								
2739	36C2	00				IR	RES	1	
2740	36C3								
2741	36C3	00	99	00		GETOP	LCDA,R2	*PC	
2742	36C6	3F	4A	58		ECTA,UN	ECTA,UN	PCINC	
2743	36C9	00	77			ECTA,UN	ECTA,UN	10	
2744	36CB	47	0A			LCDA,R3	LCDA,R3	0A	
2745	36CD	1F	56	92		ECTA,UN	ECTA,UN	INVAL,-	CHECK FOR VALID OPCODE
2746	36D2	1E	68			ECTA,UN	ECTA,UN	INER	
2747	36D2	58	79			ECTA,UN	ECTA,UN	VALID	
2748	36D4	01				STRZ,R1	STRZ,R1		
2749	36D5	02				STRZ,R2	STRZ,R2		
2750	36D6	44	03			ANDI,R0	ANDI,R0	03	

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
2751	38D8	00	1A	7E			STRA,R2	REGIND	STORE REGISTER BITS (BITS 1 AND 8)
2752	38E5	51					RBR,R1		
2753	38D0	51					RBR,R1		
2754	38D0	01					LODR,R1		
2755	38E5	44	03				ANDI,R0	03	
2756	38E5	03					STRT,R3		
2757	38E1	00	19	7F			STRA,R0	ADRMD	STORE ADDRESS MODE BITS (BITS 2 AND 3)
2758	38E4	51					RBR,R1		
2759	38E5	51					RBR,R1		
2760	38E5	01					LODR,R1		
2761	38E7	45	0E				ANDI,R1	0E	
2762	38E9	44	01				ANDI,R0	01	
2763	38E5	50	35	45			PCFA,R0	BRANCH	BRANCH IF BRANCH BIT SET IN INSTRUCTION
2764	38E5	16	00			NONB	COMI,R2	00	TEST FOR NOP
2765	38F2	10	42	13			PCFA,R0	NOP	
2766	38F3	16	40				COMI,R2	40	TEST FOR HALT
2767	38F5	10	3B	9B			PCFA,R0	HALT	
2768	38F8	0F	76	61			LODR,R3	TAB1,I	SET UP REGISTERS
2769	38F5	03					STRT,R3		
2770	38F0	FF	3A	21			PSXA	JALDI	
2771	38E1	0F	18	C2			LODR,R3	IR	SET UP OPCODE
2772	38E2	47	F2				ANDI,R3	E0	
2773	38E4	67	01				LODR,R3	01	
2774	38E6	08	3A			NONB	STRT,R0	CTMP	
2775	38E8	09	39				STRT,R1	CTMP+1	
2776	38E8	08	08				STRT,R3	CODE	
2777	38E0	00	1F	06			LODR,R0	SFSL	
2778	38E5	03					IFSL		
2779	38E2	29	31				LODR,R1	CTMP+1	
2780	38E2	08	2E				LODR,R2	CTMP	
2781	38E4	02				CODE	RES	1	EXECUTE OPCODE
2782	38E5	09	2C				STRT,R1	CTMP+1	
2783	38E7	08	29				STRT,R2	CTMP	
2784	38E9	13					SFSL		
2785	38E1	00	28				STRT,R0	CTMP+2	
2786	38E0	24	02				LODR,R0	02	
2787	38E5	03					IFSL		
2788	38E5	20	18	C2			LODR,R0	IR	
2789	38E2	44	FC				ANDI,R0	FC	
2790	38E4	F4	06				COMI,R0	06	
2791	38E6	18	09				PCFA,R0	NONB	BRANCH IF STORE RELATIVE
2792	38E8	F4	00				COMI,R0	00	
2793	38E8	18	05				PCFA,R0	NONB	BRANCH IF STORE ABS.
2794	38E0	08	16				LODR,R3	CTMP+2	
2795	38E1	0F	1F	06			STRA,R3	SFSL	STORE OUT THE CC.
2796	38E1	0F	16	7F		NONB	LODR,R3	ADRMD	STORE ALL REG.
2797	38E4	2F	76	65			LODR,R3	TAB2,I	
2798	38E7	03					STRT,R3		
2799	38E8	08	08				LODR,R0	CTMP	
2800	38E8	09	27				LODR,R1	CTMP+1	
2801	38E0	EF	3A	02			PSXA	JADD2	
2802	38E5	1F	42	13			PCFA,UN	OUT	
2803	38E2								
2804	38E2	00	00	00			CTMP	RES	3
2805	38E5								

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
2806	38E5								
2807	38E5	0F	76	69			BRANCH	LODR,R3	TAB3,I
2808	38E2	03					STRT,R3		
2809	38E9	EF	3A	27			PSXA	JADD3	
2810	38E0	0E	18	C2			LODR,R2	IR	
2811	38E4	0F	1F	06			LODR,R1	SFSL	
2812	38E2	20	1A	7E			LODR,R0	REGIND	
2813	38E5	F8	40				TM1,R2	40	
2814	38E7	10	39	D7			PCFA,R0	BREG	BRANCH IF IR=REG. BRANCH
2815	38E8	F4	03				TM1,R0	03	
2816	38E0	10	39	84			PCFA,R0	BRUN	BRANCH IF UN
2817	38E5	50					RBR,R0		TEST CONDITION OF BRANCH
2818	38E0	50					RBR,R0		
2819	38E1	21					PCFA,R1		
2820	38E2	01					STRT,R1		
2821	38E3	01					RBR,R1		
2822	38E4	61					LODR,R1		
2823	38E5	22					PCFA,R2		
2824	38E6	1F	42	13			PCFA,LT	OUT	OUT IF NO BRANCH
2825	38E9	3F	3B	0E		JUMP2	PCFA,UN	INDIRT	SEE IF INDIRECT
2826	38E0	0F	18	C2		JUMP	LODR,R3	IR	
2827	38E5	F7	20				TM1,R3	20	TEST FOR SUBROUTINE
2828	38E1	30	3A	B6			PCFA,R0	PUSH	
2829	38E4	00				JUMP1	LODR,R0	MAR	
2830	38E6	0F	0E				LODR,R1	MAR+1	
2831	38E8	04	26				STRT,R0	PC	SET PC TO NEW ADDRESS
2832	38E8	09	25				STRT,R1	PC+1	
2833	38E0	1F	42	13			PCFA,UN	OUT	
2834	38E5								
2835	38E5	24					ADRMD	RES	1
2836	38E2	02	00				PC	RES	2
2837	38E2	00	00				MAR	RES	2
2838	38E4								
2839	38E4	22					BRUN	LODR,R2	
2840	38E5	0A	62				PCFA,LT	JUMP	IF (B777,UN) THEN BRANCH
2841	38E7	08	76				LODR,R0	ADRMD	
2842	38E9	F4	22				COMI,R0	22	
2843	38E5	18	17				PCFA,R0	2B7R	BRANCH USING (2B7R)
2844	38E1								IF NOT BRANCH USING (E7XA)
2845	38E1	3F	3B	0E			PCFA,UN	INDIRT	
2846	38E0	3F	3A	6D			PCFA,UN	LREG	
2847	38E3	01					STRT,R1		
2848	38E4	20					LODR,R0		
2849	38E5	09	60				ADR,R1	MAR+1	
2850	38E7	09	6A				STRT,R1	MAR+1	
2851	38E9	77	00				IFSL	WC	
2852	38E2	08	01				ADR,R2	MAR	
2853	38E0	08	63				STRT,R0	MAR	
2854	38E5	7E	28				IFSL	WC	
2855	38E1	17	39	6C			PCFA,UN	JUMP	
2856	38E4	09	5B			2B7R	LODR,R1	PC+1	
2857	38E5	7E	5B				LODR,R0	PC	
2858	38E8	08	25				STRT,R0	PCSAV	
2859	38E8	09	2A				STRT,R1	PCSAV+1	
2860	38E0	45	01				STRT,R1	01	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2841	33AE	77	08				PFSI	WC	
2842	33E2	A6	03				SUBI,R2	R2	
2843	33E2	75	08				CPSI	WC	
2844	33F4	02	41				STPR,R2	PC	
2845	33E6	09	49				STPR,R1	PC+1	
2846	33B8	2A	26				LODR,R2	*PC	
2847	33EA	3F	3A	93			BSTA,UN	PCINC	
2848	33ED	20					FORZ,R0		
2849	33EE	0C	19	80			STPA,R0	PC	
2849	33EC	0C	19	81			STPA,R0	PC+1	
2871	33C4	02					LODZ,R2		
2872	33C5	3F	3E	2D			BSTA,UN	GRELO	
2873	33C8	28	01				LOIR,R0	PCSAV	
2874	33CA	0C	19	82			STPA,R2	PC	
2875	33CD	28	07				LOIR,R0	PCSAV+1	
2876	33CF	0C	19	81			STPA,R0	PC+1	
2877	33D2	1F	39	69			BCTA,UN	JUMP0	
2878	33E5								
2879	33E5	20	20				PCSAV	RES	2
2880	33D7								
2881	33D7								
2882	33E7	3F	3A	ED			BREG	BSTA,UN	LREG
2883	33EA	F5	80				TMI,R2	R0	
2884	33DC	18	07				BCTR,EQ	BREG0	BRANCH IF INC. OR DEC. REG.
2885	33E5	20					LODZ,R0		
2886	33E5	10	42	13			BCTA,EO	OUT	
2887	33E2	1F	39	69			BCTA,UN	JUMP0	JUMP IF REG NOT ZERO
2888	33E5	F6	20				TMI,R2	R2	
2889	33E7	18	02				BCTR,EQ	BREG1	
2890	33E9	84	02				ADII,P2	R2	
2891	33EB	A4	01				SUBI,R0	R1	
2892	33ED	3F	3A	E3			BSTA,UN	SREG	
2893	33E2	20					LODZ,R0		
2894	33E1	10	42	13			BCTA,EO	OUT	IF ZERO, NO JUMP
2895	33F4	3F	3E	2E			BSTA,UN	INDIRT	DO THE JUMP
2896	33F7	0C	19	E2			LODA,R0	MAR	
2897	33FA	01	19	E3			LODA,R1	MAR+1	
2898	33FD	1F	39	74			BCTA,UN	JUMP1	
2899	3A02								
2900	3A02						JADD2	EQU	\$
2901	3A02								
2902	3A02								
2903	3A02								
2904	3A20	CD	55	E2			OUTABS	EQU	\$
2905	3A03						OUTREL	STRA,R1	*MAR
2906	3A03	0F	1A	7E			CUTIM	EQU	\$
2907	3A06	18	29				SREG	LODA,R3	REGIND
2908	3A08	0E	1F	05			BCTR,EQ	REG1	
2909	3A0B	46	12				LODA,R2	SPSL	
2910	3A0D	18	02				ANDI,P2	R0	
2911	3A2F	87	23				BCTR,EQ	REG1	
2912	3A11	CF	7E	FF			ADDI,R3	R3	
2913	3A14	17					STRA,R3	CPUREG,1	
2914	3A15						RETC,UN		
2915	3A15								

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
2916	3A15	09	09				CTZERO	STPR,R2	ZTEM
2917	3A17	01						LODZ,R1	
2918	3A18	3E	69				BSTR,UN	SREG	
2919	3A1A	08	04				LOIR,P0	ZTEM	
2920	3A1C	0C	1E	FF			STRA,R0	CPUREG	
2921	3A1F	17					RETC,UN		
2922	3A20								
2923	3A20	03					ZTEM	RES	1
2924	3A21								
2925	3A21								
2926	3A21						JADD1	EQU	\$
2927	3A21								
2928	3A21								
2929	3A21								
2930	3A21	3F	3B	5A			INABS	BSTA,UN	GABS
2931	3A24	0C	19	80			LODA,R0	PC	
2932	3A27	44	60				ANDI,R0	R0	
2933	3A29	2D	19	82			LODA,R1	MAR	
2934	3A2C	4F	1F				ANDI,R1	1F	
2935	3A2E	61					IOEZ,R1		
2936	3A2F	0C	19	82			STPA,R0	MAR	
2937	3A32	3F	3E	01			BSTA,UN	INDIRT	
2938	3A35	0C	2A	2C			LODA,R0	PAGE	
2939	3A38	16	30				BCTR,EO	INABS0	
2940	3A3A	06	00				LOLI,R2	R0	
2941	3A3C	E4	60				COMI,R0	R0	
2942	3A3E	16	07				BCTR,EQ	LDABS0	BRANCH IF INDEX-ONLY
2943	3A40	D0					RRI,R2		
2944	3A41	1A	02				BCTR,LT	LDABS1	BRANCH IF AUTO-DECREMENT
2945	3A43	06	02				ADDI,R2	R2	
2946	3A45	A5	C1				LDABS1	SUBI,R2	R1
2947	3A47	3F	3A	6D			LDABS0	BSTA,UN	LREG
2948	3A4A	B2					ADIZ,R2		
2949	3A49	3F	3A	E3			BSTA,UN	SREG	
2950	3A4E	8C	19	83			ADIA,R0	MAR+1	
2951	3A51	0C	19	83			STPA,R0	MAR+1	
2952	3A54	77	08				PFSI	WC	
2953	3A56	22					FORZ,R0		
2954	3A57	8C	19	82			ADIA,R0	MAR	
2955	3A5A	75	08				CPSI	WC	
2956	3A5C	0D	19	82			LODA,R1	MAR	
2957	3A5F	44	1F				ANDI,R0	1F	
2958	3A61	4F	60				ANDI,R1	R0	
2959	3A63	61					IOEZ,R1		
2960	3A64	0C	19	82			STPA,FP	MAR	
2961	3A67	2A					KRZ,P0		
2962	3A68	08	14				STPR,P0	REGIND	
2963	3A6A	0D	59	82			INABS0	LODA,R1	*MAR
2964	3A6D	0F	0F				LREG	LOPR,R3	REGIND
2965	3A6F	1F	09				BCTR,EQ	REG0	
2966	3A71	2C	1F	06			LODA,R0	SPSL	
2967	3A74	44	10				ANDI,R0	R0	
2968	3A7E	18	02				BCTR,EQ	REG0	
2969	3A78	87	23				ADDI,R3	R3	
2970	3A7A	2F	7E	FF			REG2	LODA,R3	CPUREG,1

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPFRAND	COMMENTS
2871	3A7D	17					FETC.UN		
2872	3A7E								
2873	3A7F	02					REGIND RES	1	
2874	3A7F								
2875	3A7F	2D	99	88			INIM LODA,R1	*PC	
2876	3A80	39	14				ESTR.UN	PCINC	
2877	3A84	1E	67				ECTR.UN	LRIG	
2878	3A86								
2879	3A86	3F	3B	27			INREL ESTA.UN	GRIL	
2880	3A86	3F	3B	0E			ESTA.UN	INDIRT	
2881	3A8C	00	99	82			LODA,R1	*MAR	
2882	3A8F	1F	5C				ECTR.UN	LRIG	
2883	3A91								
2884	3A91	3E	FA				INZERO ESTR.UN	LRIG	
2885	3A93	C1					STAZ,R1		
2886	3A94	0C	1E	FF			LODA,R2	CPUREG	
2887	3A97	17					FETC.UN		
2888	3A98								
2889	3A98	77	12				PCINC PPSL	RS	
2890	3A9A	C3					STRZ,R3		
2891	3A9E	22					ICPZ,R2		
2892	3A9C	05	01				LODI,R1	01	
2893	3A9E	0F	19	80			ICPA,R2	PC	
2894	3AA1	8D	19	81			AIDA,R1	PC+1	
2895	3AA4	77	08				PPSL	WC	
2896	3AA6	82					ADIZ,R2		
2897	3AA7	44	1F				ANDI,R2	1F	
2898	3AA8	4E	60				ANDI,R2	60	
2899	3AA8	62					ICPZ,R2		
2900	3AA8	0C	19	60			STRA,R2	PC	
2901	3AAE	0D	19	81			STPA,R1	PC+1	
2902	3AB2	07					ICPZ,R3		
2903	3AB3	75	18				CPSL	WC+RS	
2904	3AB5	17					RETC.UN		
2905	3AB6								
2906	3AB6	77	10				PUSH PPSL	RS	
2907	3AB6	C3					STRZ,R3		
2908	3AB9	0C	1F	27			LODA,R2	SPSU	
2909	3AB9	C2					STRZ,R2		
2910	3ABD	66	01				ADDI,R2	01	
2911	3ABF	46	07				ANDI,R2	07	
2912	3AC1	44	F8				ANDI,R2	F8	
2913	3AC3	62					ICPZ,R2		
2914	3AC4	0C	1F	07			STPA,R2	SPSU	
2915	3AC7	E2					RRL,R2		
2916	3AC8	0C	19	80			LODA,R2	PC	
2917	3AC8	0E	7A	D8			STPA,R2	STACK,I	
2918	3AC8	0C	19	81			LODA,R2	PC+1	
2919	3AD1	0E	7A	D9			STPA,R2	STACK+1,I	
2920	3AD4	03					ICPZ,R3		
2921	3AD5	75	10				CPSL	RS	
2922	3AD7	17					RETC.UN		
2923	3AD8								
2924	3AD8	02	00	00	00	STACK	RES	10	
2925	3ADC	02	00	00	00				

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPFRAND	COMMENTS
3026	3AE8	02	00	00	00				
3027	3AE8	02	00	00	00				
3028	3AE9								
3029	3AE9	77	10				POP	RS	
3030	3AEA	C3					STRZ,R3		
3031	3AEF	0C	1F	27			LODA,R2	SPSU	
3032	3AEH	C2					STRZ,R2		
3033	3AEF	C1					STRZ,R1		
3034	3AF0	A5	01				STRZ,R1	01	
3035	3AF2	45	07				ANDI,R1	07	
3036	3AF4	44	F8				ANDI,R2	F8	
3037	3AF6	61					ICPZ,R1		
3038	3AF7	0C	1F	07			STRA,R2	SPSU	
3039	3AF8	46	07				ANDI,R2	07	
3040	3AF9	C2					PPSL		
3041	3AFD	21	7A	D9			LODA,R2	STACK,I	
3042	3B08	0C	19	80			STRA,R2	PC	
3043	3B03	0E	7A	D9			LODA,R2	STACK+1,I	
3044	3B06	0C	19	81			STRA,R2	PC+1	
3045	3B09	03					ICPZ,R3		
3046	3B0A	75	10				CPSL	RS	
3047	3B0C	17					RETC.UN		
3048	3B0D								
3049	3B0E								
3050	3B0E	20					INDIP2 RES	1	
3051	3B0E	08	7D				INDIRT LODR,R2	INDIR2	
3052	3B10	14					RETC,IO		
3053	3B11	77	10				PPSL	RS	
3054	3B13	07	02				LODI,R3	02	
3055	3B15	0D	99	82			LODA,R1	*MAR	
3056	3B1A	0F	99	82			LODA,R3	*MAR,-	
3057	3B1B	0C	19	83			STPA,R2	MAR+1	
3058	3B1E	0C	19	82			STPA,R1	MAR	
3059	3B21	75	10				CPSL	RS	
3060	3B23	20					ICPZ,R2		
3061	3B24	08	67				STRZ,R2	INDIR2	
3062	3B26	17					RETC.UN		
3063	3B27								
3064	3B27						JADTS ECU	\$	
3065	3B27								
3066	3B27	0C	99	80			GRIL LODA,R2	*PC	
3067	3B2A	3F	3A	98			ESTA,UN	PCINC	
3068	3B2D	C1					GPIL2 STRZ,R1		
3069	3B2E	44	80				ANDI,R2	80	
3070	3B30	0C	19	82			STPA,R2	INDIR2	
3071	3B32	01					LODI,R1	42	
3072	3B34	F4	42				ICPZ,R1	42	
3073	3B36	18	12				ECTR,IO	REL	
3074	3B38	45	3F				ANDI,R1	3F	
3075	3B3A	22					ICPZ,R2		
3076	3B3B	8D	19	81			ADDA,R1	PC+1	
3077	3B3E	1E	19	82			STPA,R1	MAR+1	
3078	3B41	77	05				PPSL	WC	
3079	3B43	6C	19	82			ADDA,R2	PC	
3080	3B46	19	14				ECTR,UN	REL	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3081	3148	20	19	81	RELH	LODA,R0	PC+1		
3082	3147	21	FF			EORI,R1	FF		
3083	3142	41	3F			ANDI,R1	3F		
3084	3147	85	01			ADDI,R1	01		
3085	3151	A1				STPZ,R1			
3086	3152	00	19	83		STPZ,R2	MAR+1		
3087	3151	77	28			FPSL	WC		
3088	3157	00	19	80		LODA,R2	PC		
3089	3151	A4	02			EORI,R2	02		
3090	3150	44	1F		REL	ANDI,R2	1F		
3091	3158	21	19	80		LODA,R1	PC		
3092	3151	45	60			ANDI,R1	60		
3093	3153	61				IOPL,R1			
3094	3154	00	19	82		STRA,R0	MAR		
3095	3157	75	28			FPSL	WC		
3096	3159	17				RETC,UN			
3097	315A								
3098	316A	20	99	80	GABS	LODA,R2	*PC		
3099	316D	3F	3A	98		BSTA,UN	PCINC		
3100	3170	01				STPZ,R0			
3101	3171	44	80			ANDI,R0	80		
3102	3173	00	1B	2D		STRA,R0	INDIR0		
3103	3175	01				LOIZ,R1			
3104	3177	44	80			ANDI,R0	60		
3105	3175	00	0A	00		STRA,R2	PAGE		
3106	317C	45	7F			ANDI,R1	7F		
3107	3171	0B	15	02		STRA,R1	MAR		
3108	3181	00	99	80		LODA,R0	*PC		
3109	3184	3F	3A	98		BSTA,UN	PCINC		
3110	3187	00	19	83		STRA,R2	MAR+1		
3111	318A	17				RETC,UN			
3112	318B								
3113	318B	51			FX0	RRR,R1			
3114	3190	07	76	ED		LODA,R1	TABEX0.I		
3115	318F	03				STPZ,R3			
3116	3192	9F	3B	EB		BIA	JEX0		
3117	3193								
3118	3193	51			FX1	RRR,R1			
3119	3194	07	76	7E		LODA,R1	TABEX1.I		
3120	3197	03				STPZ,R3			
3121	3198	9F	3C	E2		BIA	JEX1		
3122	3198								
3123	3198	05	07		HALT	LODI,R1	7		"PROGRAM HALTED"
3124	319D	3F	46	07		BSTA,UN	PSTRNG		
3125	31A2	1F	42	50		BSTA,UN	DCOMD		
3126	31A3								
3127	31A3								
3128	31A3	0C	1A	7E	RETC0	LODA,R2	REGIND		
3129	31A6	F4	03			COMI,R0	03		
3130	31A8	16	0D			ECTR,EQ	RET		
3131	31AA	50				RRR,R0			
3132	31AB	50				RRR,R0			
3133	31AC	0E	1F	06		LODA,R1	SPSL		
3134	31AF	44	02			ANDI,R2	02		
3135	31B1	45	02			ANDI,R1	02		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3136	31B3	E1					COMZ,R1		
3137	31B4	90	42	13			BCFA,EQ	OUT	
3138	31F7	3F	3A	18	RET	BSTA,UN	PCP		
3139	31FA	17				RETC,UN			
3140	31EB								
3141	31EB								
3142	31EB								
3143	31EB								
3144	31EB				JEX0	FCU	\$		
3145	31E9								
3146	31EB	3D	66		RETC	BSTR,UN	RETC0		
3147	31FD	1F	42	13		BCTA,UN	OUT		
3148	31C0								
3149	31C0	3E	61		RETE	BSTR,UN	RETC0		
3150	31C2	2C	1F	27		LODA,R2	SFSU		
3151	31C5	44	1F	27		ANDI,R2	DF		
3152	31C7	00	1F	27		STRA,R2	SPSU		
3153	31CA	1F	42	13		BCTA,UN	OUT		
3154	31C0								
3155	31C0	0C	16	02	CPS	LODA,R2	IR		
3156	31C0	03				STPZ,R3			
3157	31D1	47	01			ANDI,R3	01		
3158	31D3	01				STPZ,R1			
3159	31D4	27	01			EORI,R3	1		
3160	31D6	0F	7F	25		LODA,R3	SPSL,I		
3161	31D9	01	99	80		LODA,R2	*PC		
3162	31E0	3F	3A	98		BSTA,UN	PCINC		
3163	31E1	F5	02			TMI,R1	02		
3164	31E1	16	05			ECTR,EQ	CPS0		
3165	31E3	26	FF			EORI,R2	FF		
3166	31E4	42				ANDI,R2			
3167	31E5	1E	01			ECTR,UN	CPS1		
3168	31E8	02			CPS0	ICR2,R2			
3169	31E9	0F	7F	06	CPS1	STRA,R3	SPSL,I		
3170	31FC	1F	42	13		BCTA,UN	OUT		
3171	31FF								
3172	31FF								
3173	31FF	01	18	02	TPS	LODA,R1	IR		
3174	31FF	45	21			ANDI,R1	01		
3175	31FA	26	01			EORI,R1	1		
3176	31FC	01	9F	06		LODA,R1	SPSL,I		
3177	31F9	1F	43			BCTR,UN	MCC		
3178	31FB								
3179	31FB								
3180	31FE	3F	3A	98	TMI	BSTA,UN	LREG		
3181	31FE	01	99	80	MCC	LODA,R2	*PC		
3182	31C0	3F	3A	98		BSTA,UN	PCINC		
3183	31C4	42				ANDI,R2			
3184	31C5	21				ICR2,R2			
3185	31C6	99	42			EYR,CT	MASKCC		
3186	31C8	04	FF			LODI,R0	FF		
3187	31CA	13			*MASKCC	SFSL			
3188	31C8	0D	1F	06		LODA,R1	SPSL		
3189	31C8	44	02			ANDI,R2	02		
3190	31C0	45	3F			ANDI,R1	3F		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3151	3C12	61					LDZ,R1		
3152	3C13	00	1F	06			STPA,R0	SFSL	
3153	3C14	1F	42	13			PCTA,UN	OUT	
3154	3C19					*			
3155	3C19					*			
3156	3C19	01	99	80		REDE	LODA,R1	*FC	
3157	3C10	31	3A	59			ESTA,UN	PCINC	
3158	3C17	71					PCZ,R0		
3159	3C22	01	10	66			TRA,R1	REDEX-1	
3202	3C23	01	80				LODI,R2	02	
3201	3C25	31	31	82			ESTA,UN	I/O	
3202	3C28	00	76	7D			LODA,R2	REDETS,I	
3203	3C28	03					STRZ,R3		
3204	3C20	0F	1D	24			STPA,R0	R3STG	
3205	3C27	1F	3C	65		IREDE	ESTA	REDEX	
3206	3C22	9A	14				PCIR,IQ	IREDE	
3207	3C34	01				REDCC	STRZ,R1		
3208	3C35	13					SFSL		
3209	3C36	03	1F	06			LODA,R2	SFSL	
3210	3C39	4A	C0				ANDI,R0	C0	
3211	3C3B	46	3F				ANDI,R2	3F	
3212	3C21	62					LDZ,R2		
3213	3C31	00	1F	06			STPA,R0	SFSL	
3214	3C41	01					LODI,R1		
3215	3C42	3F	3A	03			ESTA,UN	SREG	
3216	3C45	1F	42	13			PCTA,UN	OUT	
3217	3C46					*			
3218	3C48	31	3D	25		IREDE	ESTA,UN	ERR	
3219	3C45	1F	62				PCIR,UN	IREDE	
3220	3C47					*			
3221	3C4D	2D	99	80		WRTF	LODA,R1	*FC	
3222	3C50	3F	3A	98			ESTA,UN	PCINC	
3223	3C52	22					LDZ,R2		
3224	3C54	01					STRZ,R2		
3225	3C55	01	10	66			STPA,R1	WRTS1-1	
3226	3C58	31	31	82			ESTA,UN	I/O	
3227	3C5B	00	76	7D			LODA,R0	WRTETP,I	
3228	3C5E	03					STRZ,R3		
3229	3C5F	3F	3C	64			SSKA	WRTTX	
3230	3C62	1F	42	13			PCTA,UN	OUT	
3231	3C62					*			
3232	3C62					*			
3233	3C62	01	02			REDEX	REDE,R0	02	
3234	3C67	71	C0				CPSL	C0	
3235	3C69	17					ETC,UN		
3236	3C6A	05	00			REDE1	LODI,R1	2	"INPUT PORT"
3237	3C6C	31	46	C7			ESTA,UN	PSTRNG	
3238	3C6F	00	10	66			LODA,R0	REDEX-1	
3239	3C72	3F	47	4F			ESTA,UN	HIOT	
3240	3C75	04	3D			REDA	LODI,R2	"4"	
3241	3C77	3F	45	8D			ESTA,UN	WRT	
3242	3C7A	3F	47	0F			ESTA,UN	HEXIN	
3243	3C7B	17					ETC,UN		
3244	3C7F	00	1D	F0		REDE	LODA,R0	PRESET	
3245	3C81	7F	C0				CPSL	C0	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3246	3C83	17					ETC,UN		
3247	3C84					*			
3248	3C84					*			
3249	3C84					*			
3250	3C84	3F	3A	6D		WRTTX	ESTA,UN	LRIG	
3251	3C87	D4	00			WRTS1	WRTX,R0	00	
3252	3C89	17					ETC,UN		
3253	3C8A					*			
3254	3C8A	3F	3D	72		WRTS	ESTA,UN	CKREGA	
3255	3C8D	18	04				PCIR,IQ	WRTS1	
3256	3C8F	25	FF				LODI,R1	FF	
3257	3C91	13	02				PCIR,UN	WRTS	
3258	3C93					*			
3259	3C93	05	03			WRTS1	LODI,R1	02	
3260	3C95	09	1A			WRTS2	STRZ,R1	TFLAG	
3261	3C97	05	01				LODI,R1	1	"OUTPUT PORT"
3262	3C99	3F	46	C7			ESTA,UN	PSTRNG	
3263	3C9C	08	6A				LODI,R0	WRTS1+1	
3264	3C9F	3F	47	4F			ESTA,UN	HIOT	
3265	3CA1	24	3D			WRTALL	LODI,R0	"4"	
3266	3CA3	3F	45	8D			ESTA,UN	WRT	
3267	3CA6	3F	3A	6D			ESTA,UN	LRIG	
3268	3CA9	25	06				LODI,R3	TFLAG	
3269	3CAB	90	45	8D			ESTA,IQ	WRT	
3270	3CAE	1F	47	4F			PCTA,UN	HIOT	
3271	3CB1					*			
3272	3CB1	02				TFLAG	PIS	1	
3273	3CB2					*			
3274	3CB2					*			
3275	3CB2					JEX1	ECU	\$	
3276	3CB2					*			
3277	3CB2					JAR	ECU	\$	
3278	3CB2					JRI	ECU	\$	
3279	3CB3	3F	3A	6D			ESTA,UN	LRIG	
3280	3CB5	05	01				LODI,R1	01	
3281	3CB7	01	19	7F			STPA,R1	ADRMD	
3282	3CBA	0F	18	02			LODA,R3	IR	
3283	3CB7	47	70				ANDI,R0	FC	
3284	3CB7	11	39	05			PCTA,UN	ACAO	
3285	3CB7					*			
3286	3CB7	07	15	02		SF3	LODA,R1	IR	
3287	3CB5	45	01				ANDI,R1	01	
3288	3CB7	25	01				PCIR,R1	1	
3289	3CB9	2D	7F	26			LODA,R1	SFSL,I	
3290	3C0C	00	1E	FF			STPA,R2	CPUREG	
3291	3C0F	1F	3C	6A			PCTA,UN	*ASKCC	
3292	3C02					*			
3293	3C02					*			
3294	3C02					*			
3295	3C12	07	18	02		LFS	LODA,R1	IR	
3296	3C15	45	01				ANDI,R1	01	
3297	3C17	25	21				PCIR,R1	1	
3298	3C19	00	1E	FF			LODA,R0	CPUREG	
3299	3C1C	01	7F	26			STPA,R1	SFSL,I	
3300	3C1F	1F	42	13			PCTA,UN	OUT	
3301	3C22					*			

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LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
3301	3312					*			
3302	3312	06	43			REDC	LODI,R2	'C'	
3303	3314	05	01				LODI,R1	01	
3304	3316	1B	04				ECTP,UN	REDIT	
3305	3318	05	44			REDD	LODI,R2	'D'	
3306	331A	2B	02				LODI,R1	00	
3307	331C	0C	16	C2		REDIT	LODA,R2	IR	
3308	331F	44	FC				ANDI,R0	FC	
3309	3321	0B	19				STRR,R0	RED0	
3310	3323	04	01				LODI,R2	01	
3311	3325	CA	2C				STRR,R2	HOLD	
3312	3327	06	90				LOTL,R2	80	
3313	3329	3F	3F	62			BSTA,UN	I/O	
3314	332C	0C	76	81			LODA,R0	REDTAB.I	
3315	332F	03					STRZ,R3		
3316	3330	0B	22				STRR,R0	R3STG	
3317	3332	BF	3D	0C		EREDIT	LSXA	RED0	
3318	3335	1C	3C	34			ECTA,EQ	REDCC	
3319	3338	3F	1B				BSTR,UN	IRP	
3320	333A	1F	76				BCTR,UN	EREDIT	
3321	333C					*			
3322	333C	70				REDO	REDD,R0		
3323	333E	75	C0				CPSL	C0	
3324	333F	17					RETC,UN		
3325	3340					*			
3326	3342	25	00			RED1	LODI,R1	0	"INPUT PORT"
3327	3342	3F	46	C7			BSTA,UN	PSTRNG	
3328	3345	2B	0C				LODR,R0	HOLD	
3329	3347	3F	45	8D			BSTA,UN	WRT	
3330	334A	1F	3C	75			BCTA,UN	REDA	
3331	334C					*			
3332	334D	0C	1D	F0		RED2	LODA,R0	PRESET	
3333	334F	75	C0				CPSL	C0	
3334	3352	17					RETC,UN		
3335	3353					*			
3336	3353	00				HOLD	RES	1	
3337	3354	00				R3STG	RES	1	
3338	3355					*			
3339	3355	05	0F			ERR	LODI,R1	F	
3340	3357	3F	46	CA			BSTA,UN	PRINC	
3341	335A	0B	78				LODR,R3	R3STG	
3342	335C	17					RETC,UN		
3343	335E					*			
3344	335E	06	43			WRTC	LODI,R2	'C'	
3345	335F	25	01				LODI,R1	01	
3346	3361	1B	04				BCTR,UN	WRTIT	
3347	3363	06	44			WPRD	LODI,R2	'D'	
3348	3365	05	00				LODI,R1	00	
3349	3367	0C	16	C2		WRTIT	LODA,R0	IR	
3350	336A	44	FC				ANDI,R0	FC	
3351	336C	0C	1D	55			STRR,R0	WRT0	
3352	336F	04	01				LODI,R0	01	
3353	3371	CA	62				STRR,R2	HOLD	
3354	3373	06	00				LODI,R2	00	
3355	3375	3F	3D	82			BSTA,UN	I/O	

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LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
3356	3378	2C	76	59			LODA,R0	WRTTB.I	
3357	3379	03					STRZ,R3		
3358	337C	EF	3D	52			PSIA	WRT1	
3359	337F	1F	42	13			BCTA,UN	OUT	
3360	3382					*			
3361	3382	3F	3A	6D		WRT1	BSTA,UN	LREG	
3362	3385	F0				WRT0	WRTD,R0		
3363	3386	17					RETC,UN		
3364	3387					*			
3365	3387	05	00			WRT5	LODI,R1	00	
3366	3389	0D	1C	B1		WRT3	STRR,R1	TFLAG	
3367	338C	05	01				LODI,R1	1	"OUTPUT PORT"
3368	338E	3F	46	C7			BSTA,UN	PSTRNG	
3369	3391	0B	40				LODR,R0	HOLD	
3370	3393	3F	45	8D			BSTA,UN	WRT	
3371	3396	1F	3C	A1			BCTA,UN	WRTALL	
3372	3399					*			
3373	3399	3B	07			WRT4	BSTR,UN	OREGCA	
3374	339C	1B	6A				BCTR,EQ	WRT5	
3375	339D	05	FF				LODI,R1	FF	
3376	339F	1F	3D	59			BCTA,UN	WRT3	
3377	33A2					*			
3378	33A2	3F	3A	6D		OREGCA	BSTA,UN	LREG	
3379	33A5	01					STRZ,R1		
3380	33A7	45	E0				ANDI,R1	E0	
3381	33A9	14					RETC,EQ		
3382	33AB	F4	80				TMI,R0	80	
3383	33AD	17					RETC,UN		
3384	33AE					*			
3385	33AE					*			
3386	33B0	03	00			TEMPC	RES	2	
3387	33B1	02	00			TEMPE	RES	2	
3388	33B2	03	00			TEMPE	RES	2	
3389	33B3					*			
3390	33B3					*			
3391	33B3					*			
3392	33B3	0B	7B			I/O	STRR,R0	TEMPC	INPUT
3393	33B4	09	77				STRR,R1	TEMPC+1	R0= HI ADDRESS OF I/O
3394	33B6	05	DF				ADDI,R1	NEUFF	R1= LOW ADDRESS OF I/O
3395	33B8	09	75				STRR,R1	TEMPE+1	R2= COMMAND (SEE BELOW)
3396	33BA					*			R3= PRESET DATA
3397	33BA	77	0B				PFSL	WC	
3398	33BD	04	47				ADDI,R0	NEUFF	7= INPUT
3399	33BE	0B	6E				STRR,R0	TEMPE	6= CHANGE
3400	33C0	25	62				LODR,R1	TEMPC-1	2= E1 CODE BIT
3401	33C2	0B	6B				LODR,R0	TEMPC	1= LOW CODE BIT
3402	33C4	75	01				CPSL	CRY	2=A
3403	33C6	10					ERR,R0		
3404	33C7	01					PEP,R1		
3405	33C8	02					ERR,R2		
3406	33C9	75	0B				CPSL	WC	
3407	33CB	00					LODR,R2		
3408	33CD	0C	42	8F			ECTA,EQ	INCOMD	
3409	33CF	EE	81				COMI,R1	81	
3410	33D1	11	42	8B			BCTA,GT	INCOMD	

LINE	ADDP	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3411	3T44	85	E1				ADDI,R1	MEOFF	
3412	3T46	77	08				PSLI	WC	
3413	3T48	20					ECPI,R0		
3414	3T49	84	48				ADDI,R2	TEMPFF	
3415	3T4B	75	08				CPSL	WC	
3416	3T4D	09	51				STPP,R0	TEMPA	
3417	3T4F	09	50				STPP,R1	TEMPA-1	
3418	3T51	08	0D				LODP,R0	*TEMPA	
3419	3T53	16	80				TMI,R2	80	TEST FOR UPPER/LOWER
3420	3T55	88	24				ECPI,R0	1/00	
3421	3T57	50					ECPI,R2		
3422	3T59	18					RPR,R2		
3423	3T5B	52					RPR,R0		
3424	3T5D	52					RPR,R2		
3425	3T5F	16	40			1/00	TMI,R2	40	TEST FOR IN/OUT
3426	3T60	99	02				ECPI,R0	1/01	
3427	3T62	12					RPR,R0		
3428	3T64	50					RPR,R0		
3429	3T66	16	20			1/01	TMI,R2	20	TEST FOR CHANGE
3430	3T68	08	20				STPP,R0	1/OTEM	
3431	3T6A	95	21				ECPI,R0	1/04	
3432	3T6C	16	60				TMI,R2	60	
3433	3T6E	99	03				ECPI,R0	1/05	
3434	3T6F	0F	9D	7E			STRA,R3	*TEMPB	
3435	3T70	01				1/05	STPP,R1		
3436	3T72	22					LODZ,R2		
3437	3T74	41	70				ANDI,R1	70	
3438	3T76	44	03				ANDI,R0	03	
3439	3T78	11					LODZ,R1		
3440	3T7A	16	40				TMI,R2	40	
3441	3T7C	99	02				ECPI,R0	1/02	
3442	3T7E	04					RRL,R0		
3443	3T7F	12					RRL,R0		
3444	3T81	16	80			1/02	TMI,R2	80	
3445	3T83	08	04				ECPI,R0	1/03	
3446	3T85	08					RRL,R0		
3447	3T87	12					RRL,R0		
3448	3T89	13					RRL,R0		
3449	3T8B	10					RRL,R0		
3450	3T8D	00	9D	80		1/03	STRA,R0	*TEMPA	
3451	3T8F	08	09				LODP,R0	1/OTEM	
3452	3T91	44	03			1/04	ANDI,R2	03	
3453	3T93	0F	9D	7E			LODA,R3	*TEMPB	
3454	3T95	0E	01				STPP,R3	PRESET	
3455	3T97	17					PETC,UN		
3456	3T99					*			
3457	3T9B	00				PRESET RES		1	
3458	3T9D					*			
3459	3T9F	00				1/OTEM RES		1	
3460	3T99					*			
3461	3T92	02	00	00	20	BPTAB1 RES		08	
3462	3T94	02	00	00	00				
3463	3T96	00	00	00	00	BPTAB2 RES		10	
3464	3T98	02	00	00	20				
3465	3T9A	02	00	00	20				

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LINE	ADDP	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3466	3T9B	02	00	00	20	BPTAB1 RES		08	
3467	3T9D	02	00						
3468	3T9E					*			
3469	3T9F					***** COMMANDS *****			
3470	3T99					*			
3471	3T9C	A4	01			CLIP	SUBI,R2	01	R0= BREAK POINT NUMBER
3472	3T9E	08	7A				STPP,R2		
3473	3T9F	14	02				COMI,R0	03	
3474	3T99	1D	42	8B			ECTA,R1	INCOMD	
3475	3T9B	03					STPP,R2		
3476	3T9D	11					RPI,R3		
3477	3T9F	21	7E	F2			LODA,R3	BPTAB1,I	
3478	3T99	00	1D	60			STRA,R0	TEMPA	
3479	3T9B	0F	7C	F3			LODA,R3	BPTAB1+1,I	
3480	3T9D	00	1E	81			STRA,R0	TEMPA+1	
3481	3T9F	03					RPI,R3		
3482	3T99	20	02				LODI,R2	02	
3483	3T9B	0F	7D	FD			LODA,R3	BPTAB2+3,I	
3484	3T9D	14					RETC,UN		
3485	3T9F	2F	7D	FC			LODA,R2	BPTAB2+2,I	
3486	3T99	01	FD	02			STRA,R2	*TEMPA,I	
3487	3T9B	2F	7D	FE			LODA,R3	BPTAB2+1,I	
3488	3T9D	01	ED	60			STRA,R2	*TEMPA,-	
3489	3T9F	01	7D	FA			LODA,R3	BPTAB2,I	
3490	3T99	0E	DD	80			STRA,R2	*TEMPA,-	
3491	3T9B	20					ECPI,R0		
3492	3T9D	0F	7D	FD			STRA,R3	BPTAB2+3,I	
3493	3T9F	04	01				LODI,R0	01	
3494	3T99	17					RETC,UN		
3495	3T9B					*			
3496	3T9D					*			
3497	3T9F	31	47	02		CLIP	ECTA,UN	GETNUM	*****COMMAND
3498	3T99	50	42	8B			ECPI,R0	INCOMD	
3499	3T9B	00					LODZ,R0		
3500	3T9D	90	42	8B			ECPI,R0	INCOMD	
3501	3T9F	01					LODZ,R1		
3502	3T99	3F	3E	0C			ECTA,UN	CLEAR	
3503	3T9B	10	42	80			ECTA,R0	DOCMD	
3504	3T9D	00	02				LODI,R1	2	"BREAK POINT"
3505	3T9F	3F	46	C7			ECTA,UN	BSTRNG	
3506	3T99	00	1E	CA			LODA,R0	BPTEMP	
3507	3T9B	84	01				ADDI,R0	01	
3508	3T9D	3F	47	4F			ECTA,UN	HYCT	
3509	3T9F	24	03				LODI,R1	3	"CLEARED"
3510	3T99	3F	46	CA			ECTA,UN	PRING	
3511	3T9B	11	42	90			ECTA,UN	DOCMD	
3512	3T9D					*			
3513	3T9F					*			
3514	3T99	3F	47	02		BR	ECTA,UN	GETNUM	*****COMMAND
3515	3T9B	50	42	8B			ECPI,R0	INCOMD	
3516	3T9D	00					LODZ,R0		
3517	3T9F	90	42	8B			ECPI,R0	INCOMD	
3518	3T99	01					LODI,R1		
3519	3T9B	3F	3E	0C			ECTA,UN	CLIP	
3520	3T9D	24	FF				LODI,R2	FF	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3551	3108	CF	7D	FD			STRA,R3	BPTAB2+3.1	
3552	310C	CF	1E	2B			STFA,R3	BPTMP+1	
3553	310F	3F	47	62			BSTA,UN	GETNUM	
3554	3184	9C	42	6E			BCFA,FO	INCOMD	
3555	3188	0F	1E	0E			LODA,R3	BPTMP+1	
3556	318B	CC	1D	60			STRA,R0	TEMPA	
3557	318B	CC	1E	21			STRA,R1	TEMPA+1	
3558	318F	0E	12	2A			LODA,R2	BPTMP	
3559	3191	D2					RRL,R2		
3560	3192	0E	7D	F2			STRA,R2	BPTAB1.1	
3561	3194	21					LOI2,R1		
3562	319C	CF	7D	F3			STRA,R2	BPTAB1+1.1	
3563	3199	CC	9D	60			LODA,R0	*TEMPA	
3564	319C	CF	71	FA			STRA,R3	BPTAB2.1	
3565	319F	0F	02				LOI1,R1	FS	
3566	31A1	2D	ED	60			LODA,R1	*TEMPA,+	
3567	31A4	CF	3C	7A			STRA,R3	BPTAB2,+	
3568	31A7	0E	EC	60			LODA,R1	*TEMPA,+	
3569	31AA	CF	3D	FA			STRA,R3	BPTAB2,+	
3570	31AD	04	1F				LODI,R0	1F	
3571	31AF	CC	9E	60			STRA,R0	*TEMPA	
3572	31B2	0E	3F				LODI,R1	ENTER	
3573	31B4	24	26				LODI,R2	ENTER	
3574	31B6	0E	11	CA			LODA,R2	BPTMP	
3575	31B9	D2					RRL,R2		
3576	31BA	D2					RRL,R2		
3577	31BB	D2					RRL,R2		
3578	31BC	B2					ADD2,R2		
3579	31BD	77	0B				PSSL	WC	
3580	31BF	85	00				ADD1,R1	00	
3581	31C1	75	26				CPSL	WC	
3582	31C3	C2					STR2,R2		
3583	31C4	21					LOD2,R1		
3584	31C5	07	20				LODI,R3	00	
3585	31C7	CF	BD	60			STRA,R3	*TEMPA,+	
3586	31CA	02					LOI2,R2		
3587	31CB	CF	BE	60			STRA,R3	*TEMPA,+	
3588	31CE	1F	42	90			BCTA,UN	DCOMD	
3589	31D1						*		
3590	31D1						*		
3591	31D1	3F	47	62		IX	BSTA,UN	GETNUM	*****COMMAND
3592	31D4	98	06				BCFR,FO	IXC	
3593	31D6	CC	10	60			STRA,R2	PC	
3594	31D9	CC	10	61			STRA,R1	PC+1	
3595	31DC	CC	1F	26		IXX0	LODA,R0	SPSL	
3596	31DF	CC	11	FB			STRA,R2	IXX1+1	
3597	31E2	20	1F	27			LODA,R0	SPSU	
3598	31E5	02					LFSU		
3599	31E6	77	10				PSSL	RS	
3600	31E8	05	19				LODR,R1	CPUREG+4	
3601	31FA	0A	18				LODR,R2	CPUREG+5	
3602	31FC	0B	17				LODR,R3	CPUREG+6	
3603	31FE	75	10				CPSL	RS	
3604	31FF	09	0E				LODR,R1	CPUREG+1	
3605	31FF	0A	0D				LODR,R2	CPUREG+2	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3576	31E4	0B	2C				LODR,R3	CPUREG+3	
3577	31F6	08	27				LODR,R0	CPUREG	
3578	31F9	75	FF				CPSL	FF	
3579	31FA	77	02			EXX1	PSSL	00	
3580	31FC	1F	59	60			BCTA,UN	*PC	
3581	31FF						*		
3582	31FF						*		
3583	31FF						*		
3584	31FF	00	00	00	00	CPUREG RES		7	
3585	31E3	00	00	00					
3586	31E6	00				SPSL RES		1	
3587	31E7	02				SPSU RES		1	
3588	31E8					*			
3589	31E8	06	75			SAVEIT	STRR,R2	CPUREG	
3590	31FA	13					SPSL		
3591	31FB	CC	1F	05			STRA,R0	SPSL	
3592	31FC	12					SPSU		
3593	31FC	CC	1F	27			STRA,R0	SPSU	
3594	31F2	75	10				CPSL	RS	
3595	31F4	06	6A				STRR,R1	CPUREG+1	
3596	31F6	CA	69				STRR,R2	CPUREG+2	
3597	31F8	CF	68				STRR,R3	CPUREG+3	
3598	31FA	77	18				PSSL	RS	
3599	31FC	09	65				STRR,R1	CPUREG+4	
3600	31FE	CA	64				STRR,R2	CPUREG+5	
3601	31FF	CF	63				STRR,R3	CPUREG+6	
3602	31E2	04	02				LODI,R2	02	
3603	31E4	93					LPSL		
3604	31E5	17					RETC,UN		
3605	31E6						*		
3606	31E6	3F	3F	03		ENTER	BSTA,UN	SAVEIT	
3607	31E9	04	01				LODI,R0	01	
3608	31EB	1F	3F	43			BCTA,UN	EN0	
3609	31EE	3F	3F	08			BSTA,UN	SAVEIT	
3610	31F1	04	02				LODI,R0	02	
3611	31F3	1F	3F	43			BCTA,UN	EN0	
3612	31F6	3F	3F	03			BSTA,UN	SAVEIT	
3613	31F9	04	03				LODI,R2	03	
3614	31FB	1F	3F	43			BCTA,UN	EN0	
3615	31FE	3F	3F	03			BSTA,UN	SAVEIT	
3616	31F1	04	04				LODI,R0	04	
3617	31F3	02	2F			EN0	STRR,R2	ENSAV	
3618	31F6	25	02				LODI,R1	2	"BREAK POINT"
3619	31F7	3F	46	07			BSTA,UN	PSTRNG	
3620	31FA	08	25				LODR,R0	ENSAV	
3621	31AC	64	38				IOFI,R0	02	
3622	31AE	3F	45	BD			BSTA,UN	WRT	
3623	31F1	05	08				LODI,R1	8	"REACHED"
3624	31F3	3F	46	CA			BSTA,UN	PPING	
3625	31F6	06	10				LODR,R2	ENSAV	
3626	31F8	3F	3F	2C			BSTA,UN	CLEAR	
3627	31FE	04	1F	2A			LODA,R3	BPTMP	
3628	31F1	13					RRL,R3		
3629	31F1	2F	7D	F2			LODA,R3	BPTAB1.1	
3630	31E2	CC	19	60			STRA,R2	PC	

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LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3631	3F55	3F	47	4F			ESTA.UN	HNOT	
3632	3F56	3F	35	70			LODA.F3	EPTAB1.+	
3633	3F57	3F	00	15	81		STRA.R2	PC+1	
3634	3F58	3F	47	4F			ESTA.UN	HNOT	
3635	3F71	3F	42	6E			ECTA.UN	CBST	
3636	3F74								
3637	3F74	20					ENSAV	PIS	1
3638	3F75								
3639	3F75								
3640	3F75								
3641	3F75	25	74				DEBUG	LCII.F1	4
3642	3F77	3F	45	07			PSTA.UN	PSTENG	
3643	3F7A	3F	15	27			LODA.F3	SPSU	
3644	3F7D	A7	01				SUB1.F3	01	
3645	3F7F	47	07				ANII.F3	07	
3646	3F81	D3					FRL.F3		
3647	3F82	06	08				LOII.F2	08	
3648	3F84	3F	45	8B			ESTA.UN	WRTPL	
3649	3F87	01	7A	D0			LODA.R3	STACK.+	
3650	3F8A	3F	47	4F			ESTA.UN	HNOT	
3651	3F8D	3F	3A	D6			LODA.F3	STACK.+	
3652	3F90	3F	47	4F			ESTA.UN	HNOT	
3653	3F93	E6	01				COMI.F2	01	
3654	3F95	10	42	90			ECTA.F0	DCOMD	
3655	3F99	04	20				LOII.F2		
3656	3F9A	3F	45	8E			ESTA.UN	WRT	
3657	3F9D	3F	45	8B			ESTA.UN	WRTPL	
3658	3FA2	47	2F				ANDI.F3	2F	
3659	3FA2	FA	63				EDPR.F2	DE0	
3660	3FA4								
3661	3FA4	00	99	82			REF0	LODA.R0	*PC
3662	3FA7	17					RETC.UN		
3663	3FA8	0F	E9	82			REF1	LODA.R2	*PC.+
3664	3FAE	17					RETC.UN		
3665	4220						ORG	4202	
3666	4220								
3667	4220	3F	47	92			CO	ESTA.UN	GETNUM *****COMMAND
3668	4223	90	42	8B			ECTA.F0	INCOMD	
3669	4226	00	02	92			STRA.R2	TEMPD	
3670	4229	00	00	93			STRA.F1	TEMPF+1	
3671	422C	3F	47	92			ESTA.UN	GETNUM	
3672	422E	90	42	8B			ECTA.F0	INCOMD	
3673	4230	00	00	94			STRA.F0	TEMPF	
3674	4233	00	00	95			STRA.F1	TEMPF+1	
3675	4236	3F	47	92			ESTA.UN	GETNUM	
3676	4239	90	42	8B			ECTA.F0	INCOMD	
3677	423C	00	00	96			STRA.F0	TEMPF	
3678	423F	00	00	97			STRA.F1	TEMPF+1	
3679	4242	00	00	92			COOP	LODA.F0	*TEMPF
3680	4245	10	82	84			COMA.F2	*TEMPF	
3681	4248	10	42	85			ECTA.F0	COOP0	
3682	424D	3F	45	08			PSTA.UN	LFOR	
3683	4250	00	00	92			LODA.F0	TEMPD	
3684	4253	3F	47	4F			ESTA.UN	HNOT	
3685	4256	00	00	93			LODA.R2	TEMPD+1	
3686	4259	3F	47	4F			ESTA.UN	HNOT	
3687	425C	3F	45	8D			ESTA.UN	WRT	
3688	425F	00	00	92			LODA.R0	*TEMPF	
3689	4262	3F	47	4F			ESTA.UN	HNOT	
3690	4265	25	01				COOP0	01	
3691	4268	80	2B				ADPR.F1	TEMPF+1	
3692	426B	00	00	92			STRA.F1	TEMPF+1	
3693	426E	00	00	93			PSSL	WC	
3694	4271	00	00	94			ADPR.F2	TEMPF	
3695	4274	00	00	95			STRA.F2	TEMPF	
3696	4277	00	00	96			CPSL	WC	
3697	427A	18	20				COMPR.F0	TEMPF	
3698	427D	1A	08				ECTA.LT	COOP1	
3699	4280	1F	42	90			ECTA.GT	DCOMD	
3700	4283	10	1A				COMPR.F1	TEMPF+1	
3701	4286	10	20	4B			ECTA.GT	DCOMD	
3702	4289	20					ECTA.F2		
3703	428C	2F	01				LOII.F1	01	
3704	428F	00	00	92			ADPR.F1	TEMPD+1	
3705	4292	00	00	93			STRA.F1	TEMPD+1	
3706	4295	00	00	94			PSSL	WC	
3707	4298	00	00	95			ADPR.F0	TEMPD	
3708	429B	00	00	96			STRA.F2	TEMPD	
3709	429E	00	00	97			CPSL	WC	
3710	42A1	1F	42	24			ECTA.UN	COOP	
3711	42A4								
3712	42A7	00	00	92			TEMPD	RES	2
3713	42AA	00	00	93			TEMPF	RES	2
3714	42AD	00	00	94			TEMPF	RES	2
3715	42B0								
3716	42B3	3F	47	92			IN	ESTA.UN	GETNUM *****COMMAND
3717	42B6	90	42	8B			ECTA.F0	INCOMD	
3718	42B9	00	00	92			STRA.R2	TEMPD	
3719	42BC	00	00	93			STRA.F1	TEMPD+1	
3720	42BF	3F	47	92			ESTA.UN	GETNUM	
3721	42C2	90	42	8B			ECTA.F0	INCOMD	
3722	42C5	00	00	94			STRA.F2	TEMPF	
3723	42C8	00	00	95			STRA.F1	TEMPF+1	
3724	42CB	3F	47	92			ESTA.UN	GETNUM	
3725	42CE	90	42	8B			ECTA.F0	INCOMD	
3726	42D1	00	00	96			LOII.F2		
3727	42D4	00	00	97			ECTA.F0	INCOMD	

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LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3728	42D7								
3729	42DA	00	00	92			LODA.F2		
3730	42DD	00	00	93			STRA.R2	*TEMPD	
3731	42E0	3F	47	4F			ESTA.UN	HNOT	
3732	42E3	04	20				LOII.F2		
3733	42E6	3F	45	8D			ESTA.UN	WRT	
3734	42E9	3F	45	8B			ESTA.UN	WRTPL	
3735	42EC	00	00	94			LODA.F0	TEMPF	
3736	42EF	3F	47	4F			ESTA.UN	HNOT	
3737	42F2	00	00	95			LODA.R2	TEMPF+1	
3738	42F5	3F	47	4F			ESTA.UN	HNOT	
3739	42F8	24	31				LOII.F0		
3740	42FB	3F	45	8D			ESTA.UN	WRT	
3741	42FE	00	00	92			LODA.R0	*TEMPF	
3742	4301	3F	47	4F			ESTA.UN	HNOT	
3743	4304	25	01				COOP0	01	
3744	4307	00							
3745	430A	80	2B				ADPR.F1	TEMPF+1	
3746	430D	00	00	92			STRA.F1	TEMPF+1	
3747	4310	00	00	93			PSSL	WC	
3748	4313	00	00	94			ADPR.F2	TEMPF	
3749	4316	00	00	95			STRA.F2	TEMPF	
3750	4319	00	00	96			CPSL	WC	
3751	431C	18	20				COMPR.F0	TEMPF	
3752	431F	1A	08				ECTA.LT	COOP1	
3753	4322	1F	42	90			ECTA.GT	DCOMD	
3754	4325	10	1A				COMPR.F1	TEMPF+1	
3755	4328	10	20	4B			ECTA.GT	DCOMD	
3756	432B	20					ECTA.F2		
3757	432E	2F	01				LOII.F1	01	
3758	4331	00	00	92			ADPR.F1	TEMPD+1	
3759	4334	00	00	93			STRA.F1	TEMPD+1	
3760	4337	00	00	94			PSSL	WC	
3761	433A	00	00	95			ADPR.F0	TEMPD	
3762	433D	00	00	96			STRA.F2	TEMPD	
3763	4340	00	00	97			CPSL	WC	
3764	4343	1F	42	24			ECTA.UN	COOP	
3765	4346								
3766	4349	00	00	92			TEMPD	RES	2
3767	434C	00	00	93			TEMPF	RES	2
3768	434F	00	00	94			TEMPF	RES	2
3769	4352								
3770	4355	3F	47	92			IN	ESTA.UN	GETNUM *****COMMAND
3771	4358	90	42	8B			ECTA.F0	INCOMD	
3772	435B	00	00	92			STRA.R2	TEMPD	
3773	435E	00	00	93			STRA.F1	TEMPD+1	
3774	4361	3F	47	92			ESTA.UN	GETNUM	
3775	4364	90	42	8B			ECTA.F0	INCOMD	
3776	4367	00	00	94			STRA.F2	TEMPF	
3777	436A	00	00	95			STRA.F1	TEMPF+1	
3778	436D	3F	47	92			ESTA.UN	GETNUM	
3779	4370	90	42	8B			ECTA.F0	INCOMD	
3780	4373	00	00	96			LOII.F2		
3781	4376	00	00	97			ECTA.F0	INCOMD	

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
3741	40F6	06	1A			IN0	STRR,R1	*TEMPD	
3742	40F8	06	01				LCDD,R2	01	
3743	40FA	20					ECRZ,R0		
3744	40FB	0A	56				ADDR,R2	TEMPD+1	
3745	40FD	CA	54				STRR,R2	TEMP+1	
3746	40FF	77	08				FPPL	WC	
3747	40C1	88	4F				ADDR,R0	TEMPD	
3748	40C3	08	4D				STRR,R0	TEMPD	
3749	40C5	75	03				CPPL	WC	
3750	40C7	EB	4B				COMR,R0	TEMP	
3751	40C9	1A	6B				ECTR,LT	IN0	
3752	40CB	11	42	50			ECTA,GT	DCOMD	
3753	40CE	EG	45				COMR,R1	TEMP+1	
3754	40D0	1A	64				ECTR,LT	IN0	
3755	42D7	1F	42	50			ECTA,UN	DCOMD	
3756	40E5					*			
3757	40D5					*			
3758	40D5					*			
3759	40E5	06	C0			IRIT	LCDD,R2	C0	*****COMMAND
3760	40E7	1B	12				ECTR,UN	INI/O	
3761	42D9	06	C2			IS	LCDD,R2	C2	*****COMMAND
3762	40EB	1B	0E				ECTR,UN	INI/O	
3763	42DD	06	C6			IP	LCDD,R2	C6	*****COMMAND
3764	42DF	1B	0A				ECTR,UN	INI/O	
3765	40E1	06	40			OR	LCDD,R2	40	*****COMMAND
3766	40E3	1E	06				ECTR,UN	INI/O	
3767	40E5	06	42			OS	LCDD,R2	42	*****COMMAND
3768	40E7	1E	02				ECTR,UN	INI/O	
3769	40E9	26	44			OA	LCDD,R2	44	*****COMMAND
3770	40EB	CA	21			INI/O	STRR,R2	INTEMP	
3771	40ED	3F	47	92			ECTA,UN	GETNUM	
3772	40F0	9C	42	8B			ECFA,EC	INCOMD	
3773	40F3	08	1A				STRR,R0	INTEMP+1	
3774	40F5	09	19				STRR,R1	INTEMP+2	
3775	40F7	3F	47	92			ECTA,UN	GETNUM	
3776	40FA	98	04				ECFA,EC	INI/O	
3777	40FC	01					LCDD,R1		
3778	40FE	C3					STRZ,R3		
3779	40E1	1E	02				ECTR,UN	INI/O1	
3780	4100	07	02			INI/O0	LCDD,R3	02	
3781	4102	0A	0A			INI/O1	LCDD,R2	INTEMP	
3782	4104	08	09				LCDD,R0	INTEMP+1	
3783	4106	09	08				LCDD,R1	INTEMP+2	
3784	4108	3F	3D	82			ECTA,UN	I/O	
3785	410B	1F	42	90			ECTA,UN	DCOMD	
3786	410E					*			
3787	410E	02	00	00	00	INTEMP RES		4	
3788	4112					*			
3789	4112	CB	7D			AINI/O	STRR,R3	INTEMP+3	
3790	4114	CA	78				STEP,R2	INTEMP	
3791	4116	04	01				LCDD,R0	01	
3792	4118	05	02				LCDD,R1	02	
3793	411A	A5	01			AIN0/O	SUBL,R1	01	
3794	411C	77	08				FPPL	WC	
3795	411E	A4	00				SUBL,R0	00	

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
3795	4120	75	08				CPPL	WC	
3797	4122	16					ECTR,LT		
3798	4123	08	0A				STRR,R0	INTEMP+1	
3799	4125	05	09				STEP,R1	INTEMP+2	
3800	4127	0A	65				LCDD,R2	INTEMP	
3801	4129	0B	66				LCDD,R3	INTEMP+3	
3822	412B	3F	3D	82			ECTA,UN	I/O	
3803	412F	08	5F				LCDD,R0	INTEMP+1	
3804	4132	09	5E				LCDD,R1	INTEMP+2	
3805	4132	1B	66				ECTR,UN	AIN2/O	
3806	4134					*			
3807	4134	3F	47	92		AP	ECTA,UN	GETNUM	*****COMMAND
3828	4137	9C	42	8B			ECFA,EC	INCOMD	
3809	413A	00					LCDD,R0		
3810	413B	9C	42	8B			ECFA,EC	INCOMD	
3811	413E	01					LCDD,R1		
3812	413F	C3					STRZ,R3		
3813	4140	24	00				LCDD,R0	00	
3814	4142	06	C6				LCDD,R2	C6	
3815	4144	1B	12				ECTR,UN	AIN1	
3816	4146	04	44			AA	LCDD,R0	44	*****COMMAND
3817	4148	06	00				LCDD,R2	00	
3818	414A	1B	0A				ECTR,UN	AIN0	
3819	414C	04	40			AB	LCDD,R0	40	*****COMMAND
3820	414E	06	C0				LCDD,R2	C0	
3821	4150	1B	04				ECTR,UN	AIN0	
3822	4152	04	42			AS	LCDD,R0	42	*****COMMAND
3823	4154	06	C2				LCDD,R2	C2	
3824	4156	07	00			AIN0	LCDD,R3	00	
3825	4158	08	0B			AIN1	STRR,R0	AINTEM	
3826	415A	3F	41	12			ECTA,UN	AINI/O	
3827	415D	0A	06				LCDD,R2	AINTEM	
3828	415F	3F	41	12			ECTA,UN	AINI/O	
3829	4162	1F	42	90			ECTA,UN	DCOMD	
3830	4165					*			
3831	4165	00				AINTEM RES		1	
3832	4166					*			
3833	4166	3F	47	92		CH	ECTA,UN	GETNUM	*****COMMAND
3834	4169	08	29				ECFA,EC	RE	
3835	416B	03					LCDD,R0		
3836	416C	9C	42	8B			ECFA,EC	INCOMD	
3837	416F	E5	08				COMI,R1	08	
3838	4171	1D	42	8B			ECTA,GT	INCOMD	
3839	4174	C9	13				STRR,R1	CHTEM	
3840	4176	3F	47	92			ECTA,UN	GETNUM	
3841	4179	9C	42	8B			ECFA,EC	INCOMD	
3842	417C	02					LCDD,R2		
3843	417D	9C	42	8B			ECFA,EC	INCOMD	
3844	4180	C1					LCDD,R1		
3845	4181	0E	06				LCDD,R3	CHTEM	
3846	4183	CF	E1	60			STRR,R3	*ICPD,I	
3847	4186	1F	41	60			ECTA,UN	CH	
3848	4189					*			
3849	4189	00				CHTEM RES		1	
3850	418A					*			

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3551	415A	3D	8C			IFC	ACON	PC	
3552	415C	3D	81			IPC2	ACON	PC+1	
3553	415F	06	FC			IACRT	ACON	AUTSTAB	
3554	415B	31	FF			ICPU	ACON	CFUPREG	
3555	4152	36	8D			IMOD	ACON	MODTAB	
3556	4154					*			
3557	4154	3F	03			FE	ESTA,UN	RI2	*****COMMAND
3558	4156	1F	42	98		ECTA,UN		DOCMD	
3559	4156					*			
3560	4159					*			
3561	415E	3F	45	C9		RE0	ESTA,UN	LFOP	
3562	415C	2C	61	8A			LODA,R0	*IFC	
3563	415F	3F	47	4F			ESTA,UN	HACT	
3564	41A2	0C	61	8C			LODA,R0	*IPC2	
3565	41A5	3F	47	4F			ESTA,UN	HACT	
3566	41A8	3F	45	8B			ESTA,UN	WRTBL	
3567	41AB	3F	3F	A4			ESTA,UN	RI2	*PC
3568	41AF						STRZ,R3		
3569	41AF	53					RRR,R3		
3570	41B4	53					RRR,R3		
3571	41E1	47	03				ANDI,R3	03	
3572	41E3	44	FC				ANDI,R3	FC	
3573	41B5	14	64				COMI,R2	64	
3574	41B7	18	06				ECTP,R0	RI1	
3575	41B5	14	14				COMI,R2	14	
3576	41B5	18	04				ECTP,R0	RI1	
3577	41B0	14	34				COMI,R2	34	
3578	41E5	06	02				ECTP,R0	RI2	
3579	41C1	27	02			RE1	LODI,R3	02	
3580	41C3	3F	E1	03		RE2	YODA,R3	*IADRT.I	
3581	41C6	03					STRZ,R3		
3582	41C7	06	FF				LODI,R2	FF	
3583	41C9	3F	45	8B		RE3	ESTA,UN	WRTBL	
3584	41C0	3F	3F	A8			ESTA,UN	RI1	P2 *PC,++
3585	41C7	3F	47	4F			ESTA,UN	HACT	
3586	41D2	02					LODI,R2		
3587	41D3	13					COMI,R3		
3588	41D4	06	73				ECTP,R0	RI3	
3589	41D5	06	11				LODI,R2	11	
3590	41D6	21	05	06			LODA,R1	CURSOP+1	
3591	41E8	45	0F				ANDI,R1	0F	
3592	41D5	3F	44	4C			ESTA,UN	SETCHR	
3593	41F2	27	FF				LODI,R3	FF	
3594	41F2	67	21			RE4	ANDI,R3	21	
3595	41E4	3F	45	8B			ESTA,UN	WRTBL	
3596	41F2	24	52				LODI,R0	'R'	
3597	41E9	3F	45	8D			ESTA,UN	WRT	
3598	41F0	03					LODI,R3		
3599	41E0	64	30				ICRI,R2	30	
3600	41F7	3F	45	8D			ESTA,UN	WRT	
3601	41F2	24	3D				LODI,R0	'A'	
3602	41F4	3F	45	8D			ESTA,UN	WRT	
3603	41F7	0F	E1	90			LODA,R3	*ICPU,1	
3604	41FA	3F	47	4F			ESTA,UN	HACT	
3605	41D0	E7	28				COMI,R3	28	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
3606	41FF	08	61				ECTP,R0	RI4	
3607	4201	05	0A				LODI,R1	A	" CC=" "
3608	4203	3F	46	CA			ESTA,UN	PRING	
3609	4204	2E	89				LODI,R0	*SFSI	
3610	4206	1C					RPL,R0		
3611	4209	12					RRL,R0		
3612	420A	44	03				ANDI,R0	03	
3613	420C	24	30				LODI,R0	30	
3614	4205	1F	45	8D			ECTA,UN	WRT	
3615	4211					*			
3616	4211	3F	26			SFSI	ACON	SFSI	
3617	4213					*			
3618	4213					NOP	ECU	\$	
3619	4213					*			
3620	4213	28	3F			OUT	LODI,R2	ENTER	
3621	4215	1F	01	8A			COMI,R2	IPC	
3622	4215	06	0F				ECTP,R0	OUT0	
3623	421A	07	01				LODI,R3	03	
3624	421C	0F	95	80			EXA	*PC	
3625	421F	72				OUT0	ECTP,R2		MODES ARE
3626	4220	44	7F				ANDI,R2	7F	01 - SI
3627	4222	14	18				COMI,R0	CTRLX	02 - ST
3628	4224	1C	42	6E			ECTA,R0	CHST	03 - CMD
3629	4227	2A	24			OUT1	LODI,R2	MCIE	03 - TR
3630	4229	2E	E1	92			LODA,R2	*IMOD,1	04 - SS
3631	422D	03					STRZ,R3		
3632	4231	9F	42	13			EXA	OUT	
3633	4230					*			
3634	4232	22	00			TRSTOP	RES	2	
3635	4232					*			
3636	4232	3F	41	99		TR	ESTA,UN	RI2	
3637	4235	2E	79				LODI,R2	TRSTOR	
3638	4237	12	78				LODI,R1	TRSTOR+1	
3639	4239	A5	01				SUBI,R1	01	
3640	423B	77	06				PFSI	WC	
3641	423D	14	20				SUBI,R2	20	
3642	423F	75	08				CPSL	WC	
3643	4241	06	61			CHMOD0	STRZ,R0	TRSTOP	
3644	4243	06	6C				STRZ,R1	TRSTOR+1	
3645	4245	20					LODI,R0		
3646	4246	8C	3A	03			ECTA,R0	GETOP	
3647	4249	21					LODI,R1		
3648	424A	20	38	03			ECTA,R0	GETOP	
3649	424D	04	04				LODI,R2	04	
3650	4249	08	02				STRZ,R0	MODE	
3651	4251	1F	25				ECTP,UN	SS1	
3652	4251					*			
3653	4253	07				MODE	RES	1	
3654	4254	2C	00			STSTOR	RES	2	
3655	4256					*			
3656	4256	28	70			ST	LODI,R2	STSTOR	
3657	4256	25	78				LODI,R1	STSTOR+1	
3658	425A	A1	21				SUBI,R1	01	
3659	425C	77	08				PFSI	WC	
3660	425E	A4	07				SUBI,R2	02	

LINE	ADDR	P1	P2	P3	P4	LABEL	OPCODE	OPERAND	COMMENTS
3961	4262	75	28				CPSL	VC	
3962	4262	08	78				STRR,R0	STSTOR	
3963	4264	08	6F				STRR,R1	STSTOR+1	
3964	4260	08				CHMOD	LODZ,R0		
3965	4267	9C	38	C3			BCFA,EQ	GETOP	
3966	426A	21					LODZ,R1		
3967	4263	9C	38	C3			BCFA,EQ	GETOP	
3968	4261	24	24			CHST	LODI,R0	04	
3969	4270	08	61				STRR,R0	MODE	
3970	4272	1F	42	27			BCFA,UN	OUT1	
3971	4275					*			
3972	4275	3F	41	99		SS	BSTA,UN	RES	
3973	4278	3F	46	FC		SS1	BSTA,UN	PAUSEL	
3974	4275	3F	46	F7			BSTA,UN	PAUSEL	
3975	4271	F4	18				COMI,R0	CTRLX	
3976	4280	18	0F				BCFR,EQ	DCOMD	
3977	4282	F4	15				COMI,R0	ESC	
3978	4284	18	0A				BCFR,EQ	DCOMD	
3979	4286	1F	38	C3		SI	BCFA,UN	GETOP	
3980	4289					*			
3981	4289	36	C8			CMDTB	ACOM	COMTB2	
3982	428E					*			
3983	4285	05	05			INCOMD	LODI,R1	5	
3984	428D	3F	46	CA			BSTA,UN	PRING	
3985	4292	20				DCOMD	BCFR,R0	MODE	
3986	4291	08	40				STRR,R0	MODE	
3987	4293	04	02				LODI,R0	02	
3988	4295	93					LPSEL		
3989	4296	05	06				LODI,R1	6	
3990	4298	3F	46	C7			BSTA,UN	PSTRNG	
3991	4295	24	47				LODI,R0	COMSTG	
3992	429D	05	11				LODI,R1	COMSTG	
3993	429F	06	20				LODI,R2	20	
3994	42A1	3F	46	67			BSTA,UN	ARROW	
3995	42A4	98	6A				BCFR,EQ	DCOMD	
3996	42A6	07	6C				LODI,R3	6C	
3997	42A8	18	04				BCFR,UN	NOTOK8	
3998	42AA	08	3F			NOTOK	LODI,R3	COMPTR+1	
3999	42AC	A7	04				SUBI,R3	04	
4000	42AF	0E	38			NOTOK2	STRR,R3	COMPTR+1	
4001	42B0	1A	59				BCFR,LT	INCOMD	
4002	42B2	08	3A				LODR,R0	COMSTG	
4003	42B4	3F	47	8C			BSTA,UN	LTOUT	
4004	42B7	EF	E2	89			COMA,R3	*CMITB.1	
4005	42BA	96	61				BCFR,EQ	NOTOK	
4006	42BC	08	31				LODR,R0	COMSTG+1	
4007	42B7	3F	47	8C			BSTA,UN	LTOUT	
4008	42C1	EF	A2	89			COMA,R3	*CMITB.+	
4009	42C4	98	64				BCFR,EQ	NOTOK	
4010	42C6	0F	A2	89			LODR,R3	*CMITB.+	
4011	42C9	08	21				STRR,R0	JTEM	
4012	42CB	0F	A2	89			LODR,R3	*CMITB.+	
4013	42CE	08	1D				STRR,R0	JTEM+1	
4014	42D0	20					BCFR,R0		
4015	42D1	08	17				STRR,R2	COMPTR	

LINE	ADDR	P1	P2	P3	P4	LABEL	OPCODE	OPERAND	COMMENTS
4016	42D3	3F	47	7B		OKCOMD	BSTA,UN	GETCOM	
4017	42D6	08					LODZ,R2		
4018	42D7	18	93				BCFR,EQ	*JTEM	
4019	42D9	F4	20				COMI,R0	20	
4020	42DB	18	8F				BCFR,EQ	*JTEM	
4021	42DD	3F	47	65			BSTA,UN	CINUM	
4022	42DE	96	71				BCFR,EQ	OKCOMD	
4023	42E0	08	06				LODR,R0	COMPTR	
4024	42E4	A4	01				SUBI,R0	01	
4025	42E5	C6	02				STRR,R2	COMPTR	
4026	42E6	18	62				BCFR,UN	*JTEM	
4027	42EA					*			
4028	42EA	00	00			COMPTR	RES	2	
4029	42EC	00	00			JTEM	RES	2	
4030	42EE					*			
4031	42EF	00	00	00	00	COMSTG	RES	21	
4032	42F0	00	00	00	00				
4033	42F0	00	00	00	00				
4034	42FA	00	00	00	00				
4035	42FB	00	00	00	00				
4036	42FC	00	00	00	00				
4037	42FD	00	00	00	00				
4038	42FE	00	00	00	00				
4039	42FF	00							
4040	4300					*			
4041	4300					*			
4042	430F	04	01			CSI	LODI,R0	01	*****COMMAND
4043	4311	00	02	53			STRA,R0	MODE	
4044	4314	1F	43	32			BCFA,UN	CST0	
4045	4317					*			
4046	4317	3F	47	92		CST	BSTA,UN	GETNUM	*****COMMAND
4047	431A	9C	42	61			BCFA,EQ	CHST	
4048	431C	00	02	54			STFA,R0	STSTOR	
4049	4320	00	02	55			STFA,R1	STSTOR+1	
4050	4323	00					LODZ,R0		
4051	4324	98	07				BCFR,EQ	CST1	
4052	4326	01					LODZ,R1		
4053	4327	98	04				BCFR,EQ	CST1	
4054	4329	04	04				LODI,R0	04	
4055	432B	18	02				BCFR,UN	CST2	
4056	432D	04	00			CST1	LODI,R2	02	
4057	432F	00	02	53		CST2	STFA,R2	MODE	
4058	4332	3F	47	92		CST2	BSTA,UN	GETNUM	
4059	4335	5C	42	13			BCFA,EQ	OUT	
4060	4338	00	51	8A		CPC	STFA,R0	*IPC	
4061	433B	00	51	8C			STFA,R1	*IPC2	
4062	433E	1F	42	13			BCFA,UN	OUT	
4063	4341					*			
4064	4341	3F	47	92		PCIT	BSTA,UN	GETNUM	*****COMMAND
4065	4344	9C	42	61			BCFA,EQ	INCOMD	
4066	4347	18	61				BCFR,UN	CPC	
4067	4348					*			
4068	4349	3F	47	92		CTR	BSTA,UN	GETNUM	*****COMMAND
4069	434C	9C	42	61			BCFA,EQ	CHST	
4070	434F	00	02	50			STFA,E0	TRSTOR	

LINE	ADDR	P1	P2	P3	P4	LABEL	OPCODE	OPERAND	COMMENTS
4071	4352	01	22	31			STRA,R1	TRSTOR+1	
4072	4355	24	03				LODI,R2	03	
4073	4357	1F	56				PCTR,UN	CST2	
4074	4359					*			
4075	4359					*			
4076	4359	3F	47	02		DPAGE	BSTA,UN	GETNUM	*****COMMAND
4077	435C	9C	42	0B			PCRA,R0	INCOMD	
4078	435F	08	23				STRR,R2	POINT	
4079	4361	09	22				STRA,R1	POINT+1	
4080	4363	06	10			DPAGE2	LODI,R2	10	
4081	4365	25	00				LODI,R1	00	
4082	4367	3F	44	4C			BSTA,UN	SETCUR	
4083	436A	70					ICR2,R0		
4084	436F	08	10				STRR,R2	CURSTA	
4085	4370	27	7F				LODI,R3	7F	
4086	4371	3F	43	05			BSTA,UN	DISP2	
4087	4372	3F	44	28		DPAGE0	BSTA,UN	CURPLT	
4088	4375	3F	44	57			BSTA,UN	CURIED	
4089	4376	98	76				PCFR,R0	DPAGE0	
4090	437A	04	21				LODI,R2	01	
4091	437C	88	26				ADDP,R2	POINT	
4092	437F	44	7F				ANDI,R0	7F	
4093	4382	08	22				STRR,R2	POINT	
4094	4382	1F	51				PCTR,UN	DIAGI2	
4095	4384					*			
4096	4384	02	20			POINT	FES	2	
4097	4386	02	20			CURSTA	RES	2	
4098	4388					*			
4099	4388					*			
4100	4388	3F	47	92		EDIS	BSTA,UN	GETNUM	*****COMMAND
4101	438F	9C	42	0B			PCRA,R0	INCOMD	
4102	4391	08	74				STRR,R2	POINT	
4103	4394	01	03	05			STRA,R1	POINT+1	
4104	4395	20				DDIS2	ICR2,R0		
4105	439A	08	72				STRR,R2	CURSTA	
4106	439E	27	7F				LODI,R3	07	
4107	4399	3F	1P				BSTA,UN	DISP2	
4108	439A	3F	44	28		DDIS2	BSTA,UN	CURPLT	
4109	4397	3F	44	57			BSTA,UN	CURIED	
4110	4398	98	76				PCFR,R0	DDIS0	
4111	43A2	05	12				LODI,R1	12	
4112	43A4	89	57				ADDP,R1	POINT+1	
4113	43A6	09	5D				STRR,R1	POINT+1	
4114	43AB	77	08				PPSL	WC	
4115	43AA	20					ICR2,R0		
4116	43AB	88	57				ADDP,R2	POINT	
4117	43AD	08	55				STRR,R2	POINT	
4118	43AF	75	09				CPSL	WC	
4119	43B1	1B	60				PCTR,UN	DDIS2	
4120	43B3					*			
4121	43B3					*			
4122	43B3	02	00			DIST	FES	2	
4123	43B5					*			
4124	43B5	0F	7C			DISP2	STRR,R3	DIST	
4125	43B7	06	FF				LODI,R2	FF	

FILE 'ALP' AS ASSEMBLED BY SYSTEM ON 11-23-78

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LINE	ADDR	P1	P2	P3	P4	LABEL	OPCODE	OPERAND	COMMENTS
4126	43B9	06	21			DIS2	ADDP,R2	21	
4127	43BB	0A	77				STRR,R2	DIST+1	
4128	43BD	3F	45	09			BSTA,UN	LICR	
4129	43C0	0A	72				LODI,R2	DIST+1	
4130	43C2	07	23	05			LODI,R3	POINT+1	
4131	43C5	02					LODI,R3		
4132	43C5	82					ADDP,R2		
4133	43C7	02					STRR,R3		
4134	43C8	77	08				PPSL	WC	
4135	43CA	02					ICR2,R2		
4136	43CB	6C	23	04			ADDP,R2	POINT	
4137	43CE	75	08				CPSL	WC	
4138	43D0	3F	47	4F			BSTA,UN	HXCT	
4139	43D3	03					LODI,R3		
4140	43D5	3F	47	4F			BSTA,UN	HXCT	
4141	43D7	3F	45	0B			BSTA,UN	WRTEL	
4142	43DA	05	01				SUBI,R2	01	
4143	43DC	3F	45	0B		DIS	BSTA,UN	WRTEL	
4144	43DE	3F	44	0E			BSTA,UN	R2IP	
4145	43E0	01					LODI,R1		
4146	43E3	3F	47	4F			BSTA,UN	HXCT	
4147	43E6	76	02				TMI,R2	02	
4148	43E9	08	72				PCFR,R0	DIS	
4149	43F1	A5	12				SUBI,R2	12	
4150	43F2	25	24				LODI,R1	24	
4151	43F5	3F	45	0B		DIS4	BSTA,UN	WRTEL	
4152	43F1	FD	73				BCPP,R1	DIS4	
4153	43F3	3F	19			DIS7	BSTA,UN	R2IP	
4154	43F5	31					LODI,R1		
4155	43F8	45	10				ANDI,R1	10	
4156	43F8	16	04				PCTR,R0	DIS6	
4157	43FA	34	02				TMI,R2	02	
4158	43FC	0F	22				PCFR,R0	DIS6	
4159	43FE	04	25			DIS5	LODI,R0		
4160	4400	3F	45	0E		DISC	BSTA,UN	WPT	
4161	4403	76	0F				TMI,R2	0F	
4162	4405	08	6C				PCFR,R0	DIS7	
4163	4407	1F	23	03			PCRA,R2	DIS7	
4164	440A	14					PCTR,R3		
4165	440B	1F	43	09			BSTA,UN	DIS2	
4166	440E					*			
4167	440F	03				R2IP	STRR,R3		
4168	4410	24	21				LODI,R3	01	
4169	4411	02					ADDP,R2		
4170	4412	02					STRR,R2		
4171	4413	6C	23	05			ADDP,R0	POINT+1	
4172	4416	0F	2F				STRR,R0	PTIMP-1	
4173	4418	77	08				PPSL	WC	
4174	441A	27					ICR2,R2		
4175	441B	11	23	04			ADDP,R2	POINT	
4176	441E	75	08				CPSL	WC	
4177	4420	06	04				STRR,R2	PTIMP	
4178	4422	02	02				LODI,R1	*PTIMP	
4179	4424	03					LODI,R3		
4180	4425	17					BSTA,UN		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
4181	4408								
4182	4408	00	00				PTEMP RES	Z	
4183	4408								
4184	4408								
4185	4408	2C	23	86			CURPLT	LCIA,R0	CURSTA
4186	4408	01					STPZ,R1		
4187	4408	0F	03	B3			LCIA,R3		DIST
4188	4408	1A	03				BCTR,LT		CURF0
4189	4408	02	25	08			LODA,R1		CURSOR+1
4190	4408	45	0F				CURF0	ANDI,R1	0F
4191	4408	44	F0				ANDI,R0		F0
4192	4408	03					STRZ,R3		
4193	4408	26	00				LCIA,R2		02
4194	4408	75	01				CFSL		CRY
4195	4408	72	08				FFSL		WC
4196	4408	D2					RRL,R0		
4197	4408	D2					RRL,R2		
4198	4408	83					ADDZ,R3		
4199	4408	86	10				ADDI,P2		10
4200	4408	84	50				ADDI,R0		50
4201	4408	86	20				ADDI,R2		20
4202	4408	75	08				CFSL		WC
4203	4408	61					IOFZ,P1		
4204	4408	01					STRZ,R1		
4205	4408	3F	46	3C			SETCUR	ESTA,UN	EROLD
4206	4408	01	05	C7			STRA,R2		CURSOR
4207	4408	0D	05	C6			STRA,R1		CURSOR+1
4208	4408	04	1C				LODI,R0		1C
4209	4408	0C	85	C7			STRA,R0		*CURSOR
4210	4408	17					RETC,UN		
4211	4408								
4212	4408								
4213	4408	36	9C				KEYTAB	ACON	KEYTAB
4214	4408	36	A4				KEY	ACON	KEY0
4215	4408								
4216	4408								
4217	4408	3F	46	F7			CURED	BSTA,UN	PAUSE
4218	4408	3F	47	8C			BSTA,UN		LTOU
4219	4408	14	0D				COMI,R0		0D
4220	4408	14					RETC,EC		
4221	4408	F4	1B				COMI,R0		ESC
4222	4408	1C	44	F1			BCTA,E0		CURED1
4223	4408	14	4F				COMI,R0		'Y'
4224	4408	98	07				BCFR,EC		CURED0
4225	4408	20					ECRZ,P0		
4226	4408	CC	03	P6			STRA,R0		CURSTA
4227	4408	04	21				LOIT,R2		01
4228	4408	17					RETC,UN		
4229	4408	0F	03	B3			CURED0	LODA,R2	DIST
4230	4408	1A	24				BCTR,LT		CURIDA
4231	4408	05	02				LODI,R2		22
4232	4408	1B	02				BCTR,UN		CURED1
4233	4408	0C	08				CURIDA	LODI,R2	08
4234	4408	1B	04	FB			CURED1	CCMA,R2	*KEYTAB,-
4235	4408	1C	44	D0			BCTA,E0		CURED4

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
4236	4408	4A	78				BEAR,R2		CURED1
4237	4408	3F	47	6E			BSTA,UN		ORHEX
4238	4408	04	4F				BCFR,EC		CURED
4239	4408	03					STRZ,R3		
4240	4408	3F	45	8B			BSTA,UN		WRTBL
4241	4408	0C	07	02			LODA,R0		KBBUF
4242	4408	3F	45	8D			BSTA,UN		WRT
4243	4408	03					LODI,R3		
4244	4408	3F	47	46			BSTA,UN		MHEX
4245	4408	03					LODI,R3		
4246	4408	01					STPZ,R1		
4247	4408	3F	46	F7			CUPID2	BSTA,UN	PAUSE
4248	4408	3F	47	8C			BSTA,UN		LTOU
4249	4408	F4	1B				COMI,R0		ESC
4250	4408	1C	44	F1			BCTA,E0		CUREDX
4251	4408	3F	47	6E			BSTA,UN		ORHEX
4252	4408	98	07				BCFR,EC		CURED2
4253	4408	3F	47	46			BSTA,UN		MHEX
4254	4408	0C	07	02			LODA,R0		KBBUF
4255	4408	3F	45	8D			BSTA,UN		WRT
4256	4408	03					LODI,R3		
4257	4408	F1					RRL,R1		
4258	4408	D1					RRL,R1		
4259	4408	D1					RRL,R1		
4260	4408	D1					RRL,P1		
4261	4408	61					IOFZ,R1		
4262	4408	0E	23	86			CURED3	LODA,R2	CURSTA
4263	4408	52					RRL,R2		
4264	4408	52					RRL,R2		
4265	4408	52					RRL,R2		
4266	4408	52					RRL,R2		
4267	4408	A6	01				SUBI,R2		01
4268	4408	3F	44	8E			BSTA,UN		P2IF
4269	4408	0C	04	26			STRA,R0		*PTEMP
4270	4408	06	01				LODI,R2		01
4271	4408	0C	03	86			CURIDA	LODA,R0	CUPSTA
4272	4408	01					STPZ,R1		
4273	4408	50					RRL,P0		
4274	4408	50					RRL,R0		
4275	4408	50					RRL,R0		
4276	4408	50					RRL,R0		
4277	4408	0F	F4	5D			ADDA,R2		*KEY.1
4278	4408	D0					RRL,P0		
4279	4408	D0					RRL,R0		
4280	4408	D0					RRL,R0		
4281	4408	F0					RRL,R0		
4282	4408	0C	03	86			STRA,R0		CURSTA
4283	4408	0F	03	B3			LODA,R3		DIST
4284	4408	1E					RETC,LT		
4285	4408	44	F2				ANDI,R2		F0
4286	4408	45	0F				ANDI,R1		0F
4287	4408	61					IOFZ,R1		
4288	4408	0C	03	86			STRA,R0		CURSTA
4289	4408	04	21				LODI,R0		21
4290	4408	17					RETC,UN		

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
4281	44F1								
4282	44F1	20	03	E3		CUREX	LODA,R2	DIST	
4283	44F4	01	42	02			ECFA,IT	DCOMD	
4284	44F7	06	10				LODI,R2	12	
4285	44F9	05	4F				LODI,R1	4F	
4286	44FB	3F	44	4C			BSTA,UN	SETCUR	
4287	44FE	1F	42	02			ECTA,UN	DCOMD	
4288	4501								
4289	4501	05	13			ERROR	LODI,R2	13	
4290	4503	0F	00				LODI,R1	00	
4291	4505	3F	44	4C			BSTA,UN	SETCUR	
4292	4508	03					LODI,R3		
4293	4509	01					STR2,R1		
4294	450A	2F	46	CA			BSTA,UN	PRING	
4295	450D	04	20				LODI,R2		
4296	450F	00	05	C7			STPA,R2	*CURSOR	
4297	4512	3F	46	F7			BSTA,UN	PAUSE	
4298	4515	1F	20	46			BSTA,UN	FBDN	
4299	4516								
4300	4518	3F	46	2F		BACK1	BSTA,UN	ERAS1	
4301	451B	15					RETC,LT		
4302	451C	00	05	C8			LODA,R2	CURSOR+1	
4303	451F	A4	10				SUP1,R2	12	
4304	4521	10	2F	C8			STPA,R2	CURSOR+1	
4305	4524	70	05				PPSL	WC	
4306	4525	00	05	C7			LODA,R2	CURSOR	
4307	4526	A4	27				SUP1,R2	0	
4308	452F	00	05	C7			STPA,R2	CURSOR	
4309	4531	75	08				CPSL	WC	
4310	4532	04	10				LODI,R2	10	
4311	4532	00	05	C7			STPA,R2	*CURSOR	
4312	4535	A5	01				SUP1,R1	1	
4313	4537	05	FF				COM1,R1	FF	
4314	4539	08	20				POPR,EC	NOSUP1	
4315	453A	28	06				LODR,R2	*TMP	
4316	453D	A4	21				SUP1,R2	1	
4317	453F	05	P2				STPA,R2	*TMP	
4318	4541	22				NOSUP1	LODR,R2		
4319	4542	17					RETC,UN		
4320	4543								
4321	4543	1A	24			TMP	ACON	TMPA	
4322	4545								
4323	4545	07	20			OLFOR	LODI,R2		
4324	4547	0F	05	C7			STPA,R2	*CURSOR	
4325	454A	01	25	C8		OLFOR2	LODA,R2	CURSOR+1	
4326	454D	47	2F				ANDI,R2	F	
4327	454F	07	21				ADDI,R2	1	
4328	4551	47	0F				ANDI,R2	F	
4329	4552	0F	05	C8			STPA,R2	CURSOR+1	
4330	4555	07	10				LODI,R2	10	
4331	4556	01	25	C7			STPA,R2	CURSOR	
4332	4558	04	20			12	LODI,R2	*CURSOR	
4333	4559	00	05	C7			STPA,R2	12	
4334	455B	07	10				LODI,R2	CURSOR+1	
4335	455C	0F	05	C8			STPA,R2		

LINE	ADDR	E1	E2	E3	E4	LABEL	OPCODE	OPERAND	COMMENTS
4336	455E	05	05	C9			STPA,R2	CURSOR+1	
4337	455E	77	20				PPSL	WC	
4338	456A	27	22				LODI,R2	2	
4339	456C	0F	25	C7			ADDA,R2	CURSOR	
4340	4567	01	05	C7			STPA,R2	CURSOR	
4341	4572	75	38				CPSL	WC	
4342	4574	P7	05				TM1,R2	5	
4343	4576	00	65				POPR,EC	12	
4344	4578	01	05	C8			LODA,R2	CURSOR+1	
4345	4579	0F	05	C8			STPA,R2	CURSOR+1	
4346	457E	27	10				LODI,R2	10	
4347	4582	0F	25	C7			STPA,R2	CURSOR	
4348	4583	27	10				LODI,R2	10	
4349	4585	01	05	D7			STPA,R2	*CURSOR	
4350	4586	17					RETC,UN		
4351	4589								
4352	4589	21	16			IULC	ACON	IULC	
4353	4589								
4354	4589	24	22			WTEL	LODI,R2		
4355	458D	77	13			WRT	PPSL	PS	
4356	458E	01	05	B9			LODA,R1	*IULC	
4357	4592	3F	47	20			BSTA,LT	LTOM	
4358	4595	01					STR7,R1		
4359	4596	25	FF				POPR,R1	FF	
4360	459F	P5	60				TM1,R1	60	
4361	459A	16	29				ECTA,EC	RETURN	
4362	459C	14	60				TM1,R2	60	
4363	459F	14	22				POPR,EC	WTEL	
4364	45A2	44	3F				ANDI,R2	3F	
4365	45A2	08	A3			WTEL	STPA,R2	*CURSOR	
4366	45A4	15	10				LODI,R1	10	
4367	45A5	05	20				ADDP,R1	CURSOR+1	
4368	45A5	06	12				STPA,R1	CURSOR+1	
4369	45AA	27	38				PPSL	WC	
4370	45AC	05	02				LODI,R1	02	
4371	45A5	05	17				ADDP,R1	CURSOR	
4372	45B0	08	15				STPA,R1	CURSOR	
4373	45B2	15	05				TM1,R1	5	
4374	45B4	55	2A				ECTA,EC	WTCUR	
4375	45B6	05	10				LODI,R1	CURSOR+1	
4376	45B6	06	P2				LODI,R1	70	
4377	45BA	09	00				STPA,R1	CURSOR+1	
4378	45B5	05	14				LODI,R1	14	
4379	45B5	09	27				STPA,R1	CURSOR	
4380	45C0	05	10			WTCUR	LODI,R1	10	
4381	45C2	09	83				STPA,R1	*CURSOR	
4382	45C4	75	18			RETURN	CPSL	PS+WC	
4383	45C5	17					RETC,UN		
4384	45C7								
4385	45C7	22	20			CURSOR	RES	2	
4386	45C8								
4387	45C8	3F	46	30		IFOR	BSTA,UN	EROLL	
4388	45C8	05	7A				LODI,R2	CURSOR+1	
4389	45D1	F4	2F				TM1,R2	F	
4390	45D2	15	26				ECTA,EC	SCROLL	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
4291	44F1								
4292	44F1	00	03	E3		CURLEX	LODA,R2	DIST	
4293	44F4	91	42	9C			PCFA,LT	DCCMD	
4294	44F7	05	10				LODI,R2	12	
4295	44F8	05	4F				LODI,R1	4F	
4296	44F8	33	44	4C			ESTA,UN	SETCUR	
4297	44F8	1F	42	90			ECTA,UN	DCCMD	
4298	4501								
4299	4521	05	13			ERROR	LODI,R2	13	
4299	4503	0F	C0				LODI,R1	C0	
4301	4505	3F	44	4C			ESTA,UN	SETCUR	
4302	4508	03					LCDD,R3		
4303	4505	C1					STPR,R1		
4304	450A	3F	46	CA			ESTA,UN	PRING	
4305	450D	04	20				LODI,R0		
4306	450F	00	85	C7			STRA,R0	*CURSOR	
4307	4512	3F	46	F7			ESTA,UN	PAUSE	
4308	4515	11	20	40			ECTA,UN	FRIN	
4309	4515								
4310	4516	3F	46	2F		BACK1	ESTA,UN	ERAS1	
4311	451E	16					RETC,LT		
4312	451C	00	25	C8			LODA,R0	CURSOR+1	
4313	451F	A4	10				SUBI,R0	10	
4314	4521	00	0F	C8			STRA,R0	CURSOR+1	
4315	4524	77	06				PPSL	WC	
4316	4526	00	C5	C7			LODA,R0	CURSOR	
4317	4526	A4	00				SUBI,R0	0	
4318	452E	00	25	C7			STRA,R0	CURSOR	
4319	4521	75	08				CPSL	WC	
4320	4522	04	10				LODI,R0	10	
4321	4522	00	85	C7			STRA,R2	*CURSOR	
4322	4525	A5	01				SUBI,P1	1	
4323	4527	15	FF				COMI,R1	FF	
4324	4527	06	06				PCPR,EC	NOSUB1	
4325	4528	28	86				LODI,R0	*TMM	
4326	452D	A4	01				SUBI,R0	1	
4327	4533	08	82				STPR,R0	*TMM	
4328	4541	22				NOSUB1	ECRZ,R0		
4329	4542	17					RETC,UN		
4330	4543								
4331	4543	2A	24			TMM	ACON	TMA	
4332	4545								
4333	4545	07	27			OLECR	LODI,R1		
4334	4547	CF	85	C7			STRA,R3	*CURSOR	
4335	454A	01	7F	C8		CIFCR2	LODA,R3	CURSOR+1	
4336	454D	47	2F				ANDI,R3	F	
4337	454F	87	01				ADDI,R3	1	
4338	4551	47	0F				ANII,R3	F	
4339	4553	0F	35	C8			STRA,R3	CURSOR+1	
4340	4556	07	10				LODI,R3	10	
4341	4556	0F	0F	C7			STRA,R3	CURSOR	
4342	455B	24	20				LODI,R2	10	
4343	455D	00	85	C7		L2	STRA,R0	*CURSOR	
4344	4560	07	10				LODI,R3	10	
4345	4562	87	0F	C8			ALDA,R3	CURSOR+1	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
4346	4565	1F	05	C8			STRA,R3	CURSOR+1	
4347	4568	77	28				PPSL	WC	
4348	456A	27	22				LODI,R3	2	
4349	456C	0F	25	C7			ALDA,R3	CURSOR	
4350	4567	05	0F	C7			STRA,R3	CURSOR	
4351	4572	75	28				CPSL	WC	
4352	4574	F7	05				TMI,R3	5	
4353	4576	08	65				PCPR,EC	L2	
4354	4578	03	0F	C8			LODA,R3	CURSOR+1	
4355	457B	0F	05	C8			STRA,R3	CURSOR+1	
4356	457E	07	10				LODI,R3	10	
4357	4580	0F	05	C7			STRA,R3	CURSOR	
4358	4583	27	10				LODI,R3	10	
4359	4585	01	85	C7			STRA,R3	*CURSOR	
4360	4586	17					RETC,UN		
4361	4589								
4362	4589	21	18			IULC	ACON	IULC	
4363	458B								
4364	458P	24	20			WRTEB	LODI,R0		
4365	458D	77	10			WRT	PPSL	PS	
4366	458F	07	85	89			LODA,R1	*IULC	
4367	4591	31	47	8C			ESTA,LT	170H	
4368	4596	C1					SCPR,R1		
4369	4596	25	FF				FOFI,R1	FF	
4370	4598	F5	6V				TMI,R1	62	
4371	459A	18	28				PCPR,EC	RETURN	
4372	459C	F4	60				TMI,R0	62	
4373	459E	16	02				PCPR,EC	WRTLC	
4374	45A2	44	3F				ANII,R0	3F	
4375	45A3	08	A3			WRTLC	STPR,R0	*CURSOR	
4376	45A4	03	12				LODI,R1	12	
4377	45A6	0E	20				ADDI,P1	CURSOR+1	
4378	45A8	00	11				STPR,R1	CURSOR+1	
4379	45AA	77	08				PPSL	WC	
4380	45AC	25	02				LODI,R1	C2	
4381	45AD	0F	17				ALDA,R1	CURSOR	
4382	45B0	03	15				STPR,R1	CURSOR	
4383	45B2	F3	05				TMI,R1	5	
4384	45B4	55	0A				PCPR,EC	WRTCUR	
4385	45B6	05	10				LODA,R1	CURSOR+1	
4386	45B8	01	F0				LOPI,R1	F0	
4387	45BA	0F	0C				STPR,R1	CURSOR+1	
4388	45BC	25	14				LODI,P1	14	
4389	45BE	0F	07				STPR,R1	CURSOR	
4390	45C0	0F	1C			WRTCLP	LODI,R1	1C	
4391	45C2	03	63				STPR,R1	*CURSOR	
4392	45C4	73	18			RETURN	PPSL	PS+WC	
4393	45C5	17					RETC,UN		
4394	45C7								
4395	45C7	00	02			CURSOR RES		2	
4396	45C9								
4397	45C9	3F	46	3C		IFCR	ESTA,UN	IFOLD	
4398	45CC	25	7A				LODA,R0	CURSOR+1	
4399	45CE	F4	C2				TMI,R0	F	
4400	45D2	15	2C				PCPR,EC	SCRCIL	

LINE	ADDR	P1	P2	P3	P4	LABEL	OPCODE	OPERAND	COMMENTS
4401	45D2	04	21				ADDI,R0	1	
4402	45D4	44	2F				ANDI,R0	F	
4403	45D6	08	70				STRR,R0	CURSOR+1	
4404	45D8	07	10			CLRLIN	LODI,R3	10	
4405	45DA	0E	6B				STRR,R3	CURSOR	
4406	45DC	04	22				LODI,R3		
4407	45DE	06	02				LODI,R2	0	
4408	45E0	01	E5	C7		ELL1	STRA,R2	*CURSOR,I	
4409	45E2	06	10				ADDI,R2	10	
4410	45E4	06	79				BCFR,F0	ELL1	
4411	45E7	07	21				ADDI,R3	1	
4412	45E9	0B	5C				STRR,R3	CURSOR	
4413	45EB	17	15				COMI,R3	15	
4414	45ED	06	71				BCFR,F0	ELL1	
4415	45EF	07	10				LODI,R3	10	
4416	45F1	0B	54				STRR,R3	CURSOR	
4417	45F3	04	1C				LODI,R0	1C	
4418	45F5	0B	D0				STRR,R0	*CURSOR	
4419	45F7	17					RETC,UN		
4420	45F9	04	14			SCROLL	LODI,R0	14	
4421	45FA	0B	4E				STRR,R0	CURSCR	
4422	45FC	22					STRR,R0		
4423	45FE	08	49				STRR,R2	CURSOR+1	
4424	45FF	06	00			SCROL2	LODI,R2	00	
4425	4601	07	FF				LODI,R3	FF	
4426	4603	21	A5	C7		SCROL1	LODA,R2	*CURSOR,+	
4427	4605	26	FF				LODI,R2	FF	
4428	4607	16	0F				TM1,R2	F	
4429	4609	1B	1F				BCFR,F0	SCPOL4	
4430	460B	07	A5	C7			STRA,R3	*CURSCR,+	
4431	460D	26	FF			SCROL5	LODI,R2	FF	
4432	460F	16	FF				COMI,R2	FF	
4433	4611	08	61				BCFR,F0	SCROL1	
4434	4613	0C	05	C7			LODA,R0	CURSOR	
4435	4615	A4	01				SUBI,R0	1	
4436	4617	14	2F				COMI,R0	F	
4437	4619	19	05				BCFR,F0	SCROL3	
4438	461B	0C	05	C7			STRA,R0	CURSCR	
4439	461D	1B	5				BCFR,UN	SCPOL2	
4440	461F	04	0F			SCROL3	LODI,R0	F	
4441	4621	0C	05	C8			STRA,R0	CURSOR+1	
4442	4623	17	45	D8			RETC,UN	CLRLIN	
4443	4625	07	01			SCROL4	ADDI,R3	1	
4444	4627	1E	68				BCFR,UN	SCROL5	
4445	4629					*			
4446	462F	0C	05	C7		ERAS1	LODA,R0	CURSCR	
4447	4632	14	10				COMI,R0	10	
4448	4634	08	06				BCFR,F0	EROLD	
4449	4636	0C	05	C8			LODA,R0	CURSOR+1	
4450	4638	E4	12				COMI,R0	12	
4451	463B	16					RETC,LT		
4452	463D	24	20			EROLD	LODI,R2		
4453	463E	0C	05	C7			STRA,R0	*CURSOR	
4454	4641	17					RETC,UN		
4455	4642					*			

LINE	ADDR	P1	P2	P3	P4	LABEL	OPCODE	OPERAND	COMMENTS
4456	4642					*			
4457	4642	1E	6B			BACKSP	BSTR,UN	ERAS1	
4458	4644	0F	05	C8			LODA,R3	CURSCR+1	
4459	4647	0C	05	C7			LODA,R0	CURSOR	
4460	464A	E4	12				COMI,R0	12	
4461	464C	08	03				BCFR,F0	BACKS1	
4462	464E	E4	12				COMI,R2	12	
4463	4650	16					RETC,LT		
4464	4651	A7	12			BACKS1	SUBI,R3	12	
4465	4653	77	08				PPSL	WC	
4466	4655	A4	00				SUBI,R0	0	
4467	4657	75	09				CPSL	WC	
4468	4659	0F	25	C8			STRA,R3	CURSCR+1	
4469	465C	0C	05	C7			STRA,R0	CURSOR	
4470	465F	04	1C				LODI,R0	1C	
4471	4661	0C	05	C7			STRA,R0	*CURSOR	
4472	4664	17					RETC,UN		
4473	4665					*			
4474	4666					*			
4475	4668	00	02			TMFAR	RES	2	
4476	4667					*			
4477	4667					*			
4478	4667	06	7C			ARROW	STRR,R0	TMFAR	
4479	4669	09	75				STRR,R1	TMFAR+1	
4480	466B	0F	FF				LODI,R1	FF	
4481	466D	3F	47	E3		INLOOP	ESTR,UN	GETIB	
4482	4670	E4	1E				COMI,R0	ESC	
4483	4672	1C	46	C2			BCFR,F0	ARROW2	
4484	4675	E4	20				COMI,R0	BS	
4485	4677	06	0F				BCFR,F0	NCBS	
4486	4679	1E	FF				COMI,R1	FF	
4487	467B	1E	72				BCFR,F0	INLCOP	
4488	467D	3F	45	42			ESTR,UN	BACKSP	
4489	4680	16	61				BCFR,F0	INLOOP	
4490	4682	A5	01				SUBI,R1	1	
4491	4684	66	01				ADDI,R2	1	
4492	4686	13	55				BCFR,UN	INLOOP	
4493	4688	24	15			NCBS	COMI,R0	15	
4494	468A	68	14				BCFR,F0	STRIN	
4495	468C	FE	FF				COMI,R1	FF	
4496	468E	08	5D				BCFR,F0	INLOOP	
4497	4690	02	A6	55		NCBS2	L I A, R1	*TMFAR,+	
4498	4693	16	07				BCFR,F0	STRIN2	
4499	4695	3F	45	BD			ESTR,UN	WRT	
4500	4698	FA	76				BCFR,R2	NCBS2	
4501	469A	1E	01				BCFR,UN	CRWAIT	
4502	469C	A5	01			STRIN2	SUBI,R1	1	
4503	469E	1E	4D				BCFR,UN	INLCOP	
4504	46A0	0E	A6	55		STRIN	STRA,R1	*TMFAR,+	
4505	46A3	E4	2E				COMI,R0	CRCD	
4506	46A5	16	11				BCFR,F0	CLRLAS	
4507	46A7	FA	44				BCFR,R2	INLOOP	
4508	46A9	70				CRWAIT	RETC,R2		
4509	46AA	24	08				COMI,R2	ES	
4510	46AC	1C	46	6D			BCFR,F0	INLOOP	

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
4511	45AF	E4	2D				COMI,R2	OPCD	
4512	45B1	26	7E				PCPR,R2	CHWAIT	
4513	45B3	33	46	FC			PSTA,UN	PAUSFI	
4514	45B5	27					LOI2,R0		
4515	45B7	17					PITC,UN		
4516	45B9	12				CLELAS	LOI2,R2		
4517	45BB	01	16	6F		CL	STRA,P1	*TMPAR,I	
4518	45BD	65	21				ALDI,P1	1	
4519	45BF	FA	79				PFR,R2	CL	
4520	45C1	3C					LOI2,R0		
4521	45C3	17					PITC,UN		
4522	45C5	04	FF			ARPOW2	LOI2,R2	FF	
4523	45C7	17					PITC,UN		
4524	45C9					*			
4525	45CB	22	0C			TMESS	RES	2	
4526	45CD					*			
4527	45CF	3F	45	C9		PSTRNG	PSTA,UN	LFGR	
4528	45D1	24	37			PRING	LOI1,R2	MSC0	
4529	45D3	05	26				LOI1,R2	MSC0	
4530	45D5	06	75				STR,R2	TMESS	
4531	45D7	0A	74				STR,R2	TMESS+1	
4532	45D9	A	01			PRING2	SUEI,R1	01	
4533	45DB	1A	16				PSTR,LT	PRING2	
4534	45DD	06	21			PRING1	LOI1,R2	01	
4535	45DE	7C					LOI2,R2		
4536	45E0	01	06	C6			ADDA,R2	TMESS+1	
4537	45E2	0A	66				STR,R2	TMESS+1	
4538	45E4	77	22				PSEL	WC	
4539	45E6	88	63				ADDA,R2	TMESS	
4540	45E8	08	01				STR,R2	TMESS	
4541	45EA	75	28				OPSI	WC	
4542	45EC	26	DD				LOI2,R0	*TMESS	
4543	45EE	1A	68				PSTR,LT	PRING2	
4544	45F0	15	6A				PSTR,UN	PRING1	
4545	45F2	07	02			PRING2	LOI1,R3	03	
4546	45F4	2F	AC	C5		PRING3	LOI1,R3	*TMESS..	
4547	45F6	16					PSTR,LT		
4548	45F8	3F	45	0D			PSTA,UN	WPT	
4549	45FA	1E	77				PSTR,UN	PRING3	
4550	45FC					*			
4551	45FE					*			
4552	4600	7C				PAUSE	REDD,R2		
4553	4602	1A	7D				PSTR,LT	PAUSF	
4554	4604	08	26				STR,R2	KEBUF	
4555	4606	7C				PAUSE1	REDD,R2		
4556	4608	5A	27				PSTR,LT	PAUSE1	
4557	460A	26	01				LOI2,R2	KEBUF	
4558	460C	17					PITC,UN		
4559	460E					*			
4560	4610	27				KEBUF	RES	1	
4561	4612					*			
4562	4614	35	72			GETKB	PSTR,UN	PAUSE	
4563	4616	3F	45	6D			PSTA,UN	WPT	
4564	4618	28	78				LOI2,R2	KEBUF	
4565	461A	17					PITC,UN		

LINE	ADDR	B1	B2	B3	B4	LABEL	OPCODE	OPERAND	COMMENTS
4566	461C					*			
4567	461E	36	AC			HEXTAB	ACON	HEXT1	
4568	4620	27	02			HEXSTG	RES	2	
4569	4622					*			
4570	4624	24	47			HEXIN	LOI1,R2	HEXSTG	
4571	4626	05	02				LOI1,R1	HEXSTG	
4572	4628	26	02				LOI1,R2	2	
4573	462A	3F	4F	07			PSTA,UN	ARPOW	
4574	462C	11	42	50			PSTA,LT	DOOM2	
4575	462E	2C	07	0D			LOI1,R2	HEXSTG	
4576	4630	3F	47	0C			PSTA,UN	LOU	
4577	4632	3F	47	6E			PSTA,UN	OKHEX	
4578	4634	16					PSTR,LT		
4579	4636	15					PSTR,GT		
4580	4638	35	1E				PSTR,UN	*HEX	
4581	463A	02					LOI2,R3		
4582	463C	01					STPZ,P1		
4583	463E	0C	27	2E			LOI1,R2	HEXSTG+1	
4584	4640	06	24				PCPR,R2	HEXIN2	
4585	4642	03					LOI2,R3		
4586	4644	75	02				OPSI	02	
4587	4646	17					PITC,UN		
4588	4648	3F	47	8C		HEXIN2	PSTA,UN	LOU	
4589	464A	3F	47	8F			PSTA,UN	OKHEX	
4590	464C	16					PSTR,LT		
4591	464E	15					PSTR,GT		
4592	4650	33	29				PSTR,UN	*HEX	
4593	4652	11				PBL,R1			
4594	4654	11				PBL,R1			
4595	4656	11				PBL,R1			
4596	4658	11				PBL,R1			
4597	465A	21					LOI2,R1		
4598	465C	03					LOI2,R3		
4599	465E	75	C0				OPSI	C0	
4600	4660	17					PITC,UN		
4601	4662					*			
4602	4664	27	10			*HEX	LOI1,R3	10	
4603	4666	1F	C7	2E		HEX2	CCWA,R2	*HEXTAB,-	
4604	4668	14					PITC,FC		
4605	466A	0B	7A				PSTR,R3	HEX2	
4606	466C	17					PITC,UN		
4607	466E					*			
4608	4670	01				EXOT	STPZ,P1		
4609	4672	52					PFR,R2		
4610	4674	52					PFR,R2		
4611	4676	52					PFR,R2		
4612	4678	52					PFR,R2		
4613	467A	44	2F				ANDI,R2	F	
4614	467C	0C	E7	0F			LOI1,R2	*HEXTAB,I	
4615	467E	3F	45	8D			PSTA,UN	WPT	
4616	4680	21					LOI2,R1		
4617	4682	44	2F				ANDI,R2	F	
4618	4684	0C	E7	0F			LOI1,R2	*HEXTAB,I	
4619	4686	17	45	8D			PSTA,UN	WPT	
4620	4688					*			

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
4601	4765	14	30			CKNUM	COM1,R0	'0'	
4602	4767	16					RETG,LT		
4603	4768	14	39				COM1,R0	'9'	
4604	476A	15					RETG,GT		
4605	476B	75	00				CPSL	00	
4606	476D	17					RETG,UN		
4607	476E					*			
4608	476F					*			
4609	4771					*			
4610	4773	3F	47	65		CKHEX	ESTA,UN	CKNUM	
4611	4771	14					RETG,FQ		
4612	4772	14	41				COM1,R0	'A'	
4613	4774	15					RETG,LT		
4614	4775	14	46				COM1,R0	'F'	
4615	4777	15					RETG,GT		
4616	4778	75	02				CPSL	02	
4617	477A	17					RETG,UN		
4618	477B					*			
4619	477B					*			
4620	477B	0F	02	FA		GETCOM	LODA,R2	COMPTR	
4621	477E	1A	00				ECTR,LT	GETCM2	
4622	4780	16	20				COM1,R0	20	
4623	4782	09	22				ECTR,GT	GETCM2	
4624	4784	26	20				LODI,R2	20	
4625	4786	0E	22	EE		GETCM2	LODA,R2	COMSTG,+	
4626	4789	0F	02	EA			STRA,R2	COMPTR	
4627	478C	14	60			LTCU	TMI,R0	60	
4628	478E	16					RETG,LT		
4629	478F	44	5F				ANDI,R0	5F	
4630	4791	17					RETG,UN		
4631	4792					*			
4632	4792					*			
4633	4792	3F	47	7B		GETNUM	ESTA,UN	GETCOM	
4634	4795	14	20				COM1,R0		
4635	4797	18	79				ECTR,R0	GETNUM	
4636	4799	14	48				COM1,R0	'R'	
4637	479F	18	75				ECTR,R0	GETNUM	
4638	479F	14	00				COM1,R0	00	
4639	479F	58	05				ECTR,R0	GETNM2	
4640	47A1	04	FF				LODI,R0	FF	
4641	47A3	17					RETG,UN		
4642	47A4					*			
4643	47A4					*			
4644	47A4	00	20			GETNMS	RES	2	
4645	47A5					*			
4646	47A5					*			
4647	47A5	25	00			GETNM2	LODI,R1	2	
4648	47A8	27	00				LODI,R3	0	
4649	47AF	1F	00				ECTR,UN	GETNM6	
4650	47A0	3F	47	7B		GETNM7	ESTA,UN	GETCOM	
4651	47AF	3F	47	6E		GETNM6	ESTA,UN	CKHEX	
4652	47B2	06	1F				ECTR,R0	GETNM3	
4653	47B4	14	40				COM1,R0	40	
4654	47B6	19	04				ECTR,GT	GETNM8	
4655	47B8	A4	3C				SUBI,R0	'0'	

LINE	ADDR	R1	R2	R3	R4	LABEL	OPCODE	OPERAND	COMMENTS
4656	47BA	14	02				ECTR,UN	GETNM9	
4657	47BC	A4	37			GETNM8	SUBI,R0	'A' - A	
4658	47B1	47	2F			GETNM6	ANDI,R3	F	
4659	47C0	75	01				CPSL	CRY	
4660	47C2	77	03				PPSL	WC	
4661	47C4	D1					RRL,R1		
4662	47C5	D3					RRL,R3		
4663	47C6	D1					RRL,R1		
4664	47C7	E3					RRL,R3		
4665	47C8	D1					RRL,R1		
4666	47C9	D3					RRL,R3		
4667	47CA	D1					RRL,R1		
4668	47CB	D3					RRL,R3		
4669	47CC	61					AID2,R1		
4670	47CD	C1					STHZ,R1		
4671	47CF	75	08				CPSL	WC	
4672	47D0	1F	5A				ECTR,UN	GETNM7	
4673	47D2	14	00			GETNM3	COM1,R0		
4674	47D4	08	05				ECTR,R0	GETNM4	
4675	47D6	3F	47	7B			ESTA,UN	GETCOM	
4676	47D9	1F	77				ECTR,UN	GETNM3	
4677	47DB	03				GETNM4	LODI,R3		
4678	47DD	27	02				LODI,R3	0	
4679	47DE	17					RETG,UN		
4680	47DF					*			
4681	47DF					*			
4682	47DF					MBUFF	RES	102	
4683	47F1	00	00	00	00	MBUFF	RES	8A	
4684	47F5	00	00	00	00				
4685	47F9	00	00	00	00				
4686	47FD	00	00	00	00				
4687	47FF	00	00	00	00				
4688	47FF	00	00	00	00				
4689	47FF	00	00	00	00				
4690	47FF	00	00	00	00				
4691	47FF	00	00	00	00				
4692	47FF	00	00	00	00				
4693	47FF	00	00	00	00				
4694	47FF	00	00	00	00				
4695	47FF	00	00	00	00				
4696	47FF	00	00	00	00				
4697	47FF	00	00	00	00				
4698	47FF	00	00	00	00				
4699	47FF	00	00	00	00				
4700	47FF	00	00	00	00				
4701	47FF	00	00	00	00				
4702	47FF	00	00	00	00				
4703	47FF	00	00	00	00				
4704	47FF	00	00	00	00				
4705	47FF	00	00	00	00				
4706	47FF	00	00	00	00				
4707	47FF	00	00	00	00				
4708	47FF	00	00	00	00				
4709	47FF	00	00	00	00				
4710	47FF	00	00	00	00				
4711	47FF	00	00	00	00				
4712	47FF	00	00	00	00				
4713	47FF	00	00	00	00				
4714	47FF	00	00	00	00				
4715	47FF	00	00	00	00				
4716	47FF	00	00	00	00				
4717	47FF	00	00	00	00				
4718	47FF	00	00	00	00				
4719	47FF	00	00	00	00				
4720	47FF	00	00	00	00				
4721	47FF	00	00	00	00				
4722	47FF	00	00	00	00				
4723	47FF	00	00	00	00				
4724	47FF	00	00	00	00				
4725	47FF	00	00	00	00				
4726	47FF	00	00	00	00				
4727	47FF	00	00	00	00				
4728	47FF	00	00	00	00				
4729	47FF	00	00	00	00				
4730	47FF	00	00	00	00				

****LAST ADDRESS USED: 496A****