CONTROL DATA CORPORATION

DESIGN DOCUMENT AUTHORIZATION

NO 16042970
REV A
DATE 04/13/83
PAGE 1—231

DIVISION

Terminals & Small Systems - Roseville

P.O.D. NUMBER

[ ] PROD. DVLPMT. AUTH.	[ ] GEN. INT. DESIGN	[ ] OTHER
[ ] PROD. OBJ.	[X] EXT. REF. SPEC.	
[ ] GEN. EXT. DESIGN	[ ] INT. MAIN. SPEC.	

DISCLAIMER: THIS DOCUMENT IS AN INTERNAL WORKING PAPER ONLY. IT IS UNAPPROVED AND SUBJECT TO CHANGE, AND DOES NOT NECESSARILY REPRESENT ANY OFFICIAL INTENT ON THE PART OF CONTROL DATA.

PRODUCT NUMBER/NOMENCLATURE

Viking X Resident 4.X

APPROVAL SIGNATURES		DATE
PREPARED BY:		
Lee Olson PROJECT ENGINEER	Lee O. Olson	4/25/83
A. Hornfeldt SUPERVISOR	A Hornfeldt	4-26-83
J. A. Opland DEPARTMENT MANAGER	J A Opland	4/25/83
R. A. Mundl DIRECTOR - SOFTWARE/HARDWARE	R. A Mundl	4/25/83
L. W. Schulze QA MANAGER	Larry W Schulze	4/25/83
J. C. Kranz MANAGER - PRODUCT LINE	JK	4/26/83
K. H. Kimmerle SYSTEM ENGINEERING	K. H. Kimmerle	4/25/83
T. E. Heideman OTHER	T. Heideman by CA	4/28/83

CONTROL DATA CORPORATION

Terminals & Small Systems - Roseville DIVISION

NO 16042970
REV A
DATE

DOCUMENT CLASS External Reference Specification PAGE 1A
PRODUCT NAME Viking X Resident 4.X
PRODUCT MODEL NO. _____ MACHINE SERIES _____

REVISION RECORD

REV.	E.C.O.	PAGE	DESCRIPTION	APVD.	DATE
00	CD 50010-70	-	RELEASED CLASS B	EAJ	5-4-83
01	52145		REVISED PAGES 1 1A 4-10 15 20 22-24 29 32 36-41 43 48 52-54 56 84-87 107 109 113-121 123-159 162-226 WJG 6-10-83	LDO	6-10-83
02	52204		REVISE PAGES 1 1A 4-10 28 52-57 86-88 WJG 7-20-83 114-118 121 122 125 126 130 131 158-160 163-231	LDO	7/20/83
A	15153-55	ALL	RELEASED CLASS "A"	MCL	07-29-83

CONTENTS

ILLUSTRATIONS

TABLES

1.0 INTRODUCTION

The Viking X standard hardware has the capability of holding up to 32K bytes of ROM, 64K bytes of RAM, and 16K bytes in ROM pack. The ROM contains resident programs that provide self-testing of the terminal hardware via resident diagnostics as well as programs to autoload and checksum controlware in the terminal RAM loaded from the Data Services Network (DSN) or the flexible disk subsystem option. The resident ROM also contains CYBER mode with subroutines that can be used by other controlware that has been loaded. Operator control of loading is accomplished by setting certain installation parameters via the keyboard. This document describes the operation of the resident ROM programs in the terminal. Further information on the hardware or loaded controlware may be found in separate documents directed specifically toward those topics.

2.0 APPLICABLE DOCUMENTS

EIA RS-232-C	Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange
CDC-STD 1.80.000	Programming Standards
CDC-STD 1.01.103	Software Development Documentation
CDC-STD 1.01.105	External Reference Specification
CDC-SPEC 16042886	Display Terminal Equipment Specification
CDC-ERS 16042871	IST-III ERS (Predecessor Product)
CDC-PUB 62950101	Operator's Guide/Installation Manual
CDC-PUB 62950102	Reference/On-Site Hardware Maintenance Manual
CDC-PUB 62940034	HMM On-Site/Service Center Manual
CDC-SPEC 51941115	Viking X Keyboard Specification
CDC-SPEC 16042854	CDC PLATO Flexible Disk Subsystem
CDC-SPEC 16042890	1200/1200 Internal Modem

3.0 FEATURE DESCRIPTION

The resident ROM firmware consists of the following major program segments that interact to perform the overall desired functions.

3.0 (Contd)

- Common Entry-Jump Table and Variables
- Initialization
- Resident Diagnostics
- Parameter Selection
- Load Source Selection
- Load File Selection
- ASCII Network Loader
- Flexible Disk Loader
- ROM Pack Load
- CYBER Mode

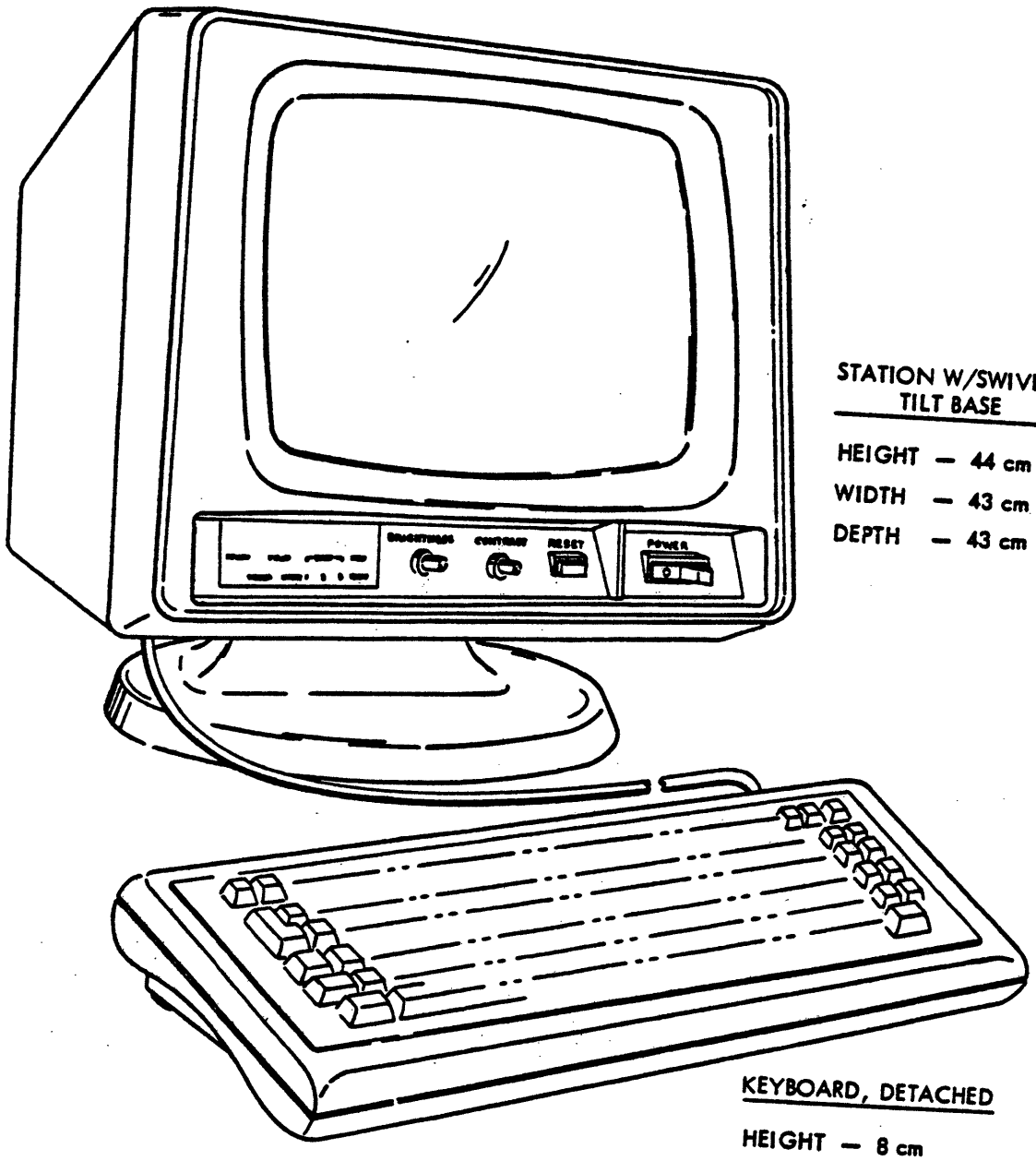
The terminal (figures 3.0.1 and 3.0.2) is capable of having a ROM pack or external controlware loaded into it. These external packages can use subroutines that already exist in the resident ROM. Paragraph 4.3 is dedicated to describing the interfaces to the usable routines.

The terminal does not use switches for parameter definition. Instead it utilizes nonvolatile memory (NVM), which stores parameters while the machine is turned off or unplugged. The resident ROM has subroutines that will allow qualified people to change these parameters. An initial value is forced into the NVM from ROM.

3.1 Initialization

3.1.1 Abstract

When the terminal is powered on or when the RESET switch is pressed, the initialization routine is executed.



STATION W/SWIVEL, TILT BASE

HEIGHT — 44 cm
WIDTH — 43 cm
DEPTH — 43 cm

KEYBOARD, DETACHED

HEIGHT — 8 cm
WIDTH — 49 cm
DEPTH — 23 cm

05034

Figure 3.0.1. Viking X Cabinet

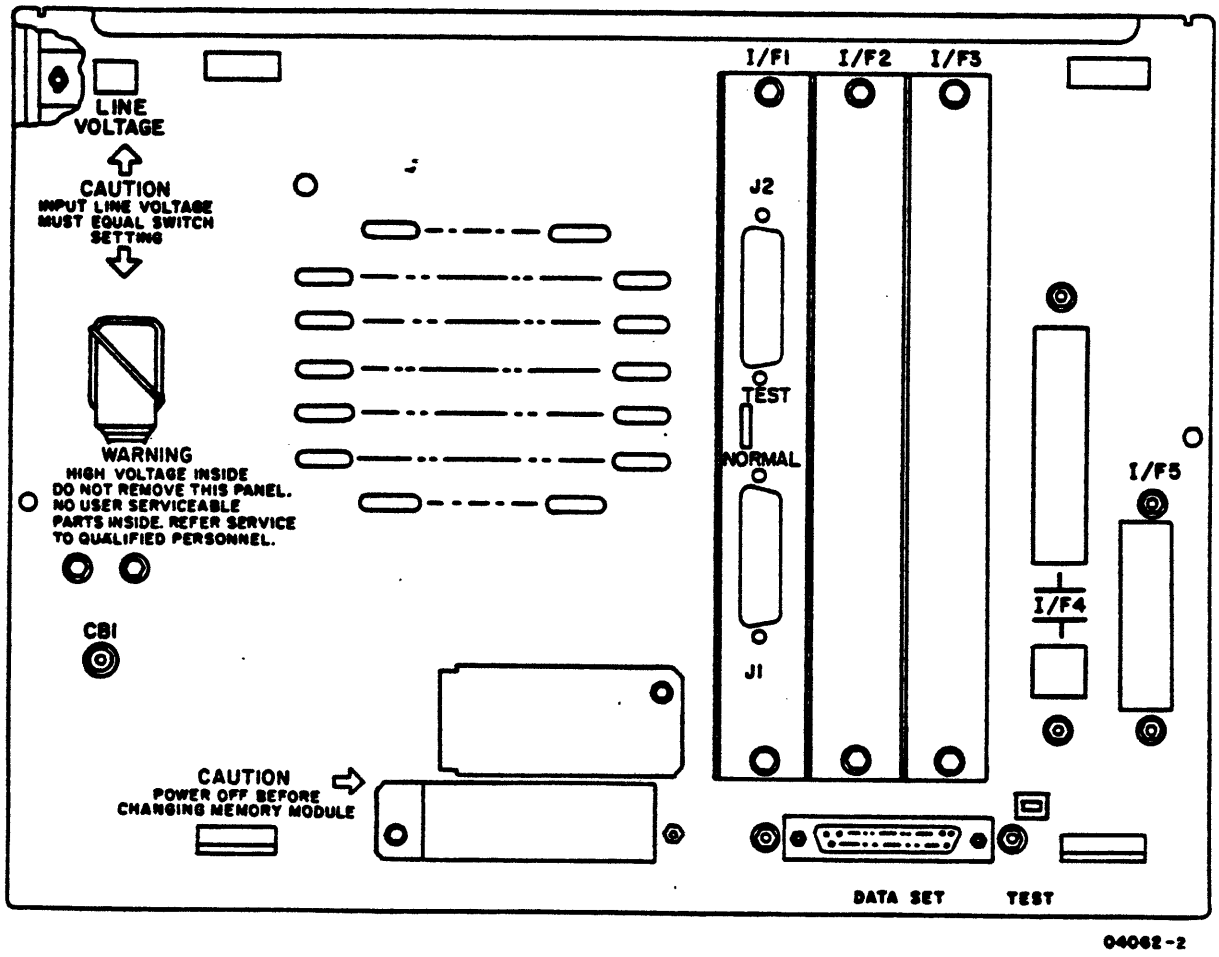


Figure 3.0.2. Connectors

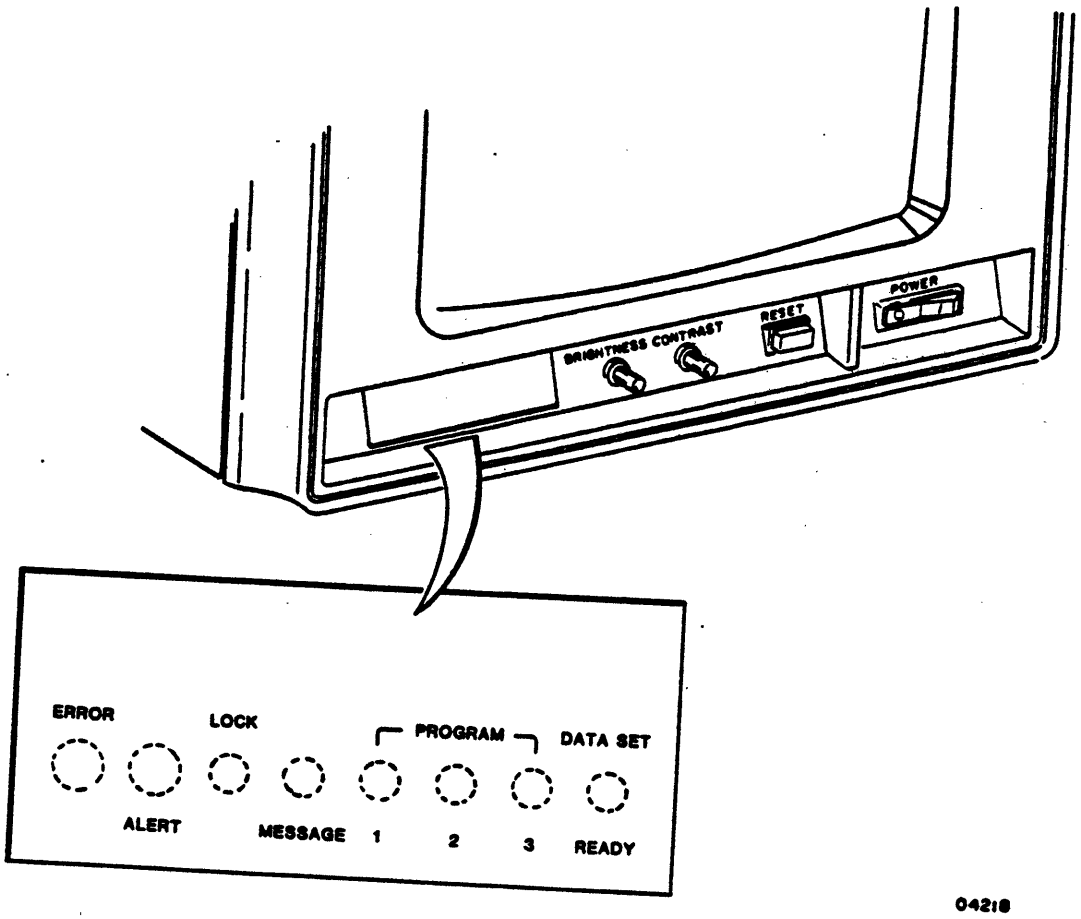


Figure 3.0.3. Switches and Indicators

3.1.2 Description

The initialization routine will first check if the NVM has ever been loaded or had a loss of power. If never loaded or the loss of NVM power is detected, default values will be forced into the NVM; see paragraph 3.3.7 for initial NVM values.

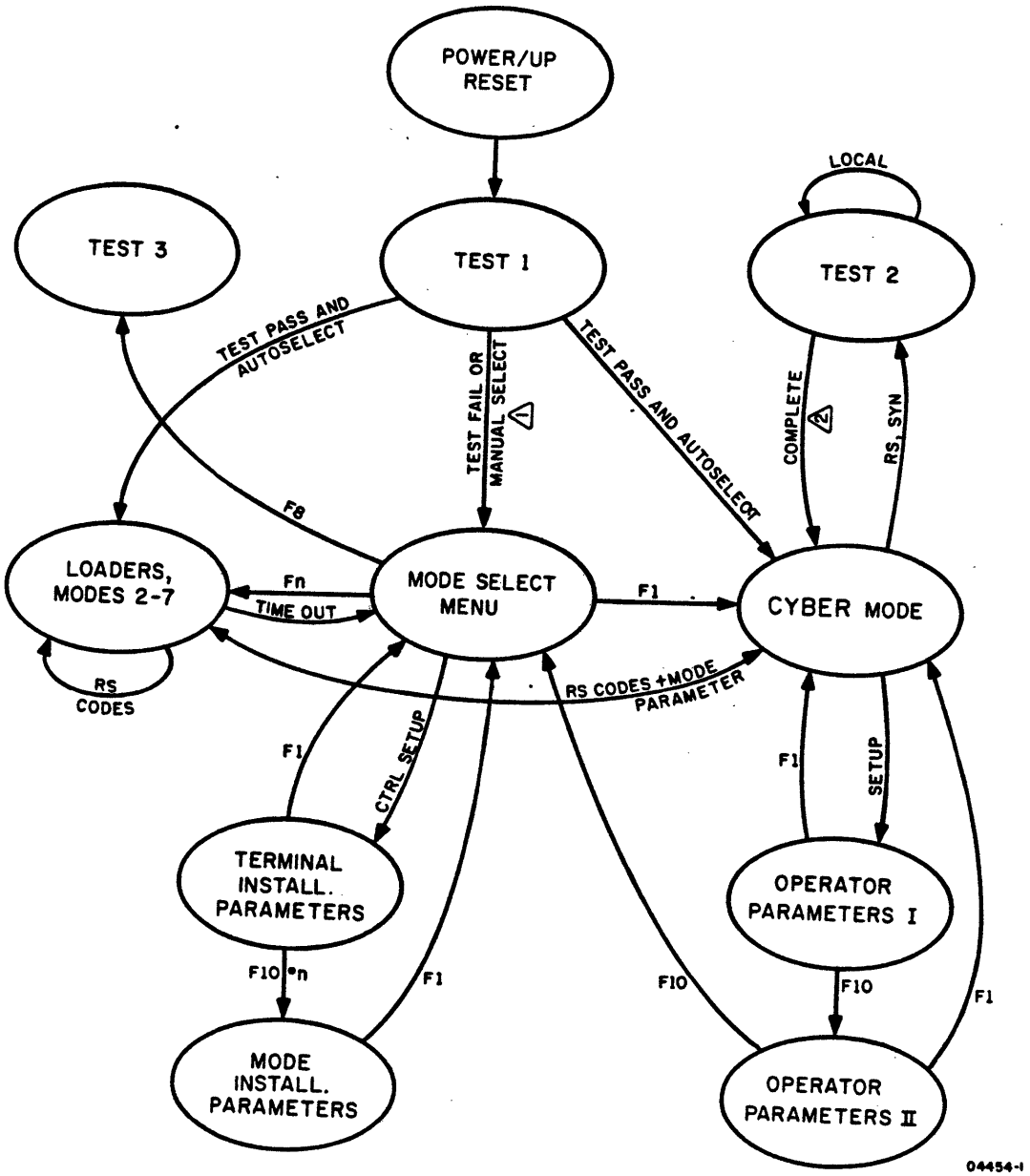
The initialization routine will then run test one of the resident diagnostic (quicklook). See paragraph 3.2. The error results are displayed on the CRT. See figure 3.0.4 for general flow of events.

If any errors are detected while running test 1, the results will be left on the display and the Mode Selection Menu prompt will be displayed. (see figure 3.1.1). If no errors have occurred the AUTO SELECT ENABLED parameter will be tested and control transferred to Load Source Selection (paragraph 3.4) if enabled. If not enabled, the Mode Selection Menu will be displayed.

The operator must select the operating mode through a soft function key approach. This means the function keys are used according to the meaning given them on the screen.

Eight function keys and the selection of Parameter Entry Mode is enabled when the MODE SELECTION MENU is being displayed, (see figure 3.1.1).

- F1 (MODE 1 CYBER) - If F1 is pressed, control will be transferred to CYBER mode.
- F2 (MODE 2 PLATO) - If F2 is pressed, the mode 2 installation parameters will be examined to determine from where and how to load that mode (see paragraph 3.4, Load Source Selection).
- F3 through F6 (MODES 3 through 6) - These modes are set up by the owner or installer to any type mode. If enabled the mode installation parameters for the associated mode will be examined to determine from where and how to load that mode (see paragraph 3.4, Load Source Selection).
- F7 (MODE 7 PACK) - If F7 is pressed, a test will be made to see if a ROM PACK is installed. If a pack is installed, a test will be made to see if a function is contained within that pack (see paragraph 3.8). If a function is contained in the pack, control will be transferred to that function.
- F8 TERMNL TEST - If F8 is pressed, test 3 of the resident diagnostics will be run (see paragraph 3.2.2.3).



1 THIS PATH MAY ALWAYS BE FORCED BY TEST SWITCH ENABLED
2 LOCAL TEST 2 DOES NOT RETURN

Figure 3.0.4. General Flow of Events

3.1.2 (Contd)

- PARAMETER ENTRY MODE - If the operator simulatenously presses the CTRL then SETUP keys, control will be passed to Terminal Installation parameter entry mode (see paragraph 3.3). This mode should only be entered by terminal installation personnel or equivalent (operating system understanding required).

When a mode has been selected, the mode enabled/disabled parameter bit will be tested.

- If the mode is disabled, a message will appear FAILURE LOADING MODE, the alarm will sound, and the operator is required to enter another mode.

- When the mode is enabled, a test will be made to see if the access has been enabled for that mode (this is a mode installation parameter bit). If access is enabled, the following message will appear on line 27.

ENTER ACCESS CODE |_|_|_|_|

The four entry positions will appear in inverse video with the cursor at the first entry position. As a code is entered the inverse video will disappear and an X code will be displayed. Four entries are required. If the code entered (all four codes) does not match the access code entered into the mode installation parameters the word SORRY will be displayed, the alarm will sound and control sent back to require the selection of a new mode. If access is entered properly, control will transfer to load source selection, see paragraph 3.4.

3.1.3 Interfaces

The operator can cause the terminal to run the initialization routine by pressing the RESET switch. After running test 1 of the resident diagnostic, the operator must select a mode that has been enabled. Note that at this point a qualified person could change parameters by pressing the CTRL then SETUP keys simultaneously. If the access for the selected mode has been enabled, the operator must type the proper access code sequence.

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
MODE 1 CYBER	MODE 2 PLATO	MODE 3 *CP/M	MODE 4 *DISK	MODE 5 *C120	MODE 6 *	MODE 7 PACK	TERMNL TEST		

0	10	20	30	40	50	60	70	80

LAST TWO ROWS DISPLAY (VIRTUAL LINES)

AFTER POWER ON OR RESET

CONVENTIONS: (PERTAINING TO FIGURES 3.1.1, 3.3.2, AND 3.3.3)

1. LOWERCASE LABELS INDICATE A BRANCHING FUNCTION.

2. ALPHA CAPS LABELS INDICATE A DIRECT FUNCTION SELECTION.

3. "BOXES" ARE DISPLAYED IN INVERSE VIDEO.

4. F1 THROUGH F10 ARE SELECTED BY PRESSING (OPERATOR) FUNCTION KEYS F1 THROUGH F10.

5. AN * WILL APPEAR IN THE LOWER RIGHT CORNER OF THE BOX THAT IS THE AUTO SELECT MODE.

*A USER OR APPLICATION DEFINED 4 ALPHANUMERIC CHARACTER LABEL FOR MODES 3 THROUGH 6 AND OPERATOR DEFINED AT MODE INSTALLATION TIME. THE DEFAULT VALUES ARE SHOWN.

Figure 3.1.1. Mode Selection Menu

3.1.4 Aborts and Recovery

If the operator selects a mode that is not enabled or types an incorrect access code, the alarm is sounded and control is sent back to require entry of a new mode.

If the operator selects a mode that specifies a ROM pack, and a ROM pack has not been inserted, an error message FAILURE LOADING MODE is displayed and control is sent back to require entry of a new mode.

3.1.5 Errors

If any keys are pressed that have not been defined previously, the alarm will sound and the key is ignored.

3.1.6 Performance

All sections require the Initialization section to work. Performance is discussed in each section.

3.1.7 Installation Parameters

Refer to paragraph 3.3.

3.2 Resident Diagnostics

3.2.1 Abstract

The resident diagnostics contain three tests. Test 1 runs after a power up or RESET and requires no operator verification or intervention. Test 2 is a host or operator initiated test. Test 3 contains a setup raster and other tests that require operator verification or intervention. Resident diagnostics test the basic hardware, and some

3.2.1 (Contd)

options. In test 1 if any failure occurs, a message will be displayed, an error flag will be set and the MODE SELECTION MENU displayed. If no errors are detected, the revision and copyright will be displayed and the mode selection process will begin.

Note: While running the diagnostics the modem control signals may change.

3.2.2 Description

3.2.2.1 Test 1 (Quicklook)

Test 1 runs after power on or by pressing the RESET switch. It is also run if test 2 is run. Keyboard entry during this test may cause invalid errors. Test 1 contains the following subtests:

- Character RAM Test - A 55 hex and AA hex are written, read and compared throughout the RAM Character Generator memory. A failure of this test is signaled by displaying "CHARACTER RAM FAIL on the next line of the CRT. Nothing will be displayed if there is no failure.

- RAM Test - A 55 hex and AA hex are written, read, and compared throughout the 64K resident RAM. A failure of this test is signaled by displaying RAM FAIL XXXX AA EE on the next line of the CRT (assuming a failure does not prevent display) where: XXXX = failing address; AA = actual data read; EE = expected data read. Nothing will be displayed if there are no failures. Parity error interrupts are enabled during the RAM test, and the above failure will be reported if a parity error is detected. (Note: If actual = expected the parity chip itself may be bad.)

- Graphics RAM Test - If this option is present, the graphics RAM will be selected and a 55 hex and AA hex pattern will be stored and tested. A failure of the test will be displayed on the next line saying GRAPHICS FAIL XXXX, AA EE. Nothing will be displayed if there are no failures.

3.2.2.1 (Contd)

- Graphics Bulk Write Test - If the option is present, a bulk write function will be performed writing all zeros into the graphics RAM. If the bulk write busy status does not set and clear, the message "GRAPHICS FAIL" will be displayed. The same message will be displayed if the graphics RAM does not contain all zeros after the completion of the bulk write function.

- ROM Test - A checksum is run on each memory chip of the resident ROM. A failure of this test is signaled by displaying "ROM FAIL XX XX XX". The first value is ROM #1, the second is ROM #2 and the third is ROM #3. A value other than 00 is bad.

- NVM Test - A checksum will be run on the nonvolatile memory (NVM). A failure of this test is signaled by displaying "NVM ALTERED" on the next line of the CRT. Nothing will be displayed if there are no failures.

- Loopback Tests - The test is comprised of transferring 128 characters from the processor to the communications UART, which is conditioned to echo rather than transmit data. The data is tested as it is received. Transmitter speed is fixed at 9600 baud. A failure of the test is signaled by displaying "COMM FAIL" on the next line of the CRT. The same test is conducted on the UART to the keyboard. A failure of this test is signaled by displaying "KEYBOARD FAIL" on the next line of the CRT.

- Timer Test - The timer will be started for a 5-millisecond delay with the timer interrupt enabled. If a timer interrupt does not occur before 6 milliseconds, interrupts will be disabled and the message TIMER FAIL displayed.

- Battery Test - This test will sample the battery low status. If the battery voltage level is low, "BATTERY LOW" will be displayed. This is not an error condition, but indicates battery should be replaced before NVM is lost.

- Serial Ports - If this option is present, this test will transfer 128 characters to the UART on ports A and B which are conditioned to echo rather than transmit data. The data is tested as it is received. Transmission speed is fixed at 9600 baud. A failure of the test is signaled by displaying "PORT A or PORT B FAIL".

3.2.2.1 (Contd)

- o Internal Modem Test - If the 1200/1200 Baud internal modem option is in, a call will be made to address 8009 if it contains a C3. The following tests will be performed:
  - ROM Checksum - A checksum will be run on the internal modem firmware. A failure of this test is signaled by displaying "INTERNAL MODEM CHECKSUM FAIL" on the next line. Nothing will be displayed if there are no failures.
  - UART Loopback - The 8250 UART will be placed into local loopback mode. All 128 codes, 00 to 7F hex, will be transmitted and tested as they are received. If a failure is detected the message "INTERNAL MODEM UART FAIL" will be displayed.
  - Modem Card Loopback - This test will be run only if F4-3 in th terminal parameters is set to a 1. The modem card will be placed into loopback mode. All 128 codes, 00 to 7F hex, will be transmitted and tested as they are received. If a failure is detected the message "INTERNAL MODEM LOOPBACK FAIL" will be displayed. This test will be run twice, once in originate mode and once in answer mode. This test will not be run if a mode has been selected and the terminal is online.
  - Modem Firmware Revision Level - The message INTERNAL MODEM REV X.X will be displayed.
- o Serial Port Test Switch - If the test switch on the Dual Serial Interface board is in the test position, the message "SERIAL PORT TEST SWITCH ENABLED" will be displayed.
- o Test Switch - The test switch on the main logic board is tested. If not enabled it will go to the next section. If enabled it will:
  - Keyboard Clock - The keyboard clock is fed into the CTC timer chip, the timer is tested to see if it runs, if not the message KBD CLOCK FAIL will be displayed.
  - Keyboard Loopback - The keyboard UART, transmitter, and receiver will be tested. 128 characters, 00 to 7F hex, will be transmitted, they should be looped back through the switch and tested as they are received. The message EXT KBD LOOPBACK FAIL will be displayed if an error occurs.
  - The message "TEST SWITCH ENABLED" will be displayed.

3.2.2.1 (Contd)

- Diagnostic ROM Pack - If a ROM PACK containing a diagnostic is installed, a call will be made to the ROM PACK diagnostic input. The ROM PACK diagnostic should do a ROM checksum, test any additional hardware used, display any error messages and display ROM PACK name and revision. If an error occurs, the call is returned with non-zero condition active, else it is returned with zero active.

- Revision Level - This section displays the revision level of the resident firmware. Note: This is only seen if auto select is disabled. The release and revision numbers may be different than shown.

RES REV 4.0

- Alarm - Completion of test 1 is signaled by the audible alarm sounding for one-quarter second at a soft level, one-quarter second at a loud level and followed by another one-quarter second at a soft level. See figure 3.2.1 for internal diagnostic failure format after test.

- Copyright - The message "COPYRIGHT CONTROL DATA 1983" will be displayed on the next line.

3.2.2.2 Test 2

Test 2 can be initiated from the keyboard in local character mode or upon receipt of the Initiate Test command from the host while running in resident CYBER mode (1E, 16). Test 1 is rerun. If an error occurs, the error flag will be set. Keyboard entry during this test may cause invalid errors.

- Host Initiated - At the completion of the test, if the error flag is set an error response is sent to the host (STX, ACK, NAK). The error message will not remain on the screen. If the error flag is not set, a positive response is sent (STX, ACK, ACK) to the host and the screen will be cleared.

- Locally Initiated - If the operator holds down the CTRL key and presses =, V (RS, SYN) while in local CYBER mode, the test will be run, as long as no errors are detected the test will loop and keep running. This can only be cleared by pressing RESET. If an error occurs, the test will halt displaying the failure and the RESET must be pressed to exit.

```
CHARACTER RAM FAIL
RAM FAIL XXXX XX XX
GRAPHIC FAIL XXXX XX XX
GRAPHIC FAIL
ROM FAIL XX XX XX
NVM ALTERED
COMM FAIL
KEYBOARD FAIL
TIMER FAIL
BATTERY LOW
PORT A FAIL
PORT B FAIL
KBD CLOCK FAIL
EXT KBD LOOPBACK FAIL
INTERNAL MODEM FAIL
INTERNAL MODEM CHECKSUM FAIL
INTERNAL MODEM UART FAIL
INTERNAL MODEM LOOPBACK FAIL
INTERNAL MODEM REV X.0
SERIAL PORT TEST SWITCH ENABLED
TEST SWITCH ENABLED
(DIAGNOSTIC ROM PACK MESSAGES HERE)
RES REV 4.0
COPYRIGHT CONTROL DATA 1983
```

Figure 3.2.1. Diagnostic Display Test 1 If Everything Failed

3.2.2.3 Test 3

Test 3 is initiated if the operator presses the F8 key while the Mode Selection Menu is being displayed.

- Graphic Video - If the graphics option is present the graphics video will be enabled and the graphics RAM will be filled with an alternate dot pattern. This display will switch between 480 and 512 scans at approximately a 1 second rate. Depressing any key will disable the graphics video and continue test.
- Alignment Raster - This test enters an alignment pattern around the outer edge of the display area.
- ROM Character Generator - Seven lines will be displayed as follows:
  - 32 Control codes
  - 33 Numeric and special characters
  - 32 Uppercase alpha and special characters
  - 31 Lowercase and special characters
  - 32 Foreign character symbols
  - 32 Line drawing characters
  - 64 PLATO characters

3.2.2.3 (Contd)

Note: If a foreign character set is selected they will appear in their assigned locations.

Note: The external RAM characters will not be displayed because they cannot be displayed simultaneously with PLATO characters.

- Attribute Test - A line saying, "BLINK DIM UNDERSCORE INVERSE BLANK" will be displayed with each word having the associated bit set in background. If BLANK is seen on the CRT, the function is not working.

- Keyboard Test - This test displays "KEYBOARD TEST". As the operator presses a key, the hex code received from the key will be displayed after the words KEYBOARD TEST.

  Note: The keyboard sends a hex code whenever a key is depressed or released. Bit 2^7 is clear when ever a key is pressed and the same code with bit 2^7 set when the key is released. The codes sent by the keyboard are not ASCII codes. See figure 3.9.2 for codes generated by the keyboard. The following is an example.

  KEYBOARD TEST 10 (when the PRINT key is pressed)
  KEYBOARD TEST 90 (when the PRINT key is released)

  As keys are pressed, the CYBER modes keyboard interrupt routine will be used to receive the code. This routine will ignore unused keys. Only one code will be used under double keycaps. The language parameter determines which keys are ignored.

- Indicator Test - The eight indicators that are controlled by the firmware will be stepped on and off at a slow rate. After the first indicator is lit a short while, it will be shifted right. After the last indicator has been lit the first will again be lit.

- Touchpanel Test - The touchpanel interrupt will be enabled. When the screen is touched an interrupt occurs and the cursor will be moved to the area touched.

- External Loopback - A message displays near the bottom of the screen explaining how to run external loopback. It displays "TO RUN EXTERNAL LOOPBACK - ENABLE TEST SWITCHES".

  When the test switch on the main logic board is enabled, the following tests will be looped on;

3.2.2.3 (Contd)

- The UART clock for the keyboard I/F will be tested and the message "KBD CLOCK OK" or "KBD CLOCK FAIL" will be displayed.

- PARALLEL PORT - If a graphic printer is installed, it must be powered-on and selected, then deselected (or wait about 20 seconds) or an error will occur. A 55 hex and AA hex will be sent to the printer which is conditioned to echo data. If incorrect data is received back or no response received, the error message "PARALLEL PORT FAIL" will be displayed and there will be no further test on this port. If no error is detected, the message "PARALLEL PORT OK" is displayed.

  If the graphic printer is not installed, a test will be made for flexible disk present. A read ID will be sent to the disk. If an improper status is received, the message "PARALLEL PORT FAIL" will be displayed. If proper status is received, the message "PARALLEL PORT OK" will be displayed.

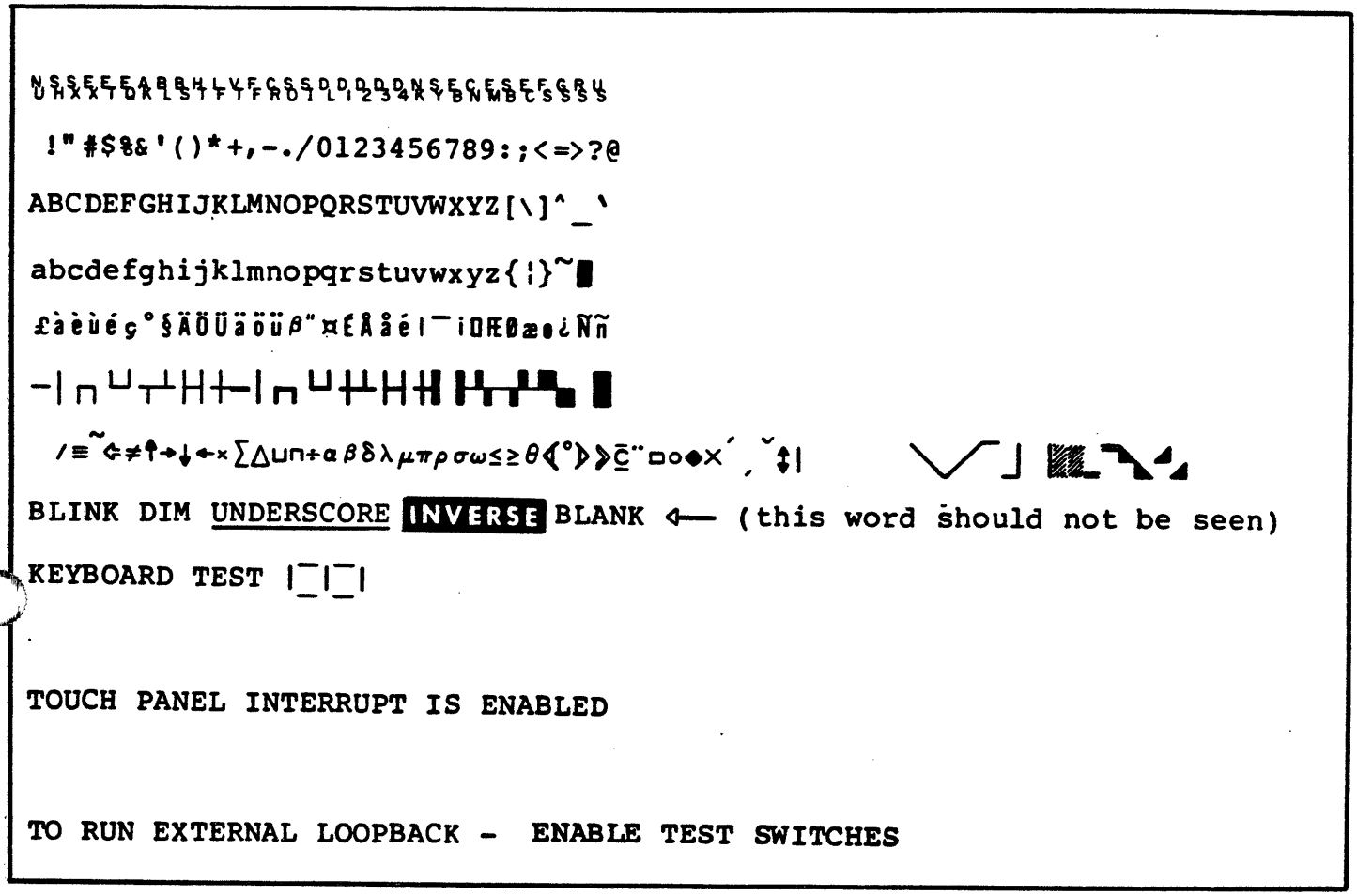
- KEYBOARD LOOPBACK - The message "KEYBOARD RUNNING" will be displayed. 128 characters, 00 hex to 7F hex, will be looped back continuously. If an error occurs, the word "RUNNING" will change to "FAIL".

- COMMUNICATIONS LOOPBACK - The message "COMM RUNNING" will be displayed. 128 characters, 00 hex to 7F hex, will be looped back continuously. If an error occurs, the word "RUNNING" will change to "FAIL".

- SERIAL PORT A and B - If the Dual Serial Port board is installed, the message "PORT A (or B) RUNNING" will be displayed. 128 characters from 00 hex to 7F hex will be looped back continuously. If an error occurs, the word "RUNNING" will change to "FAIL".

  NOTE: The test switch on this board must be switched to TEST before starting the test or an error will occur.

To exit test 3, the operator must press the RESET switch (see figure 3.2.2 for display format of test).



04342

Figure 3.2.2. Diagnostic Display Test 3 (English)

3.2.3 Interfaces

- Test 1 - The only operator interface required to run test 1 is to power on unit or press RESET. Operator can verify failures by displayed messages.
- Test 2 - Host selectable in CYBER mode only, and operator selectable in local CYBER mode by pressing CTRL and =, CTRL and V.
- Test 3 - The operator is required to press F8 while the Mode Selection Menu is displayed. The operator can verify all symbol shapes, indicators, touchpanel and keyboard. Symbols will be displayed according to language selected. Figure 3.2.2 shows English selected. To run external loopback, the operator must pull the TEST switch.

3.2.4 Aborts and Recovery

- Test 1 - If an error occurs, the remainder of that section is aborted, an error message is displayed, and the test will continue. Depression of RESET will rerun Test 1.
- Test 2 - If initiated while on line and an error occurs, test 2 is aborted and a negative response is sent to the host. If initiated while local and an error occurs, Test 2 will halt with message displayed. Operator must press RESET to recover.
- Test 3 - If an error occurs during loopback, the failing section will no longer be run, the test will continue running all good sections. Operator must press RESET to end test. Pushing in the TEST switch will start Test 3 over.

3.2.5 Errors

- Test 1 - Errors display on the screen. If no error occurs, nothing is displayed. (Figure 3.2.1.)
- Test 2 - An error message is sent back to the host (STX, ACK, NAK).
- Test 3 - Operator verification required, except during external loopback. (Figure 3.2.2.)
- See figure 3.2.1 and paragraph 3.2.2 for error messages.

3.2.6 Performance

- Test 1 - Requires less than 6 seconds to run if the internal modem loopback is disabled, and less than 20 seconds if enabled and present.
- Test 2 - Same as Test 1.
- Test 3 - No time limit, test ends when RESET is pressed.
- Usage of internal diagnostics in conjunction with manuals will allow 98-percent error detection.
- Usage in combination with manuals will allow 95 percent isolation to the field replaceable module.

3.2.7 Installation Parameters

See paragraph 3.3 for Terminal Installation Parameters.

3.3 Parameter Selection Entry Mode

3.3.1 Abstract

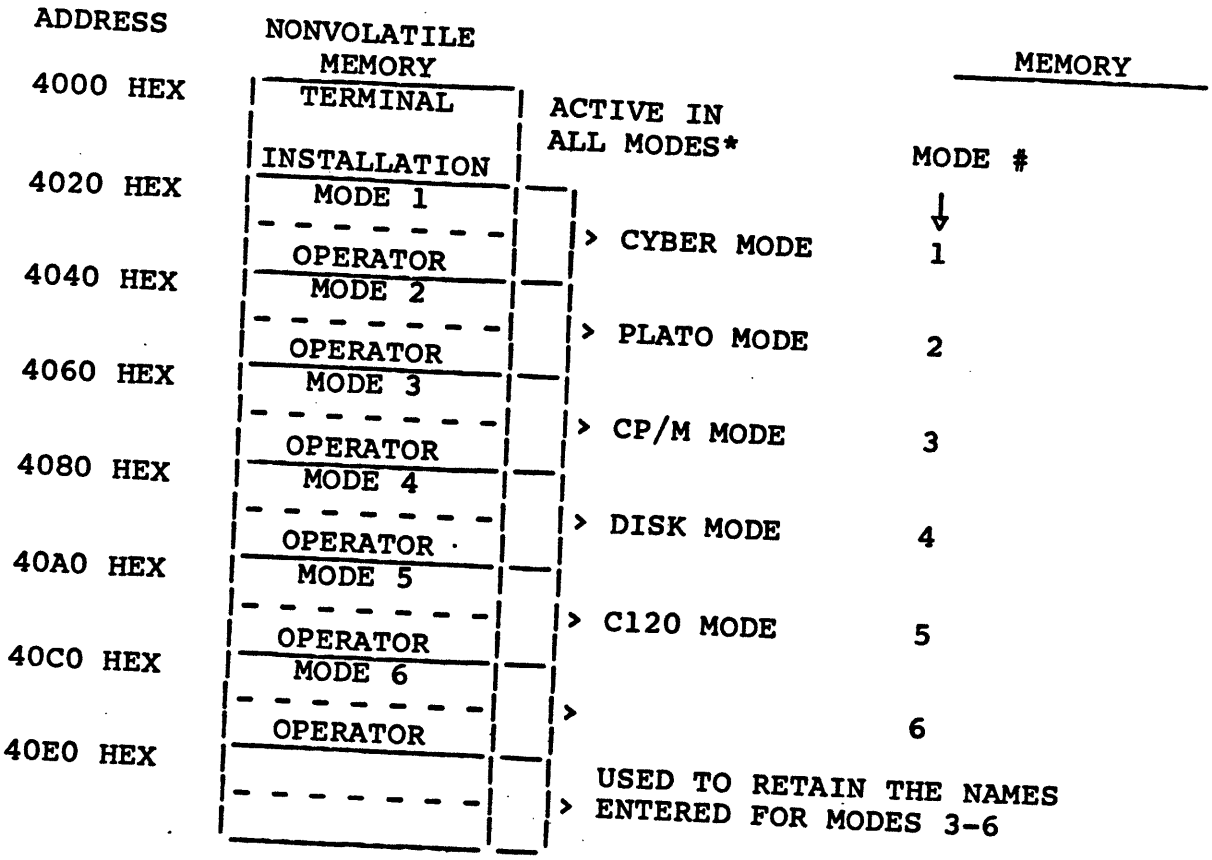
The terminal has no operator switches that can be sensed by the processor. Instead parameters are entered into a nonvolatile memory (NVM) and read by the processor. The NVM retains the parameters when power is off via the use of a battery. It is intended that these parameters be set/changed by terminal installation personnel or equivalent (operating system understanding required). A look has been added in the firmware that will go to address 6000h (bank 13) when the Control-Setup keys are pressed. Address 6000H must contain a C3 in order for this to work. This hook has been added so that a User Friendly Parameter entry could be place at address 6000H. The following text will describe what happens if 6000h does not contain a C3.

3.3.2 Description

The parameters are comprised of the following three groups.

- o Terminal Installation Parameters
- o Mode Installation Parameters
- o Mode Operator Parameters

There is one set of terminal installation parameters, six sets of mode installation and operator parameters (see figure 3.3.1). The terminal installation parameters are viewed and changed by simultaneously pressing, CTRL, and SETUP while waiting for the operator to enter the mode. The mode installation parameters can then be viewed and changed by pressing F10 and the desired mode number. Parameters are changed in NVM by pressing COPY. The mode operator parameters are viewed and temporarily changed by pressing SETUP while in the mode.



*ANY MODE CAN BE ASSIGNED TO ANY BLOCK, EXCEPT 1 AND 2 ARE RESERVED FOR RESIDENT CYBER MODE AND PLATO MODE.

Figure 3.3.1. Parameters

3.3.3 Interfaces

3.3.3.1 Terminal Installation Parameters

The terminal installation parameters are used in all modes. They can be viewed and changed by simultaneously pressing CTRL, and SETUP while the MODE SELECTION MENU is being displayed (See figure 3.3.2 for screen format). To change any installation parameter, the cursor must be positioned under the item to be changed. To do this the following keys are operable:

3.3.3.1 (Contd)

F1	Returns to Mode Selection Menu.
F2-F9	Moves cursor under first changeable parameter in the associated field.
F10	Goes to Mode Installation Parameters (see paragraph 3.3.3.2).
COPY	Stores the current line of parameters displayed in NVM.
SPACE	Moves cursor to next changeable parameter. If cursor is under the last changeable parameter, it will wrap around and reposition again under the first changeable parameters.
Back Space	Moves cursor back to next changeable parameter. If cursor is under the first changeable parameter, it will stop.
0-1	Enters 0 or 1 at cursor if field requires a binary value.
0-7	Enters 0 to 7 at cursor if field requires an octal value.
0-9/A-F	Enters 0 to 9 or A through F at cursor if field requires a Hex value.

The cursor advances to next changeable location after each data entry. See figure 3.3.2 for terminal installation parameters.

3.3.3.1.1 F1 Return

Returns control to Mode Selection Menu.

F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
return	CONFIG	CONFIG	CONFIG	CONFIG	AS X Y	L ID	PORT A	PORT B	instl
	123456	123456	123456	123456	O O H	O HHHH	H H	H H	mode n

1-6 = BINARY
O = OCTAL
H = HEX

F2 CONFIGURATION (BINARY)

1 1 = SPARE
2 1 = TOUCH PANEL OPTION IN
3 1 = DUAL SERIAL INTERFACE OPTION IN
4 1 = GRAPHIC PRINTER OPTION (726-10) ATTACHED
5 1 = FLEXIBLE DISK OPTION ATTACHED
6 1 = SERIAL GRAPHIC PRINTER (726-20) ATTACHED

F3 CONFIGURATION (BINARY)

1 1 = 1200/1200 INTERNAL MODEM OPTION IN
2 1 = SPARE
3 1 = GRAPHIC OPTION IN
4 1 = PARALLEL PORT OPTION IN
5 1 = SPARE
6 1 = RIGID DISK OPTION IN

F4 CONFIGURATION (BINARY)

1 1 = AUTO SELECT ENABLED 0 = AUTO SELECT DISABLED
2 1 = USE PRINTER SRTS 0 = IGNORE PRINTER SRTS
3 1 = RUN INTERNAL MODEM LOOPBACK
4 1 = TONE DIAL 0 = PULSE DIAL
5 1 = MONITOR PRINTER RDY 0 = IGNORE PRINTER RDY
6 1 = MONITOR BIDIR RDY 0 = IGNORE BIDIRECTIONAL RDY

F5 CONFIGURATION (BINARY)

1 1 = SPARE
2 1 = SPARE
3 1 = SPARE
4 1 = SPARE
5 1 = SPARE
6 1 = SPARE

FIGURE 3.3.2. Terminal Installation Parameters

WP0047h

F6 AS AUTO SELECT (MODE NUMBER) (OCTAL)

0 = CYBER MODE
1 = CYBER MODE
2 = PLATO MODE
3 = MODE 3
4 = MODE 4
5 = MODE 5
6 = MODE 6
7 = ROM PACK FUNCTION

F6 X DISPLAY DISPLACEMENT RIGHT/LEFT (OCTAL)

0 = NO DISPLACEMENT
1 = RIGHT 1 CHARACTER
2 = RIGHT 2 CHARACTER
3 = RIGHT 3 CHARACTER
4 = NO DISPLACEMENT
5 = LEFT 1 CHARACTER
6 = LEFT 2 CHARACTER
7 = LEFT 3 CHARACTER

F6 Y DISPLAY DISPLACEMENT UP/DOWN (HEX)

0 = NO DISPLACEMENT
1 = UP 1 SCANS
2 = UP 2 SCANS
3 = UP 3 SCANS
4 = UP 4 SCANS
5 = UP 5 SCANS
6 = UP 6 SCANS
7 = UP 7 SCANS
8 = NO DISPLACEMENT
9 = DOWN 1 SCANS
A = DOWN 2 SCANS
B = DOWN 3 SCANS
C = DOWN 4 SCANS
D = DOWN 5 SCANS
E = DOWN 6 SCANS
F = DOWN 7 SCANS

Figure 3.3.2. Terminal Installation Parameters (Contd)

F7 L LANGUAGE (OCTAL)

0 = ENGLISH
1 = ENGLISH
2 = FRENCH
3 = GERMAN
4 = SWEDISH/FINNISH
5 = BRITISH
6 = SPANISH
7 = DANISH/NORWEGIAN

F7 ID TERMINAL IDENTIFICATION

F8 PORT A (HEX)
1ST VALUE

B0 0 = 7 DATA BITS	1 = PORT A 8 DATA BITS
B1 0 = PORT A PARITY ODD/SPACE	1 = PORT A PARITY EVEN/MARK
B2 0 = PORT A PARITY ENABLED	1 = PORT A PARITY DISABLE
B3 0 = PORT A PRINTER	1 = PORT A BIDIRECTIONAL

2ND VALUE - BAUD RATE (HEX)

0 = 75 BAUD	4 = 300	8 = 2400	C = 19.2K
1 = 110	5 = 600	9 = 4800	D = 19.2K
2 = 150	6 = 1200	A = 9600	E = 19.2K
3 = 200	7 = 1800	B = 19.2K	F = 19.2K

F9 PORT B
Same as PORT A

F10 INSTALLATION PARAMETERS FOR MODE n

THE FOLLOWING MESSAGE WILL BE DISPLAYED

ENTER MODE n |_|

ENTER MODE NAME |____| (FOR MODES 3-6)

Figure 3.3.2. Terminal Installation Parameters (Contd)

3.3.3.1.2 F2 CONFIG (Configuration)

Each parameter must be set to 1 for each option present, set to 0 if option not present or disabled. See figure 3.3.2 for options list.

3.3.3.1.3 F3 CONFIG (Configuration)

Each parameter must be set to 1 for each option present, set to 0 if option not present or disabled.

3.3.3.1.4 F4 CONFIG (Configuration)

- F4-1 AUTO SELECT Enabled/Disabled - If this bit is set to a 1, the mode selected in the AUTO SELECT (AS) field (see F6) will be automatically loaded if test 1 detected no errors. If this bit is set to 0, the Mode Selection Menu will appear after running test 1.
- F4-2 USE/IGNORE PRINTER SRTS - If this bit is set to 1, a 200 msec. delay will follow every Carriage Return (CR) and Line Feed (LF) sent to the serial printer if the Secondary Request To Send (SRTS) is in a marking or open condition. If this bit is set to a 0, no delays will be used when sending data to a serial priner.

  Recommended settings:

  NIP - 1
  PM70-1

  SCAMP - 0
  Letter Quality - 0
  Serial Graphic - 0

- F4-3 RUN INTERNAL MODEM LOOPBACK - The internal modem performs four subtests.
  - ROM checksum
  - Local loopback on the 8250
  - Local loopback of the modem card
  - Displayed revision level

The loopback of the modem card can be disabled during the quicklook by setting this parameter to a 0.

3.3.3.1.4 (Contd)

- F4-4 PULSE/TONE Dial - If this parameter is set to 0, the internal modem firmware will use the pulse dialing technique of dialing the modem during auto dial. If this parameter is set to 1, tone dialing is used.

- F4-5 MONITOR PRINTER Ready - If this parameter is set to 0 (Ignore Printer Ready), online data will be sent to the printer port with or without Ready active. If this parameter is set to 1 (Monitor Printer Ready) online data will be sent to the printer port only if the Ready signal is active.

  Note: If this parameter is set to monitor the printer Ready and the device is not turned on the online communication with a host will be locked up. Only bringing up Ready will correct the problem.

  On a serial printer, the ready refers to DSR input active. On parallel printer, the ready refers to the ready status.

- F4-6 MONITOR BIDIRECTIONAL Ready - If this parameter is set to 0 (Ignore Bidirectional Ready), data directed to the bidirectional port will be sent with or without the Ready active. If this parameter is set to 1 (Monitor Bidirectional Ready) data directed to the bidirectional port will be sent only if the Ready signal is active.

  Note: If this parameter is set to monitor the bidirection Ready and the Ready is not active, the online communication with a host will be locked up. Only bringing up Ready will correct the problem.

3.3.3.1.5 F5 CONFIG (Configuration)

- F5, 1-6 Spare.

3.3.3.1.6 F6 CONFIG (Configuration)

- AS (AUTO SELECT) - This parameter allows the entry of a number between 0 and 7. The parameter value is used as the mode number if auto select enable is selected.

3.3.3.1.6 (Contd)

0-1 - Executes CYBER mode.
2-6 - Executes the appropriate mode.
7 - Executes function in a ROM PACK.

- X (Screen Move in X Direction) - As the CRT ages the picture raster may drift. This parameter will allow the installer to move the raster left or right up to approximately three characters in width. It is set to 0 when aligned at factory.

  To move the raster left or right see the following listing:

0 = No move	4 = No move
1 = Move right 1 character	5 = Move left 1 character
2 = Move right 2 characters	6 = Move left 2 characters
3 = Move right 3 characters	7 = Move left 3 characters

- Y (Screen Move in Y Direction) - As the CRT ages the picture raster may drift. This parameter will allow the installer to move the raster up or down, up to seven scans. It is set to 0 when aligned at factory. To move the raster up or down see the following listing:

0 = No move	8 = No move
1 = Move up 1 scans	9 = Move down 1 scans
2 = Move up 2 scans	A = Move down 2 scans
3 = Move up 3 scans	B = Move down 3 scans
4 = Move up 4 scans	C = Move down 4 scans
5 = Move up 5 scans	D = Move down 5 scans
6 = Move up 6 scans	E = Move down 6 scans
7 = Move up 7 scans	F = Move down 7 scans

3.3.3.1.7 F7 CONFIG (Configuration)

- L - Language - This parameter allows the displaying of special foreign characters; only the numbers 0 through 7 are allowed. The unit must be reset after changing this parameter.

3.3.3.1.7 (Contd)

0 = English
1 = English
2 = French
3 = German
4 = Swedish/Finnish
5 = British
6 = Spanish
7 = Danish/Norwegian

- ID - (Terminal Identification Code) - The ID code is broken up into four codes. Each code can be set between 0 and F. This code can be used as a physical or logical identifier (host defined). They will be sent to the host with the Model Report Request in CYBER Mode. (See table 3.9.18.)

3.3.3.1.8 F8 (PORT A)

- 1st Value - This is an encoded value to select different parameters for Port A.

  - Bit 3 Printer/Bidirectional - This parameter is used by the firmware to determine if an ASCII type printer or a serial graphics printer is connected to the terminal. In order to connect an ASCII printer, the Dual Serial Interface Option must be installed. This option has two serial I/O Ports, A and B. This parameter must be set to 0 if the printer is connected to Port A. Otherwise, it must be set to 1 for a bidirectional port, which is supported by the resident firmware. Note: The firmware tests for a printer on Port A first. If both ports are set for printer, Port A will be used.

  - Bit 2 Parity Enabled/Disabled.

  - Bit 1 Parity Odd/Even, Space/Mark.

  - Bit 0 7/8 Data Bits.

  The three parameters above work together to select the proper communication format to Ports A and B. See the following example for a better understanding.

3.3.3.1.8 (Contd)

Example: Dual Serial Uart Word Format

WORD FORMAT	7/8 (BIT 0)	ODD/ EVEN (BIT 1)	ENABLE/ DISABLE (BIT 2)	PRINTER BIDIR (BIT 3)
8 data bits, even parity	1	1	0	X
8 data bits, odd parity	1	0	0	X
8 data bits, no parity	1	X	1	X
7 data bits, even parity	0	1	0	X
7 data bits, odd parity	0	0	0	X
7 data bits, mark parity	0	1	1	X
7 data bits, space parity	0	0	1	X
	7=0 8=1	Odd=0 Even=1	Enable=0 Disable=1	PRNT=0 BIDIR=1

One stop bit is away selected.

- 2nd Value (PORT A Baud Rate) - This parameter will be used to select the baud rate (send and receive) of PORT A. The value is encoded; 0 through F may be entered. (See figure 3.3.2).

3.3.3.1.9 F9 (PORT B)

- 1st Value - This is an encode value to select different parameters for PORT B.
  - Bit 3 (Printer/Bidirectional) - Same as stated in paragraph 3.3.3.1.8 except in regards to PORT B.
  - Bit 2 (Parity Enabled/Disabled) - Same as stated in paragraph 3.3.3.1.8 except in regards to PORT B.
  - Bit 1 (Parity Odd/Even) - Same as stated in paragraph 3.3.3.1.8 except in regards to PORT B.
  - Bit 0 (7/8 Data Bits) - Same as stated in paragraph 3.3.3.1.8 except in regards to PORT B.
- 2nd Value (PORT B Baud Rate) - Same as A.Baud, paragraph 3.3.3.1.8, except in regards to Channel B.

3.3.3.1.10 F10 [Instl Mode n (Installation Mode n)]

When F10 is pressed the following message will be displayed on line 27:

ENTER MODE n (1-6) |_|

The number 1 through 6 must be entered. It will be displayed where the inverse box is, and the inverse will go to normal intensity. If any other key is pressed, the alarm will sound and the key is ignored.

If mode 3 through 6 are selected, the following message will be displayed on line 28:

ENTER MODE NAME |_|_|_|_|

The current mode name will be displayed in the inverse boxes. If no change is desired, the NEXT key can be pressed. A change can be made by entering the new codes. When all four codes are entered (or the NEXT key pressed) control will transfer to mode installation parameter entry (see paragraph 3.3.3.2).

3.3.3.2 Mode Installation Parameters

There are six sets of mode installation parameters, one for each mode 1 through 6 (see figure 3.3.3). To enter into this mode, the operator must press F10 and enter the desired mode while in the terminal installation parameter entry mode. To change any parameter, the cursor must be positioned under the item to be changed. To do this the following keys are enabled.

- F1 - Returns to Mode Selection Menu.
- F2-F10 - Moves cursor under first changeable parameter in the associated field.

See paragraph 3.3.3.1 for Copy, Space, Backspace, 0-F.

The cursor advances to the next changeable location after each data entry. If an entry is not allowed in the field the alarm will sound and the key ignored.

3.3.3.2.1 F1 Return

Return control to Mode Selection Menu.

3.3.3.2.2 F2 CONFIG (Configuration)

- F2-1 Mode Disabled/Enabled - When this parameter is set to 0, the mode is disabled and will not be executed. All the other parameters in the block can be set to perform a given load. This could allow a supervisor to simply disable or enable a mode. When this parameter is set to 1, the mode is enabled and can be executed.

- F2-2 Access Off/On - If this parameter is set to 1 (Access On), the operator will be required to enter the proper access code before the mode is loaded. If this parameter is set to 0 (Access Off), the load will commence immediately after entering the mode block number.

- F2-3 Load Default/Operator Selected Source/File/Phone # - If the host load has been selected and this parameter is set to 0, the default source and file parameters will be used to select the load source and file. If the parameter is set to 1, the operator will be allowed to select the source, file and phone number (phone number is intended to be used with the 1200/1200 auto dial modem).

- F2-4 Run Internal/Load External - This parameter must be set to 0 to execute CYBER mode or run from ROM pack. This parameter must be set to 1 to load a mode from host or disk.

- F2-5 Load From Host/Disk - This parameter works in conjunction with the Run Internal/Load External parameter. If the Load External (1) is selected and this parameter is set to 0, a load from host will be initiated. If this parameter is set to 1, a load from disk is initiated.

WP0047h
CD6953R

```
ENTER MODE n (1-6) 1

| F | return | F | CONFIG | F | CONFIG | F | CONFIG | F | CONFIG | F | OPR DF | F | A-DIAL | F | A-DIAL | F | DF T R | F | ACCESS |
| 1 |        | 2 | 123456 | 3 | 123456 | 4 | 123456 | 5 | 123456 | 6 | HHHH   | 7 | HHHHHH | 8 | HHHHHH | 9 | OH H H | 10| HHHH   |
```

F2 CONFIGURATION (BINARY)

1	0 = MODE DISABLED	1 = MODE ENABLED
2	0 = ACCESS CODE DISABLED	1 = ACCESS CODE ENABLED
*3	0 = USE DEFAULT SOURCE/FILE/PHONE NUMBER	1 = OPERATOR SELECT SOURCE/FILE/PHONE NUMBER
*4	0 = RUN INTERNAL	1 = LOAD EXTERNAL
*5	0 = LOAD FROM HOST	1 = LOAD FROM FLEXIBLE DISK
6	0 = HOST INTERFACE	1 = 1200/1200 INTERNAL MODEM INTERFACE

F3 CONFIGURATION (BINARY)

1	0 = DIAL ONCE	1 = CONTINUOUS DIAL
2	0 = AUTO DIAL DISABLED	1 = AUTO DIAL ENABLED
3	0 = HOST 7 BITS (DATA)	1 = HOST 8 BITS (DATA)
4	0 = HOST PARITY DISABLE	1 = HOST PARITY ENABLE
5	0 = HOST PARITY ODD/SPACE	1 = HOST PARITY EVEN/MARK
6	0 = HOST 1 STOP BIT	1 = HOST 2 STOP BITS

F4 CONFIGURATION (BINARY)

1	0 = DTR CONSTANT	1 = DTR SWITCHED
2	0 = RTS CONSTANT	1 = RTS SWITCHED
3	0 = TYPAMATIC ON	1 = TYPAMATIC OFF
4	0 = DATA ONLY OFF	1 = DATA ONLY ON
5	0 = HOME UPPER LEFT	1 = HOME LOWER LEFT
6	0 = AUTO LF OFF	1 = AUTO LF ON

*NOT CHECKED IF MODE 1 SELECTED.

Figure 3.3.3. Mode Installation Parameters

F5 CONFIGURATION (BINARY)

1	0 = PACING DISABLED	1 = PACING ENABLED
2	0 = BIAS DISABLED	1 = BIAS ENABLED
3	0 = AUTOMATIC CARRIAGE RETURN ON	1 = AUTOMATIC CARRIAGE RETURN OFF
4	0 = SPARE	
5	0 = SPARE	
*6	0 = CYBER MODE	1 = LOAD FROM ROM PACK

F6 OPERATOR DEFAULT PARAMETERS (HEX)

1ST VALUE

B0	0 = ONLINE	1 = LOCAL
B1	0 = PRINTER DESELECTED	1 = PRINTER SELECTED
B2	0 = MARGIN ALERT OFF	1 = MARGIN ALERT ON
B3	0 = ALERT SOFT	1 = ALERT LOUD

2ND VALUE (HEX)

B0	0 = ALPHA LOCK	1 = SHIFT LOCK
B1	0 = NUMERIC PAD NORMAL	1 = NUMERIC PAD SHIFT
B2	0 = PAGE SCREEN	1 = ROLL SCREEN
B3	0 = SMALL CYBER	1 = LARGE CYBER

3RD VALUE (HEX)

B0	0 = BACKGROUND DARK	1 = BACKGROUND LIGHT
B1	0 = CURSOR LINE	1 = CURSOR BOX
B2	0 = CURSOR BLINK	1 = CURSOR SOLID ON
B3	0 = NOT USABLE	1 = NOT USABLE

*NOT CHECKED IF MODE 1 SELECTED.

Figure 3.3.3. Mode Installation Parameters (Contd)

4TH VALUE (HEX)

B0	0 = HALF DUPLEX	1 = FULL DUPLEX
B1	0 = 80 CHARACTERS/LINE	1 = 132 CHARACTERS/LINE
B2	0 = 24 LINES	1 = 30 LINES
B3	0 = TRANSPARENT OFF	1 = TRANSPARENT ON

F7 A-DIAL AUTO DIAL NUMBER PART 1 (HEX)

F8 A-DIAL AUTO DIAL NUMBER PART 2 (HEX)

F9

DF DEFAULT FILE NUMBER (HEX)

T TRANSMIT BAUD RATE (HEX)

0 = 75	4 = 300	8 = 2400	C = 19.2K
1 = 110	5 = 600	9 = 4800	D = 19.2K
2 = 150	6 = 1200	A = 9600	E = 19.2K
3 = 200	7 = 1800	B = 19.2 K	F = 19.2K

R RECEIVE BAUD RATE

SAME AS TRANSMIT BAUD RATE

F10 ACCESS CODE (HEX)

THIS IS THE CODE THAT MUST BE ENTERED IF ACCESS ENABLED BEFORE ENTERING A MODE.

Figure 3.3.3. Mode Installation Parameters (Contd)

3.3.3.2.2 (Contd)

- F2-6 Use Resident Host/Internal Modem Interface - This parameter works in conjunction with LOAD FROM HOST/DISK. If LOAD FROM HOST is selected and this parameter is set to 0, the Resident Host interface is used. If this parameter is set to 1, the internal 1200/1200 modem is used.

3.3.3.2.3 F3 CONFIG (Configuration)

- F3-1 Dial Once/Continuous Dialing - This parameter is used by the internal modem firmware to determine how many times to dial a number. It is not supported by the resident firmware. See the 1200/1200 Internal Modem Specification (16042890) for user definition.

- F3-2 Auto Dial Off/On - If the host load has been selected using the internal modem, the internal modem option is installed, and this parameter is a 1, the auto dial or operator entered number will be used. If this parameter is a 0, the operator will be requested to make an external phone connection.

- F3-3 Host 7/8 Bits.

- F3-4 Host Parity Enabled/Disabled.

- F3-5 Host Parity Odd/Even, Space/Mark.

- F3-6 Host 1/2 Stop Bits.

  These four parameters work together to select the proper word format to the host. If 8 bits is selected, eight data bits are sent. The parity bit is dependent upon Parity Enabled/Disabled and Parity Odd/Even. If 7 bits is selected, only seven data bits are sent. Selecting 7 bits with parity disabled will send 7 data bits and a mark or space parity bit.

  If 8 bits is selected CYBER mode will not display any parity errors.

  Table 3.3.1 is to aid in selecting the proper word format.

TABLE 3.3.1. HOST UART WORD FORMAT

WORD FORMAT	7/8 (F3-3)	ENABLED/ DISABLED (F3-4)	ODD/ EVEN (F3-5)	STOP 1/2 (F3-6)
8 data bits, even parity	1	1	1	X
8 data bits, odd parity	1	1	0	X
8 data bits, no parity	1	0	X	X
7 data bits, even parity	0	1	1	X
7 data bits, odd parity	0	1	0	X
7 data bits, mark parity	0	0	1	X
7 data bits, space parity	0	0	0	X
	7=0 8=1	Disable=0 Enable =1	Odd=0 Even=1	1 Bit=0 2 Bits=1

1. 8 bits, parity enabled

S	1	2	3	4	5	6	7	8	E/O	S

2. 8 bits, parity disabled

S	1	2	3	4	5	6	7	8	S

3. 7 bits, parity enabled

S	1	2	3	4	5	6	7	E/O	S

4. 7 bits, parity disabled

S	1	2	3	4	5	6	7	M/S	S

3.3.3.2.4 F4 CONFIG (Configuration)

- F4-1 DTR Constant/Switched - If this parameter is set to 0 (DTR Constant), the DTR (Data Terminal Ready) signal on the host connector will be held on at all times. If this parameter is set to 1 (DTR Switched), the DTR signal on the host connector will be switched off if the mode is in local operation. DTR is maintained in the on condition at all other times. Received data is ignored if DTR is off.

3.3.3.2.4 (Contd)

- o F4-2 RTS Constant/Switched - If this parameter is set to 0 (RTS Constant), the RTS (Request to Send) signal will be on whenever DSR and DTR are on. If this parameter is set to 1 (RTS Switched), the RTS signal will operate as follows if DSR and DTR are on, and Data Only Off:

  - Half Duplex - RTS is on with the first keystroke and is switched off a minimum of 1 millisecond, maximum of 16 milliseconds following transmission of a CR, LF, ACK, or NAK. RTS is switched off following the transmission of the appropriate codes for all function keys and special action keys. RTS will be placed to off if a break is received, or local operation is selected. Automatic responses to the host will cause RTS to be on for the duration of the response and switched off 1 to 16 milliseconds following the last word transmitted.

  - Full Duplex - RTS is on until local operation is selected.

- o F4-3 Typamatic On/Off - If Typamatic is on the keys shown in table 3.9.11 will repeat at a rate of 15 $\pm$ 3 characters per second if held down longer than 1 second. If typamatic is off, no keys will repeat when held down.

- o F4-4 Data Only Off/On - If this parameter is set to 0 (Data Only Off), the terminal honors the DSR and DTR when sending and CO when receiving. If this parameter is set to 1 (Data Only On), the terminal will disregard the RS-232-C modem control signals. Data is transmitted without regard to the presence of DSR or CTS. Received data is acted upon without regard to CO or DSR. DTR operates normally.

- o F4-5 Home Upper/Lower Left - This parameter may be ignored in some modes. In the resident CYBER mode it is operational, but should be set to Upper Left to be compatible with Viking TTY advanced mode. If this parameter is set to a 0, the cursor will be placed to upper left for home. If this parameter is set to a 1, the cursor will be placed to lower left for home.

- o F4-6 Auto LF Off/On - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to a 0 (Auto LF Off), it is intended that a carriage return operation position the cursor to the beginning of the current line. If this parameter is set to a 1 (Auto LF On), it is intended that a line feed operation in addition to a carriage return operation be performed upon actuation of the CR key or receipt of the carriage return code.

3.3.3.2.5 F5 CONFIG (Configuration)

- F5-1 Pacing Disabled/Enabled - When this parameter is set to 1, the rate of data being sent to the host will be limited to one code every 8 milliseconds regardless of the baud rate. This gives an effective throughput of 1200 baud. If the parameter is set to 0, no limiting is performed.

- F5-2 Code Bias Off/On - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to a 0 (Code Bias Off, no bias is added to the cursor address when sending or subtracted when receiving X/Y positioning information or set scroll field information. If this parameter is set to a 1 (Code Bias On), a bias of 20 hex is added to the cursor address when sending or subtracted when receiving X/Y positioning information or set scroll field information.

- F5-3 Automatic Carriage Return ON/OFF - When this parameter is set to a 0 (ON or Enabled), the cursor will automatically advance to the beginning of the next line when the last position of a line is entered with data. When this parameter is set to a 1 (OFF or Disabled), the cursor will remain in the last column when data is entered from the host. The host can also enable or disable this parameter (see RS, & and RS, ' commands).

- F5-4 Spare.

- F5-5 Spare.

- F5-6 CYBER MODE/ROM PACK - If the Run Internal Parameter is selected this parameter will be tested to see if control is passed to CYBER mode or to the ROM PACK.

3.3.3.2.6 F6 OPR DF (Operator Default)

All of the Mode Operator Parameter default values are encoded in hex digits. They are the initial operator parameters when a mode is selected. They are not the same in all modes and must be defined in the ERS for each mode. The initial value is moved from NVM into an active RAM table to allow temporary changes by operator or host.

3.3.3.2.6 (Contd)

- o F6 1st Digit

  - Bit 0 - Online/Local - This parameter may be ignored in some modes. In the resident CYBER mode it determines the initial state. If this parameter is set to 1 (Local), the transmit portion of the terminal is disabled and data originating at the keyboard is displayed. Modem interface circuits are also affected. If this parameter is set to 0 (Online), data originating at the keyboard is transmitted in character mode and block mode transmission is enabled. It is possible to receive data while in local mode if Constant DTR is selected.

  - Bit 1 Printer Off/On - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to 1 (Printer On), the initial condition will have the printer interface active. The host can also change the active value. If this parameter is set to 0 (Printer Off), the initial condition will have the printer interface disabled. When the printer is on, all data sent or received in Character mode will be printed while it is being displayed.

  - Bit 2 Margin Alert Off/On - This parameter may be ignored by some modes. In the resident CYBER mode it is operational. If this parameter is set to 1 (Margin Alert On), the audible alarm will sound whenever the cursor is advanced into the eighth position from the end of a line during keyboard entry. The audible alarm will also sound when the cursor is moved into the last line from the previous line during keyboard entry. If this parameter is set to 0 (Margin Alert Off), the audible alarm will not sound due to cursor movement from the keyboard.

  - Bit 3 Alert Soft/Loud - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to 1 (Alert Loud), the audible alarm will be at a higher volume. If this parameter is set to 0 (Alert Soft), the audible alarm will be at a lower volume.

- o F6 2nd Digit

  - Bit 0 Shift/Alpha Lock - When this parameter is set to 1, the LOCK key will be a shift lock (all keys used as shifted). If the parameter is set to 0, the LOCK key will lock only alpha keys.

3.3.3.2.6 (Contd)

- Bit 1 Numeric Pad - When this parameter is set to 0 (normal), the 13 key numeric pad will be used with the normal shift and control features. When the parameter is set to 1 (shift), the 13 key numeric pad will be used as if the shift key were depressed.

- Bit 2 Roll/Page Screen - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to 1 (Roll Screen), the scroll feature is enabled, the field scroll feature is unaffected. It is recommended to set this parameter to Roll Screen to be compatible with Viking TTY. The host has the capability to switch the active value. If this parameter is set to 0 (Page Screen), the initial value will disable the scroll feature.

- Bit 3 Small/Large CYBER Operation - This parameter will determine which code is sent as keys are pressed (see Keyboard Keycode table 3.9.11) and reaction to receive codes (see table 3.9.18).

o F6 3rd Digit

- Bit 0 Background Dark/Light - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to 0 (Background Dark), characters will be displayed as light characters on a dark background. If this parameter is set to 1 (Background Light), characters will be displayed as dark characters on a light background (inverse video).

- Bit 1 Cursor Line/Block - This parameter may be ignored in some modes. In the resident CYBER mode it is operational. If this parameter is set to 0 (Cursor Line), the cursor will appear as an underline. It may be blinking or solid depending upon the next parameter. If this parameter is set to 1 (Cursor Block), the cursor will appear as a solid box. It may be blinking or solid depending upon the next parameter.

- Bit 2 Cursor Blink/Solid On - This parameter may be ignored by some modes. In the resident CYBER mode it is operational. If this parameter is set to 0 (Cursor Blink), the cursor will blink. If this parameter is set to 1 (Cursor Solid On), the cursor will be always on.

- Bit 3 Not usable - This position is used for operator selection of baud rate in Operator Parameter Entry.

3.3.2.6 (Contd)

- o F6 4th Digit

  - Bit 0 Half/Full Duplex - This parameter may be ignored in some modes. In the resident CYBER mode a 0 selects Half Duplex and a 1 selects Full Duplex. In half-duplex operation, data is displayed, printed (if enabled), and sent to the host as it is typed. In full-duplex operation data is only sent to the host as it is typed. In either operation, data will be displayed and printed (if enabled) as data is received from the host. This parameter is ignored if the terminal is in local or block mode operations.

  - Bit 1 80/132 Characters/Line - This parameter may be ignored by some modes. In the resident CYBER mode it is operational. If this parameter is set to 0 (80 Characters/Line), 80 characters will be the maximum number per line. If this parameter is set to 1 (132 Characters/line), 132 characters will be the maximum number per line.

  - Bit 2 24/30 Lines - This parameter is ignored by some modes. In the resident CYBER mode it is operational. If this parameter is set to 0 (24 Lines), there will be a maximum of 24 lines displayed. If this parameter is set to 1 (30 Lines), there will be a maximum of 30 lines displayed.

  - Bit 3 Transparent - This parameter may be ignored by some modes. In the resident CYBER mode it is operational. If this parameter is set to 1 (transparent on) all control codes received and entered on the keyboard will be displayed and not acted upon. When set to 0 (off) control functions will be performed.

- o F7 A-DIAL Auto Dial number part 1.

- o F8 A-DIAL Auto Dial number part 2. - These parameters are used if auto dial is selected. It contains up to 12 digits. If less than 12 digits are used, they must be left justified with the letter F after the last digit used to denote terminational digits.

- o F9 - DF - Default File Number - This parameter may be used when requesting a downline load (see paragraph 3.5, Load File Selection, for when it is used).

3.3.3.2.6 (Contd)

- T - Host Transmit Baud Rate - This parameter will be used to select the host transmit baud rate. It can be set to a value between 0 and F hex, which represents baud rates between 75 and 19.2K baud (see figure 3.3.3 for table).

- R - Host Receive Baud Rate - This parameter will be used to select the host receive baud rate. It can be set to a value between 0 and F hex, which represents baud rates between 75 and 19.2K baud (see figure 3.3.3 for table).

  Note: The Transmit and Receive baud rate may be set to different rates when selected here. If the operator changes the rate in Operator Parameter Entry mode the Transmit and Receive rates will be forced to the same rate.

- F10 ACCESS - Access Code - This parameter is used if the Access On parameter is selected. It contains four hexadecimal digits. The operator is required to type in the same four digits before the mode is entered. If the Access Disabled parameter is selected, these parameters are ignored.

3.3.3.3 CYBER Mode Operator Parameters

Operator parameters are mode dependent. It is intended that all mode operator parameters operate similar to the resident CYBER mode operator parameters described in the following paragraphs. The initial state of each operator parameter is set in the mode installation parameters. The operator parameters are moved into an Active RAM section and can only be temporarily changed by the operator or host. The operator cannot change the NVM values.

To change the operator parameters, the operator must press SETUP while in an operating mode. Eight parameters will be written on the bottom two lines. To change any parameter, the operator must press the FUNCTION key number that precedes the word. The alternate state will then be displayed. If there are more parameters, F10 will say "MORE SELECT". Pressing F10 will display eight new parameters. If there are no more parameters, F10 will say "mode SELECT". Pressing F1 at any time will exit the operation.

3.3.3.3 (Contd)

If the operator does not change the 80/132 Characters/Line parameter, or 24/30 lines, the data on the display will not change. If the parameters are changed, the CRT will be cleared and the cursor placed at home.

The only keys operational in this mode are:

- F1 return - return to mode.
- F2-F9 - alternate state of that parameter.
- F10 - display next group or go to MODE SELECTION MENU.

All other keys are inoperable. See figure 3.3.4 for CYBER Mode Operator Parameters.

3.3.3.3.1 F2 LINE

Pressing F2 will toggle between ON and OFF line. If the Internal Modem is installed and the Enable Auto-Answer Flag has been set, F2 will toggle between ON, OFF, HANGUP, ANSWER, and DIAL.

When the F1 is pressed the following will happen:

- ON - Enter online operation.
- OFF - Enter offline operation.
- HANGUP - This will hangup the internal modem and go to online.
- ANSWER - This will display "WAITING TO ANSWER" on the last line and call a subroutine in the internal modem firmware that will

3.3.3.3.1 (Cond)

monitor the Ring Indicator (RI) and answer after 2 rings. The BREAK key can be used to terminate the monitoring.

- DIAL - This routine will call a subroutine in the internal modem firmware that will either autodial the default phone number entered for the current mode or request the operator to enter a new phone number.

The Enable Auto-Answer Flag is set in CYBER mode.

3.3.3.3.2 F3 PRINTR

Pressing F3 will toggle the online print between OFF, SERIAL, and PARALL (if both serial and parallel type printers are installed). If only a serial printer is installed, it will toggle between OFF and SERIAL. If only a parallel printer is installed, it will toggle between OFF and PARALL. If the words SERIAL or PARALL are displayed, all data received from and sent to the communications port will be sent to the associated printer. If there are no printers on the system, the box will say nothing and cannot be toggled.

Nothing will be written in this field if both ports of the dual serial interface option are set to bidirectional and the 726-10 graphic printer option is not installed.

3.3.3.3.3 Baud Rate

When the second line of the CYBER Mode Operator parameters are being displayed (see figure 3.3.4) the transmit baud rate will be shown in field F5. If the F5 key is pressed, both the transmit and receive rates will be set to the next faster rate. (Transmit and receive will be set to the same rate). When changing from 19.2, the slowest rate will be selected.

3.3.4 Aborts and Recovery

None.

F	return	F	LINE	F	PRINTR	F	MARGIN	F	ALERT	F	LOCK	F	N PAD	F	SCREEN	F	CYBER	F	MORE
1		2	(OFF)	3	(BLANK)	4	(OFF)	5	(SOFT)	6	(ALPHA)	7	NORMAL	8	(ROLL)	9	(SMALL)	10	SELECT
			(ON)		(OFF)		(ON)		(LOUD)		(SHIFT)		(SHIFT)		(PAGE)		(LARGE)		
			(HANGUP)		(SERIAL)														
			(ANSWER)		(PARALL)														
			(DIAL)																

0 20 30 40 50 60 70 80

SETUP #1

1. OPERATOR SELECTED AFTER MODE ACTIVE BY DEPRESSING SETUP KEY.

2. F(N) KEY SELECTION ACTIVATES ALTERNATE SPECIFIED FUNCTION.

F	return	F	BACKGD	F	CURSOR	F	CURSOR	F	BAUD	F	DUPLEX	F	CH/LN	F	LINES	F	XPARNT	F	mode
1		2	(DARK)	3	(LINE)	4	(BLINK)	5		6	HALF	7	(80)	8	(24)	9	(OFF)	10	SELECT
			(LIGHT)		(BLOCK)		(SOLID)		(75-19.2)		(FULL)		(132)		(30)		(ON)		

0 10 20 30 40 50 60 70 80
Character Position

SETUP #2

1. OPERATOR SELECTED VIA F10 = more select IN SETUP #1.

2. F(N) KEY SELECTION ACTIVATES ALTERNATE SPECIFIED FUNCTION.

Figure 3.3.4. CYBER Mode Operator Parameters

3.3.5 Errors

If an unallowable key is pressed the alarm will sound.

3.3.6 Performance

The time required to change parameters is installer or operator dependent. Mode operation is dependent on parameter installation.

3.3.7 Installation Parameters

When the terminal is first powered up or if the unit is ever turned off and the battery removed, the following default parameters are forced into NVM:

The terminal installation parameters

Function Key	721-20 terminals	721-30 terminals
F2	000000	010000
F3	000000	001000
F4	000000	000000
F5	000000	000000
F6	0 0 0	0 0 0
F7	0 0000	0 0000
F8	0 6	0 6
F9	A 6	A 6

The Mode names and installation parameters

Function	MODES				
	CYBER	PLATO	CP/M	Disk	C120
F2	100000	100100	100110	100110	100000
F3	000110	000110	000100	000110	000000
F4	000000	000001	000000	000001	000000
F5	010000	000000	000000	000000	000000
F6	4C04	6C24	6C25	6C24	4421
F7	000000	000000	000000	000000	000000
F8	000000	000000	000000	000000	000000
F9	00 6 6	08 6 6	00 6 6	00 6 6	00 9 9
F10	0000	0000	0000	0000	0000

The initial values must be set up before a mode is selected, as previously discussed.

3.4 Load Source Selection

3.4.1 Abstract

If the operator selects modes 2 through 6 and has met the access requirement or host selects a mode change, the resident controlware must determine which load source is to be used. This is accomplished by the resident controlware looking at preset mode installation parameters.

3.4.2 Description

This feature allows automatic or operator selection of load source in any mode. Any of the following load sources can be selected if present.

- Resident Host or Internal Modem
- Optional Flexible Disk Subsystem
- Optional ROM Pack

Automatic or operator selection of load source is accomplished by presetting these Mode Installation Parameters.

- Use Default/Operator Select-Source/File/Phone Number
- Run Internal/Load External
- Load From Host/Load From Disk
- Resident Host/Internal Modem
- CYBER Mode/ROM Pack

3.4.3 Interfaces

This activity is entered to select the load source:

- If the auto select enable parameter is a 1 and auto select number is 2-6.
- If F2 through F6 (modes 2 through 6) are depressed while displaying the mode selection menu.

The "USE DEFAULT/OPERATOR SELECT" parameter will be tested first.

- If USE DEFAULT SOURCE/FILE is selected the parameter RUN INTERNAL/LOAD EXTERNAL, CYBER MODE/ROM PACK, and LOAD FROM HOST/LOAD FROM DISK will be used.
- If OPERATOR SELECT SOURCE/FILE/PHONE NUMBER is selected the following prompt will be displayed.

  SELECT LOAD SOURCE > DISK HOST ROM

Selection of source is done from keyboard by pressing D, H, or R. Pressing the NEXT key will result in auto selection of the load source using the installation parameters.

If ROM Pack is selected as the load source, the ROM pack load will be performed (see ROM Pack Load, paragraph 3.8).

If Load External is selected, the controlware must then look at the Load From Host/Disk parameter.

If Load From Disk is selected, the flexible disk loader is performed (see Flexible Disk Loader, paragraph 3.7).

If Load From Host is selected:

- The firmware will first test if host interface is used or the 1200/1200 internal modem is use.

3.4.3 (Contd)

- o If the 1200/1200 Internal Modem is selected, it is used with the ASCII loader. If the internal modem is selected but the board is not installed the error message "FAILURE LOADING MODE" will be displayed.

If Auto Dial is not selected, it is assumed the operator has made the connection.

If Auto Dial is selected, the operator select - Source/File/Phone Number will be tested.

- o If Default is selected - The Auto Dial number is used.
- o If Operator is selected - The message "ENTER PHONE NUMBER" is displayed. If the operator presses "NEXT" without entering a number, the Auto Dial number is used. If an operator makes a mistake, the ERASE key will clear all entries and start over. When the operator has entered the correct number the NEXT key will cause the number to be dialed.

The controlware must next determine the load file number (see paragraph 3.5 for this process).

3.4.4 Aborts and Recovery

If operator error is made during number entry, the ERASE key will clear all entries.

3.4.5 Errors

If a selected option board is not present the error message "FAILURE LOADING MODE" will appear and control sent to mode selection menu.

3.4.6 Performance

The time required to enter entries is operator dependent.

3.4.7 Installation Parameters

The mode installation parameters must be preset to the desired load source, as previously discussed.

3.5 Load File Selection

3.5.1 Abstract

When loading from the communications host, this feature allows different controlware load files to be selected for loading into the terminal.

3.5.2 Description

When the communications host has been selected (see paragraph 3.4), this feature allows selection of a controlware load file to be loaded into the terminal. This can be done either automatically or manually. One default value can be used in the mode installation parameters or one of 64 different files may be selected manually.

3.5.3 Interfaces

Automatic selection of a load file is done if the Use Default Source/File/Phone Number parameter is selected in the mode installation parameters.

Manual selection is done if the Operator Selected Source/File/Phone Number parameter is selected. The terminal requests the load file selection with the following prompt:

SELECT LOAD FILE _

3.5.3 (Contd)

The operator then selects the desired load file by using the keyboard. Entry is done by entering one or two hexadecimal digits followed by pressing the NEXT key. The file number entered must be less than 40 hexadecimal. If an error is made during entry, the ERASE key may be pressed to start over. Other keyboard keys are ignored.

If the file number entered is 40 hexadecimal or more, the program will force entry to start over; the same as if ERASE had been pressed.

If the NEXT key is pressed before any other entry is made, the program will select the automatic default file; the same as if the Load Default File parameter were selected.

3.5.4 Aborts and Recovery

If operator error is made during number entry, the ERASE key will clear all entries.

3.5.5 Errors

Not applicable.

3.5.6 Performance

The time required to enter entries is operator dependent.

3.5.7 Installation Parameters

The appropriate mode installation parameters must be setup. (See figure 3.4.1).

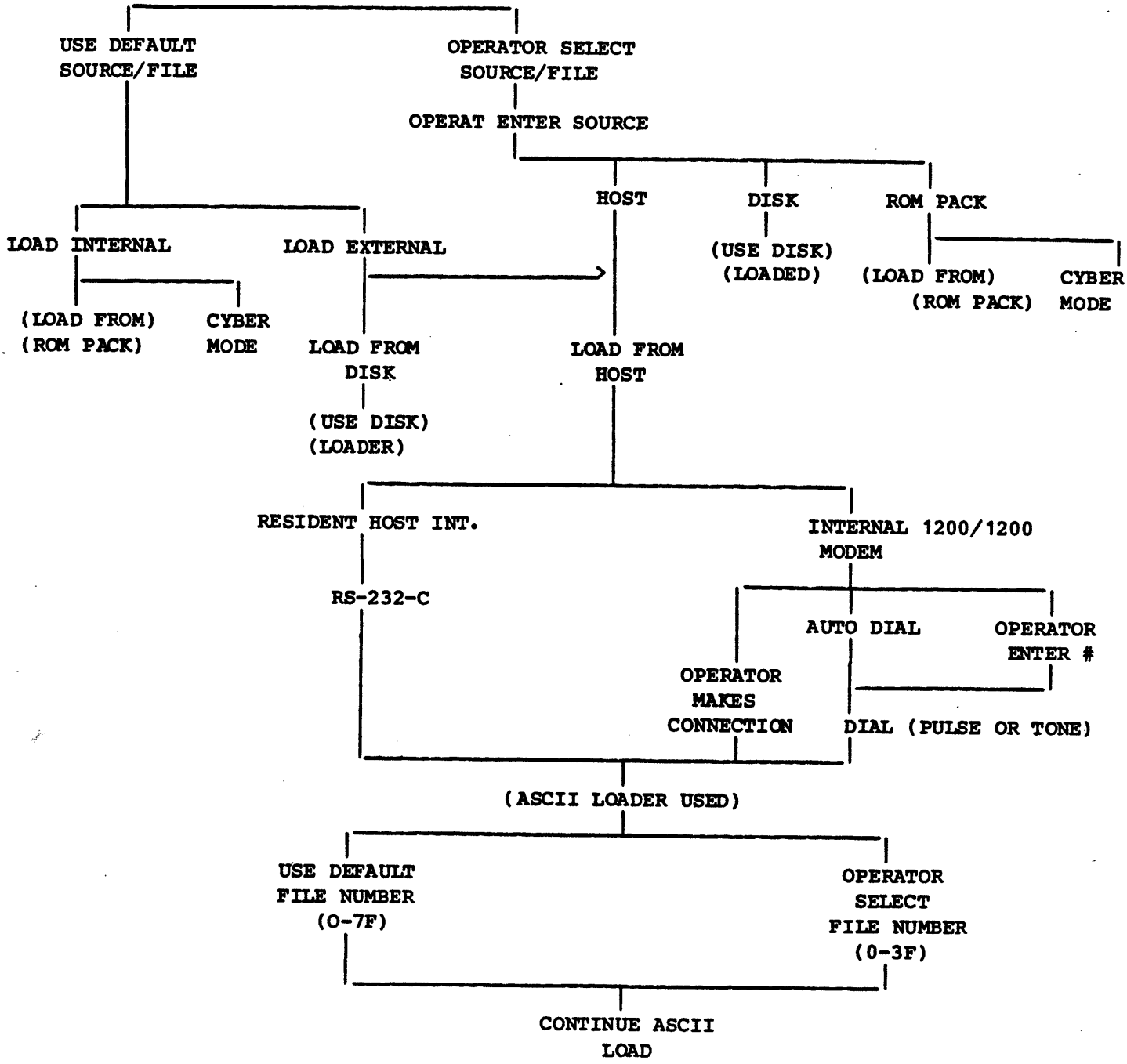


Figure 3.4.1. Load Source/File Selection

3.6 ASCII Network Loader

3.6.1 Abstract

The ASCII network loader allows the terminal to load a selected controlware program from an ASCII communications network, which supports the protocol described in the following paragraphs.

3.6.2 Description

3.6.2.1 General Data

The ASCII communications loader loads a selected controlware file into the RAM of the terminal. Once the load file is selected, the load process proceeds automatically until control is transferred to the loaded controlware or until an unrecoverable error situation occurs. This section describes the communications protocol for loading the terminal from the ASCII communications network.

The protocol contains the following features:

1. All data transmitted to the terminal from the network is in blocks and associated with each block is a cyclic redundancy check.*
2. The load process generates a memory checksum of the loaded controlware. It is intended that the loaded controlware have a routine that utilizes this checksum for checking the integrity of the loaded controlware during operation.
3. The RESET switch can be used to exit from operation on the ASCII network if other techniques do not work.
4. Automatic error recovery during loading is limited to three attempts. After three unsuccessful load attempts, the terminal will abort the load.

---

*Transmit and receive data is switched to 8 bits of data and no parity.

3.6.2.1 (Contd)

5. Partial loading of selected blocks is not supported. If a checksum error occurs or a load is aborted, a full load is then performed.

6. The maximum number of production load files is 64. Block lengths are variable with a maximum number of 240 data characters per block. The maximum number of blocks in a file is 65536.

7. The first block is loaded starting at a host defined memory address and all succeeding blocks are loaded contiguously after this block. No auxiliary block loading table is used.

   Host is restricted from using addresses 0000 to 3FFF hex and D870 to FFFF hex. (See paragraph 4.3.1 Memory Layout.)

8. If no carrier is detected within 30 sec of load initialization the message "HOST NOT CONNECTED" is displayed.

3.6.2.2 Autoload Message Formats

The following message formats are utilized by the host communications line autoload routine (currently supported on the DSN). Unless otherwise specified, communications characters are those in the ASCII character set with even parity.

- Load Block
- Load Request
- NAK Sequence
- Load Complete

3.6.2.2.1 Load Block

Each Load Block received from the host (DSN compatible) is formatted as follows:

DLE	STX	HEADING	DATA	DLE	ETB	or	ETX	CRC

3.6.2.2.1 (Contd)

The heading is formatted as follows:

SEQ1 SEQ2	LDN	A1 A2 A3

Each block begins with a DLE STX character sequence and ends with either a DLE ETB or DLE ETX character sequence followed by a block cyclic redundancy check. The DLE ETB sequence is used on all blocks except for the last one. In this case, a DLE ETX sequence is used, signifying to the terminal that this is the last block of the load. The CRC is a two-character, 16-bit cyclic redundancy check; that is, the remainder after polynomial division modulo two. The polynomial divisor is $X^{16}+X^{15}+X^{2}+1$. The end of the block occurs immediately after the CRC characters. The division is performed on all characters except the initial DLE STX sequence and the first DLE of any DLE DLE sequence in the block.

The heading and data parts of the block can be comprised of any 8-bit character sequence. If any character happens to be a DLE, it is prefixed by another DLE.

SEQ1 SEQ2 is a two-character, 16-bit binary number that uniquely identifies each load block being transmitted. SEQ1 SEQ2 equals 0 for the first load block and is incremented by one for each subsequent load block initially transmitted.

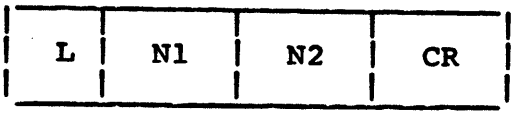
LDN is a single 8-bit character that uniquely identifies the particular load file. The load file can be selected by the operator if desired.

A1 A2 A3 is a three-character, 24-bit binary number that identifies the absolute starting address of the load data in the present block. The address sequence must be in sequential ascending order with all load data being loaded contiguously in memory. Only the lower 16 bits are used.

The data portion of the block may be variable in length from one to 240 8-bit load-data characters.

3.6.2.2.2 Load Request

The downline load operation from the host is initiated by the terminal sending the following character sequence, termed a Load Request.

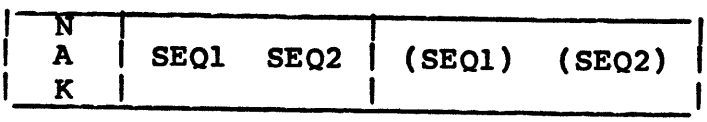


The sequence begins with an uppercase ASCII L and ends with an ASCII CR. The N1 N2 sequence is an ASCII representation of the desired load file. Each N is a hexadecimal number represented by the corresponding ASCII character (uppercase for the numbers A through F). N1 N2 corresponds to the LDN binary number in the resulting load blocks. All four ASCII characters have even parity.

3.6.2.2.3 NAK Sequence

If the terminal detects an error during the load process that can be corrected by retransmitting the load block, it sends a five-character NAK sequence indicating the block to be retransmitted.

DSN compatible



The NAK is the corresponding ASCII NAK character. SEQ1 SEQ2 is a two-character sequence identifying the load block from which point retransmission is to occur. This sequence corresponds to the SEQ1 SEQ2 16-bit binary number in the load block where the error occurred. (SEQ1) (SEQ2) is a one's complement of SEQ1 SEQ2 and is used for error detection.

The use of NAK does not alter the sequence of alternating acknowledgments. The same positive reply (ACK 0 or ACK 1) is used for successful retransmission as would have been used if the previous transmission of the unaccepted block had been successful.

3.6.2.2.4 Load Complete

Upon successful receipt of the last load block, the terminal sends the following Load Complete message to the DSN.

D	E
L	O
E	T

The characters are the corresponding ASCII characters with even parity.

3.6.2.3 Autoload Sequence

After the host autoload routine is initiated, the following sequence shall occur.

1. The terminal will transmit a Load Request upon detection of the network sign on message (ASCII "/"). If the default file is not selected, the terminal will wait for the operator to select the desired load file from the keyboard before transmitting the load request. The message LOADING FILE MM is also displayed to indicate that file number MM is the selected load file.

2. The network must then send load blocks to the terminal. As it receives the load blocks, the terminal checks for valid SEQ1 and SEQ2 characters. If they are too large, a NAK sequence is sent and the terminal waits for successful retransmission of the desired block. If they are too small, the terminal ignores the block. The terminal also checks the LDN and A1, A2, and A3 characters to see if they match the values expected by the terminal. If not, the terminal sends a NAK sequence and awaits retransmission of the block. After the header has been verified, the terminal stores data characters at sequentially increasing RAM addresses. When the end of the block is encountered, the received CRC characters are compared to the CRC calculated by the terminal on the received data. If they do not agree, the terminal sends a NAK sequence to request retransmission of the load block.

3.6.2.3 (Contd)

3. If the two CRC values agree, the block has been received successfully. For DSN operation, if this was not the last load block, the terminal then updates the expected values for the header and awaits receipt of the next block (no positive acknowledgement is sent). If this was the last load block, the terminal sends a Load Complete message signaling a positive acknowledgement of completing the load process.

4. The network then returns to its sign-on phase and awaits operator action. The loader, upon detection of the sign-on phase, turns over control to the loaded controlware.

5. During the load process, the loader program calculates an 8-bit arithmetic-sum checksum of the loaded RAM controlware and saves it for use by the memory checksum routine.

While each block is being loaded the message LOADING FILE MM BLOCK NN is displayed to indicate that block number NN of load file MM is being loaded.

During the load, various timeout conditions can occur. When this happens, the Error light is turned on and error recovery is attempted.

If no response to a NAK sequence has been received, the NAK sequence is resent. After three tries without success, the load is aborted with a load-failure message being displayed.

If no response to a load request has been received, the load request is retried up to three times. If there is still no success, the load is aborted with a load-failure message being displayed.

If the network does not return to the sign-on phase after the load-complete message has been sent, the load-complete message is resent. After three retries without success, the load is aborted with a load-failure message.

3.6.3 Interfaces

The operator interface consists of a series of messages on the CRT screen indicating progress of the load operation. The load process is automatic and does not require any operator interaction.

The message LOADING FILE MM is displayed whenever the terminal sends a load request to the network, indicating that a load of controlware file number MM has been initiated.

The message LOADING FILE MM BLOCK NN is displayed to indicate that block NN of controlware load file MM is being loaded. Error messages are shown in paragraph 3.6.5.

The common variables are as follows at the end of a completed ASCII load.

LINFO is set to X1 (ASCII loader used)

3.6.4 Aborts and Recovery

If the load is unsuccessful due to checksum errors, no response from the network for 30 seconds or loss of carrier on the selected RS-232-C communications interface, the ASCII loader will display the message HOST LOAD FAIL, FAILURE LOADING MODE and then return to the mode selection routine.

Pressing the RESET switch on the terminal front panel will result in the terminal aborting the load and running diagnostics again.

3.6.5 Errors

The following error messages can be generated on the CRT screen during the course of the load process.

NO REPLY

Indicates that the load operation has not progressed for 30 seconds due to no response or incorrect response from the network. The terminal will then send a new load request and try loading again up to three times.

3.6.5 (Contd)

HOST LOAD FAIL

Indicates that the load process has been aborted after three unsuccessful load attempts or that host carrier has been lost. The terminal will return to load file selection after momentarily displaying this message.

In addition, the ERR light on the front panel will be lit whenever a load error has occurred and will remain lit until the error has been recovered or the load has been aborted.

HOST NOT CONNECTED

No initial carrier signal was detected within 30 sec of load initialization.

3.6.6 Performance

The ASCII loader program in the terminal is capable of loading programs from the ASCII network at communication line rates specified by the send and receive parameters in the mode installation parameters. A typical controlware load will take about 3 to 4 minutes at 1200 bps.

3.6.7 Installation Parameters

Transmit and receive rates are selectable in the mode installation parameters. These rates must be set to the desired value at installation (see Parameter Selection paragraph 3.3). The host transmit and receive is forced to 8 data bits and no parity.

3.7 Flexible Disk Loader

3.7.1 Abstract

This feature loads a controlware file from the optional flexible disk subsystem.

3.7.2 Description

When disk is selected by the load source selection feature (see paragraph 3.4), control is transferred to the Flexible Disk Loader. Loading from the flexible disk subsystem is performed by sending an autoload command from the terminal firmware to the flexible disk subsystem. If no errors occur, the flexible disk subsystem sends binary data to the terminal. The terminal firmware stores this data in RAM locations and then returns control to the caller program. If disk load was caused by mode selection, control will be passed to the initial load address.

3.7.3 Interfaces

The following steps occur when loading the terminal from disk. The PFDS is connected to the parallel I/O interface of the terminal.

1) The terminal sends out a load command (0E hex) and looks for a status reply (48 hex). If the correct reply status is not received, a timeout occurs and the disk load is terminated.

2) The terminal sends out an inverse load command (F1 hex) and looks for a status reply (4A hex). If the correct reply status is not received, a timeout occurs and the disk load is terminated.

3) The terminal inputs the terminal memory address at which to start storing data, this starting address is stored and used as an entry point. Then the number of data bytes and the data itself. The address and number of bytes are each two bytes long, with least significant byte being read first.

3.7.3 (Contd)

4) The terminal inputs two bytes of checksum data, which are compared to a calculated checksum of the data bytes. If the checksums do not agree, the disk load is terminated. If they do agree, the terminal firmware returns control to the calling routine.

Checksum algorithm:

```
H = (H .XOR. DATA) CLS 1     First Byte
L = (L .XOR. DATA) CRS 1     Second Byte
```

H and L are both 0 initially.

The common variables are set as follows at the end of the Flexible Disk Load.

- LINFO is set to a value of X2 hex (disk loader used).
- The other variables are not used.

The CRT screen is used to display a loading failure message should the load fail for some reason.

The operator must make the flexible disk subsystem ready and insert the desired autoload flexible disk into the flexible disk subsystem before selecting the flexible disk subsystem as the load source. Once loading is started from flexible disk subsystem, it runs automatically without operator intervention until sucessfully completed or until the load fails.

3.7.4 Aborts and Recovery

Should the Flexible Disk Load fail for some reason, the terminal will display a DISK LOAD FAIL message on the CRT screen. To recover, the operator must correct the problem with the flexible disk subsystem and then RESET. The terminal will then run diagnostics and prompt for the operator to enter mode block number again, this will then return to load source selection (see paragraph 3.4).

3.7.5 Errors

If loading errors occur due to checksum problems, flexible disk subsystem not ready, or disk not inserted, the message DISK LOAD FAIL will be displayed on the CRT screen. To recover, the operator must correct the disk subsystem problem and then press RESET.

3.7.6 Performance

This feature requires the presence of an optional flexible disk subsystem. Loading time depends on controlware residing on the flexible disk.

3.7 Installation Parameters

An optional flexible disk subsystem must be connected to the parallel I/O interface of the terminal. Refer to flexible disk subsystem documentation for installation parameters of the flexible disk subsystem itself. See paragraph 3.4 to select the proper parameters for using the flexible disk subsystems as the load source. The device address of the disk must be set to 7.

8 ROM Pack Load

8.1 Abstract

The ROM Pack can be used in many different ways. It can contain a mode (like graphics firmware ROM pack), diagnostics, or special functions. In fact a pack can contain one, two or all three operations all at the same time.

3.8.2 Description

The ROM pack has a name, revision level, and three entry points.

Address	Data	Description
8000	C3 __ __	Entry point to Mode
8003	C3 __ __	Entry point to Diagnostic
8006	C3 __ __	Entry point to Function
800A	X X X	3 ASCII codes of Pack name
800D	X X X	3 ASCII codes of Pack version

- Mode entry - When ROM pack is selected as the load source (see paragraph 3.4), control will be transferred to address 8000 if that address contains a C3 with mode parameters loaded in RAM. If the C3 is not read a message "FAILURE LOADING MODE" will be displayed.

- Diagnostic Entry - When test 1 is complete, it will test address 8003 for a C3. If a C3 is read control will be transferred to 8003. If a C3 is not read, control is not transferred and test 1 will be completed. The ROM pack should contain a checksum of its own ROM, test any special hardware it uses and display its name and revision.

- Function Entry - When the terminal is displaying the Mode Selection Menu and the F7 key is depressed, or if Auto Select Mode 7 is selected control will be transferred to address 8006 if it contains a C3. If the C3 is not read the alarm will sound, the message "FAILURE LOADING MODE" is displayed and control transferred to the mode selection menu.

3.8.3 Interfaces

Selection of the ROM pack as load source is explained in paragraph 3.4.

Once selected, loading proceeds automatically without operator intervention. If the ROM pack option is not present, the message "FAILURE LOADING MODE" is displayed.

3.8.3 (Contd)

The common variables are set as follows before the jump to ROM.

LINFO is set to a value of X4 hex (ROM loader used).

3.8.4 Aborts and Recovery

See paragraph 3.8.5.

3.8.5 Errors

If the ROM pack option is not present, the message FAILURE LOADING MODE is displayed on the CRT screen.

3.8.6 Performance

The ROM pack load requires the presence of a ROM pack option at address 8000 hex, bank 5, with the entry table containing a C3 for each entry that is enabled. A jump is performed to 8000 if it contains a C3.

3.8.7 Installation Parameters

A ROM pack option must be installed. See paragraph 3.4 to select the proper parameter for using the ROM pack as the load source.

The ROM pack must contain the proper format: (See paragraph 3.8.2).

3.9 CYBER Mode Operation

3.9.1 Abstract

None.

3.9.2 Description

3.9.2.1 General Information

The resident terminal mode is CYBER mode. CYBER mode consists of two operating submodes. Small CYBER mode is functional on CYBER-C120 compatible systems. Large CYBER Mode is functional on CYBER C170/C180 compatible systems. Small CYBER mode emulates an enhanced Advanced Mode operation compatible with the Viking TTY terminal product. Small CYBER and Large CYBER alternate submodes are host and operator selectable. The differences are covered by tables 3.9.11 and 3.9.18. See table 3.9.18 for CYBER control codes and escape sequences.

The CYBER mode supports character mode operation, in both protect and nonprotect operation, and block mode, both protect and nonprotect operation.

3.9.2.1.1 Terminal Switches, Controls, and Indicators

These switches are mounted on the main terminal cabinet.

- Power ON/OFF - Allows the operator to control primary power to the terminal. It is located on the front of the terminal.
- Circuit Breaker - Provides line circuit over current protection for the terminal. It is located at the back of the terminal and can be reset when the current fault condition is cleared.

3.9.2.1.1 (Contd)

- o TEST Switch - This switch located at the back of the terminal allows maintenance loop back of the host interface and keyboard interface for fault isolation capability in Test 3.
- o RESET Switch - Allows operator to reset the terminal to a normal restart condition. This provides a clear function when the terminal is in an abnormal condition. This switch is located on the front of the terminal.
- o INTENSITY Control - Front access control which allows the operator to adjust video intensity to ambient lighting conditions.
- o CONTRAST Control - Front access control which allows the operator to adjust the intensity variation between the normal characters and background.
- o Line Voltage Control - Located at the rear of the unit, this control switch allows the installer to select the line voltage range (120/ 220/240 V ac).
- o Data Set Ready Indicator* - Is illuminated if the Data Set Ready signal at the modem interface is on. Refer to the RS-232-C/CCITT V.24 Interface for a description of the DSR signal.
- o LOCK (Keyboard Locked) Indicator* - Is illuminated during;
  - Page print operations
  - Unable to transmit due to loss of CTS or DSR and online
  - Block mode transmission active
  - Host output buffer is full
  - Host locked keyboard
- o Message Indicator* - Is illuminated under host control.
- o Alert Indicator* - Illuminated under host control.
- o Error Indicator* - Is illuminated when a terminal load or diagnostic error condition is detected.
- o Programmable Indicators* - Are illuminated under host control.

*All indicators are located on the front of the terminal and are driven by the controlware.

3.9.2.1.1 (Contd)

- Audible Alarm - A two-level, loud/soft intensity audible signal is provided. Operation is under firmware control and is operator parameter bit controlled. The alarm will sound for the following conditions:
  - After power on or RESET has run test 1.
  - Improper key depressions during MODE selection.
  - Host code sequence.
  - Entry of certain key while the cursor is in a protected position while autotabbing is disabled.
  - Entry on keyboard while the keyboard is locked.
  - Entry of the cursor by the keyboard into the 8th position from end of line or into the last line caused by keyboard entry and margin alert enabled.

3.9.2.1.2 Cursor

The cursor indicates the current entry position. It is represented on the screen in one of the following manners:

- Constant underline
- Blinking underline
- Solid block
- Blinking solid block

The type of cursor is determined by two operator selectable parameter bits.

3.9.2.1.3 Character Attributes

A character attribute code (background) is loaded into the display memory for every character display code (foreground). These are:

Bit No.	Feature	
0	Blank	Used by Hardware
1	Underscore	
2	Inverse	
3	Blink	
4	Dim	
5	Modified	
6	Validate	
7	Protect	

The terminal has a host command that can enable or disable the using of the old attribute. This means, as data is entered from the host or keyboard while the Use Old Attribute is enabled, only the data is stored into memory and the attribute is not changed (except the modified bit is set for keyboard input).

If the Use Old Attribute is disabled the background code is stored along with the displayable character in the following manner:

1. The modified bit is always set if displayable character came from the keyboard and cleared if from host (Comm Input).

2. With Protect disabled the new attribute code will be stored with each keyboard input and comm input.

3. With Protect enabled the old attribute is reused if comm input and with the modified bit set if keyboard input.

4. The validate bit is not changed with keyboard input.

3.9.2.1.4 Line Attribute

Two line attribute bits are available, but not used.

3.9.2.1.5 Keyboard Operation

The keyboard provides for operator entry of specific symbol and control codes which are displayed or transmitted as directed by the Half-Duplex/Full-Duplex, Online/Local, characer/block mode and protect enable/disabled parameter settings. Terminal function keys are provided in addition to the alphanumeric and control-code entry keys. The keyboard has the capability of generating all 128 ASCII 3.4 codes. Refer to figures 3.9.1 and 3.9.8 for keystation assignments and keyboard layout respectively. Table 3.9.11 is a listing of keyboard codes and legends.

The keyboard incorporates sculptured keycaps and provides N-key rollover. Also typamatic key action is provided on all keys indicated in table 3.9.11. This typamatic action provides a repeat rate of 15 $\pm$3 characters per second after a 1 second delay when the operator holds the desired key continuously depressed. This feature can be disabled by the host or mode installation parameter.

A serial keyboard interface is provided. A single, standard-length cable is provided to allow 1 metre keyboard to monitor separation.

Seven keyboard languages are supported by CYBER mode. An installation parameter must be set accordingly.

Figure 3.9.1 shows the 48-key proposed ANSI standard keyboard array. Figures 3.9.1 and 3.9.7 shows the 48-key ISO standard keyboard array. Figure 3.9.8 shows the keyboard keystation assignments. The symbols on the top of the key support the standard alphanumeric requirements and mode dependant special function keys. The keyboard allows the use of special overlay templates for the function keys which allow them to be labeled with application-unique legends. The keyboard conforms to ANSI X4.14-1971 and the 46-key subset of ISO 3243 Standard. A provision is made to support full compatibility with the 48-key ISO 3243 Standard and the proposed 48-key ANSI X4A12 Standard.

3.9.2.1.6 (SHIFT) Keys

When two symbols share a key, the upper symbol or control function is active while either one of the two SHIFT keys is actuated.

Actuating the SHIFT key in conjunction with a key labeled with a single legend causes the transmission of the uppercase code for the symbol indicated on the key. See table 3.9.11.

3.9.2.1.7 (LOCK) Key/Indicator

This key is operator parameter selectable to perform a shift lock or alpha lock function. In shift lock mode, all function, control and alpha/numeric keys unconditionally transmit the level two column shifted keycode definition in table 3.9.11 unless modified by loaded codes. Operator care must be exercised to ensure intended operation of all keys when shift lock is active. Shift lock is provided for single key activation "ease of use".

In alpha lock, when depressed, this key causes all alpha keys only to transmit the uppercase code until pressed a second time. The alpha lock mode is provided to disable the generation of lowercase codes. If this key is in the lock position, uppercase characters are generated in place of the lowercase characters. Special function, control and numeric keys are unaffected. This key contains an indicator that is illuminated when in lock mode.

3.9.2.1.8 CTRL (CTRL) Key

Actuation of the CTRL key in conjunction with any data key or combination of data key and SHIFT key causes the generation of the codes outlined in the level three and four column of table 3.9.11 unless modified by loaded codes.

3.9.2.1.9 Validation

The host has the ability to load validation code, (see Host Specified Code Sequence/Controlware) and start/stop validation.

3.9.2.1.9 (Contd)

As the host is entering data on the screen the start validation will store the validate bit in background memory for each code stored while the start validation is active.

As keys are pressed on the keyboard, the following conditions are tested:

- o Is the key a host loadable key?
  - YES - Perform loadable key function
  - NO - Is current position a validate position?
    - -- NO - Perform normal function
    - -- YES - Has host loaded validation code?
      - o NO - Perform normal function
      - o YES - Call host loaded validation code. When control is returned, the normal function will be performed if the ZERO flag is clear. Nothing will be done if the ZERO flag is set.

3.9.2.1.10 Host Multiple Code Sequences

The host has many multiple code sequence functions (see table 3.9.18). They are either 2 codes (RS, X) or 3 codes (RS, DC2, X). When the terminal received the RS, keyboard inputs will be ignored until:

a. The next code is processed unless it is a DC2.

b. If the next code is a DC2 the keyboard input is ignored for one more code.

Note: It is possible to hang up the keyboard if the RS or RS, DC2 is received without another code following. The manual release (M REL) function will reenable the keyboard.

Example of Loading Validation Code

Following is an example of loading validation code that requires a 0 through 9 to be entered. If the code is not between 0 through 9, the alarm will sound and nothing displays on the screen.

3.9.2.1.10 (Contd)

First the identification codes are sent.

ASCII RS, HT, V, W
HEX 1E, 09, 30, 32

Next the address of the code is sent (must be broken up with 20 added to odd numbered codes and 60 added to even numbered codes). Example shows address D095.

HEX 2D, 60, 29, 65

Next the code is sent (must be broken up with 20 added to upper half of each 8 bit code and 60 added to the lower half).

Following is a listing of Z80 codes.

```
 1:                          ;       ENTER WITH ASCII CODE TO TEST IN REG. B
 2: 0000                     VAL     EQU     $
 3: 0000 78                          LD      A,B             ; MOVE CODE TO A
 4: 0001 FE30                        CP      30H             ; COMPAIR TO ASCII 0
 5: 0003 3806          000B$         JR      C,VALERR        ; JUMP TO ERROR IF CODE LESS THAN 0
 6: 0005 FE3A                        CP      3AH             ; COMPAIR TO CODE ABOVE 9
 7: 0007 3002          000B$         JR      NC,VALERR       ; JUMP TO ERROR IF CODE > OR = 3AH
 8:                          ;       ENTER HERE TO SET THE ZERO FLAG (CODE IS OKAY)
 9: 0009 AF                          XOR     A               ; SET ZERO FLAG
10: 000A C9                          RET                     ; RETURN
11:                          ;       ENTER HERE TO SOUND THE ALARM, CLEAR THE ZERO FLAG AND RETURN
12: 000B                     VALERR  EQU     $
13: 000B CD33 00                     CALL    0033H           ; CALL ALARM ROUTINE
14: 000E AF                          XOR     A               ; CLEAR A
15: 000F 3C                          INC     A               ; CLEAR ZERO FLAG
16: 0010 C9                          RET                     ; RETURN
17: 0011                             end             ;End of file on input
```

HEX 27, 68, 2F, 6E, 23, 60, 23, 68, 20, 66, 2F, 6E, 23, 6A, 23, 60, 20,
62, 2A, 6F, 2C, 69, 2C, 6D, 23, 63, 20, 60, 2A, 6F, 23, 6C, 2C, 69

Next the termination code is sent:

Z

CR

HEX OD

3.9.2.1.11 Prologue Code

The user will be able to down load a series of characters to be used as a screen prologue. The screen prologue characters, if active, will be sent back to the host prior to sending the unprotected fields on the screen in block mode. The main use for the prologue characters would be as a screen or transaction identifier which would be unknown, unmodifiable and nondisplayable by the terminal operator. Prologue characters are down loaded using the following command: (see paragraph 3.9.2.5.1 for more details).

RS,HT,(V),(W),(X),(Y),(Z) where:

V = 5F the prologue command identifier
W = 31 (this specifies host code sequence)
X = The address in RAM where the code is to be loaded
Y = Prologue character sequence (same as host code sequence)
Z = Termination code (CR)

To clear the prologue characters the user would send an RS,HT,(V),(W),(X),(Y),(Z) where:

V = 5F (the prologue identifier)
W = 30 (clears the function)
X = not required
Y = not required
Z = termination character

.9.2.1.12 Printer Operation

The CYBER modes supports an RS-232-C printer connected to either port on the Dual Serial Interface board and the 726-10 graphic printer on the parallel channel. As data is received from the host, it is sent to the printer if the printr on parameter is selected. See paragraph 3.3.3.3.2. As data is entered from the keyboard it is sent to the printer only if "Printer On" is selected and half duplex active.

There are two reasons for data to be sent to a printer:

1. Online receive data

2. Local print key

)47h
)53R

3.9.2.1.12 (Contd)

There are two types of printers that data can be sent to:

1. Serial printers

2. Parallel printer

When printing online data, the terminal can be set to monitor the printer ready or ignore the printer ready. Following is a summary of when online data is sent to a printer.

Online data is sent to a serial printer if the serial printer is selected in the operator parameters are:

1. Monitor printer RDY parameter is not set.

2. Monitor printer RDY parameter is set and the RDY input signal from the printer is active.

Note: The terminal will hang waiting if the monitor RDY parameter is set and the RDY input signal from the printer is not active.

Online data is sent to a parallel printer if the PARALL printer is selected in the operator parameter and:

1. Printer is turned on and the monitor printer RDY parameter is not set.

2. Printer is turned on and the monitor printer RDY parameter is set and the printer ready status ia active. Printer is not ready if:

   a. Paper out

   b. The platen yoke assembly is not closed

   c. A vertical format unit fault occurs

   d. A paper jam or paper motion fault occurs

   e. Printer is offline (deselected)

Note: The terminal will hang waiting if the monitor printer RDY parameter is set and the printer is not ready and selected.

3.9.2.1.12 (Contd)

When printing local data using the print key (or host print commands to print the screen), the printers must be ready. The terminal does not look at the monitor printer RDY parameter. Following is a summary of what is required to send data to a printer during a local print.

Local prints to a serial printer requires:

1. Printer ON

2. DSR input signal from the printer active

Local prints to a parallel printer requires:

1. Printer ON

2. Printer ready and selected

A printer X-ON/X-OFF is supported on the serial printers. If the printer sends an X-OFF to the terminal, the terminal will stop taking data from its comm buffer and sending it to the printer. When the X-ON is received from the printer, data transfer will continue.

If the comm input buffer ever reaches the point where it sends an X-OFF to the host, the X-OFF is sent.

If it is desired to communicate to the host after the printer has sent the X-OFF, the manual release operation will send an X-ON to the host and resume sending data to the printer even if it cannot except it.

3.9.2.1.12 (Contd)

When CYBER is selected, an ESC, 4 will be sent to the 726-20 serial graphic printers to select the basic character set. The ESC, 4 is also sent when the Print key is pressed.

3.9.2.1.13 Autodial

CYBER mode can be set to run with the internal modem (IM). The IM can be set to autodial a pre-entered number or request the operator to enter a number to dial. The autodial function is located in the IM firmware and can be invoked by two means.

1. When the CYBER mode is selected
2. When the SETUP key is pressed, F2 toggled to DIAL and F1 pressed

To determine what number is dialed and the format for dialing, see section called Mode Installation Parameters, and also see the 1200/1200 Internal Modem specification.

3.9.2.1.14 Auto-Answer

CYBER mode can be made to enter an auto-answer mode where the keyboard is dead (except the BREAK key), where the internal modem is given control to monitor and answer the phone line. When a call has been answered, control will be sent back to the mode.

The auto-answer function can be invoked by pressing the SETUP key, toggling F2 key to ANSWER and press F1.

The auto-hangup or manual hangup function can be used to hangup the line.

3.9.2.1.14 (Contd)

This feature is also described in the CYBER Mode Operator Parameters, paragraph 3.3.3.3.1.

3.9.2.1.15 Auto-Hangup

The residents monitor routine will call the internal modems hangup routine if the Carrier On (CO) is not present while using the internal modem.

The internal modem can also be hungup by the operator by pressing SETUP, toggle F2 to HANGUP, and pressing F1.

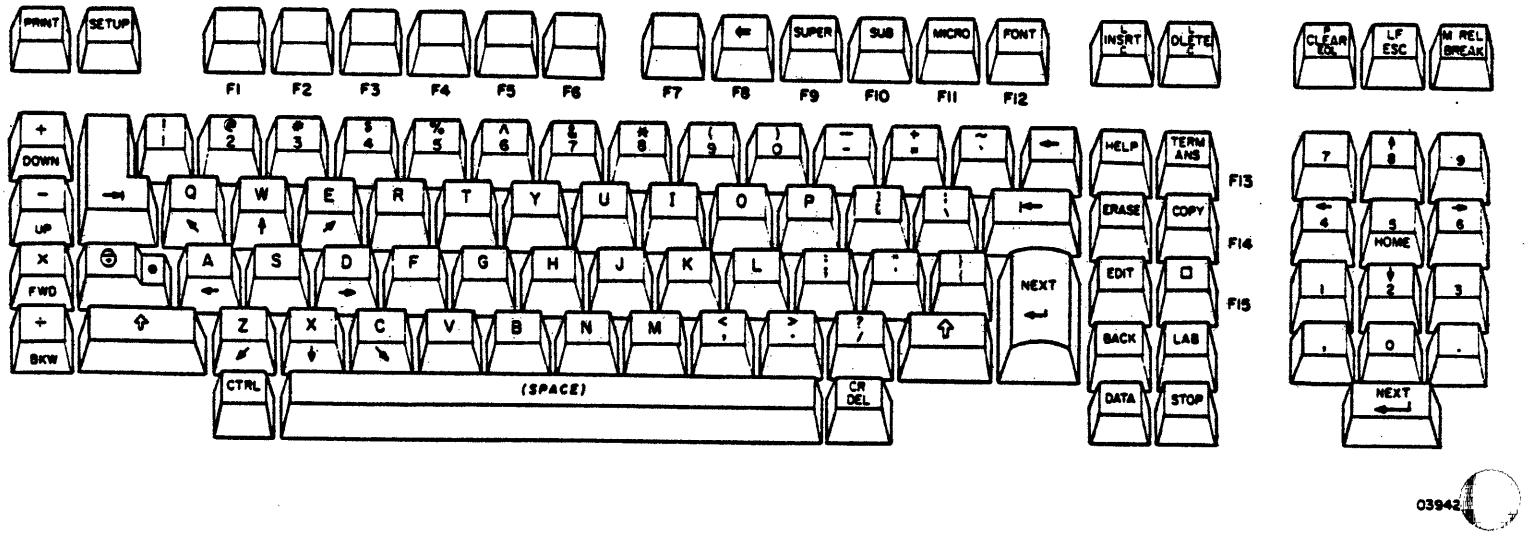


Figure 3.9.1. Multifunction Keyboard, Viking X (ANSI X4.14) English Standard

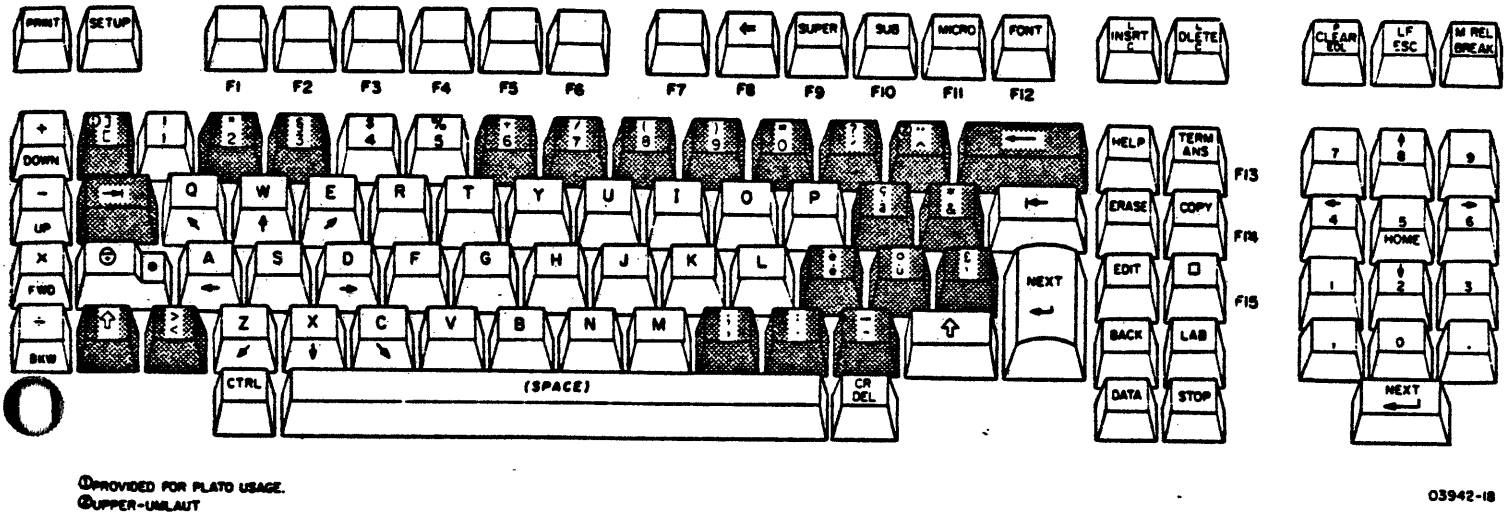


Figure 3.9.2. Multifunction Keyboard, Viking X
French Standard Keyboard

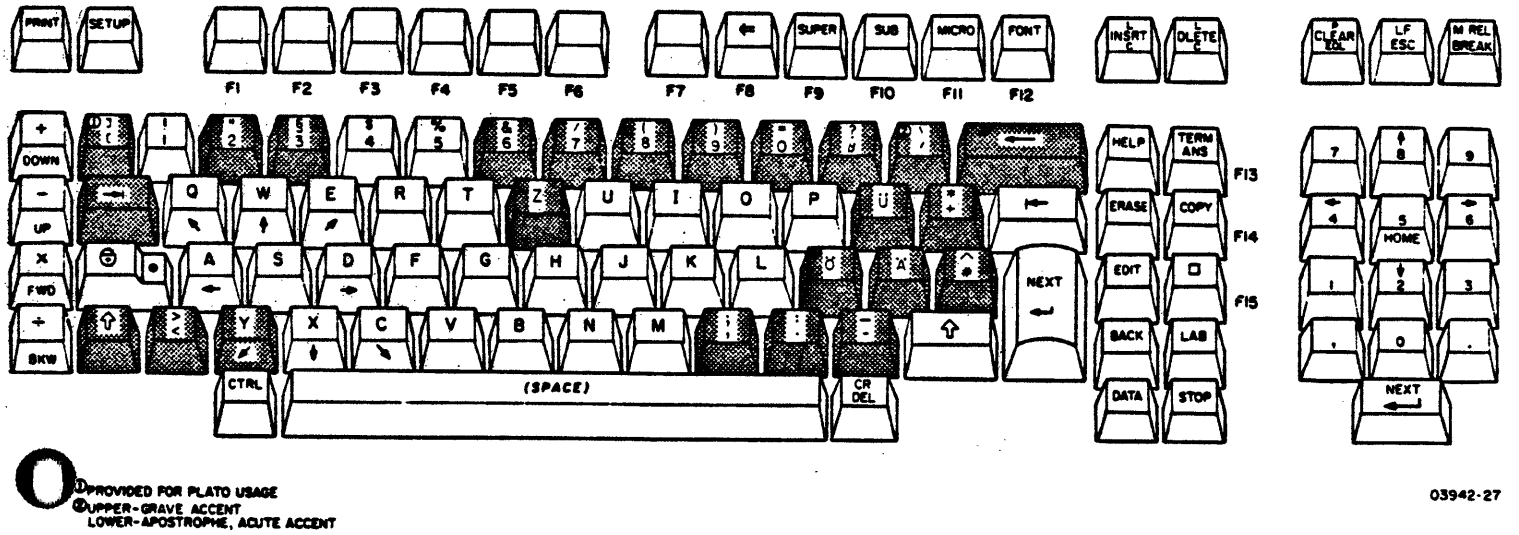


Figure 3.9.3. Multifunction Keyboard, Viking X
German Standard Keyboard

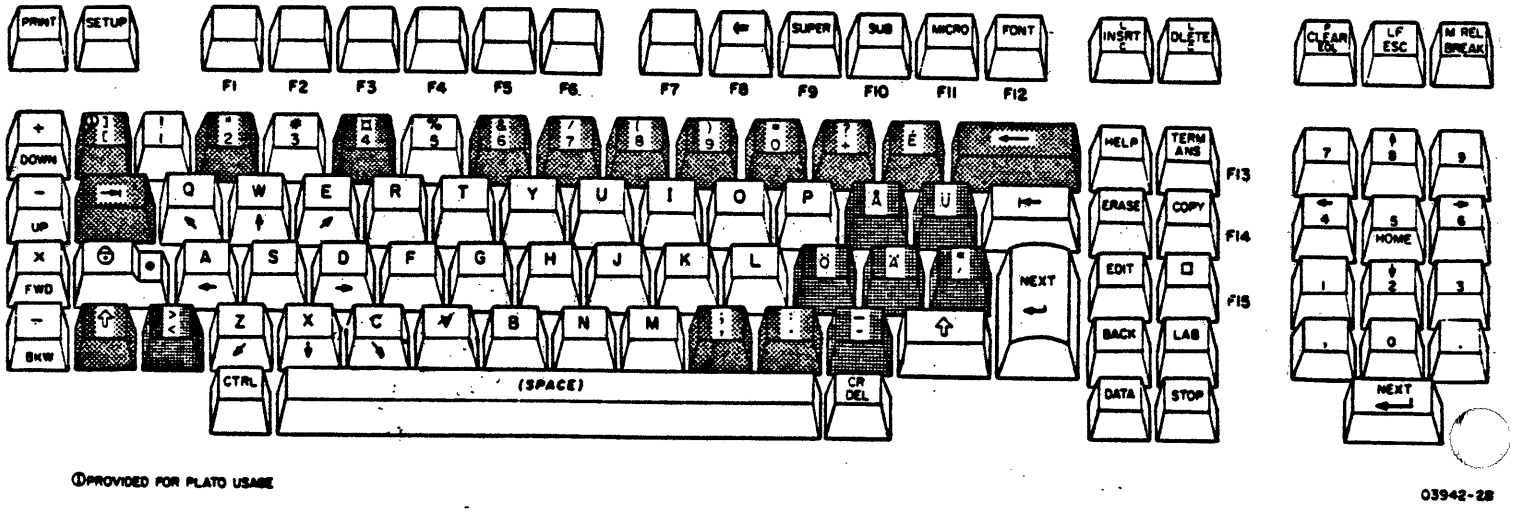


Figure 3.9.4. Multifunction Keyboard, Viking X Swedish/Finnish Standard Keyboard

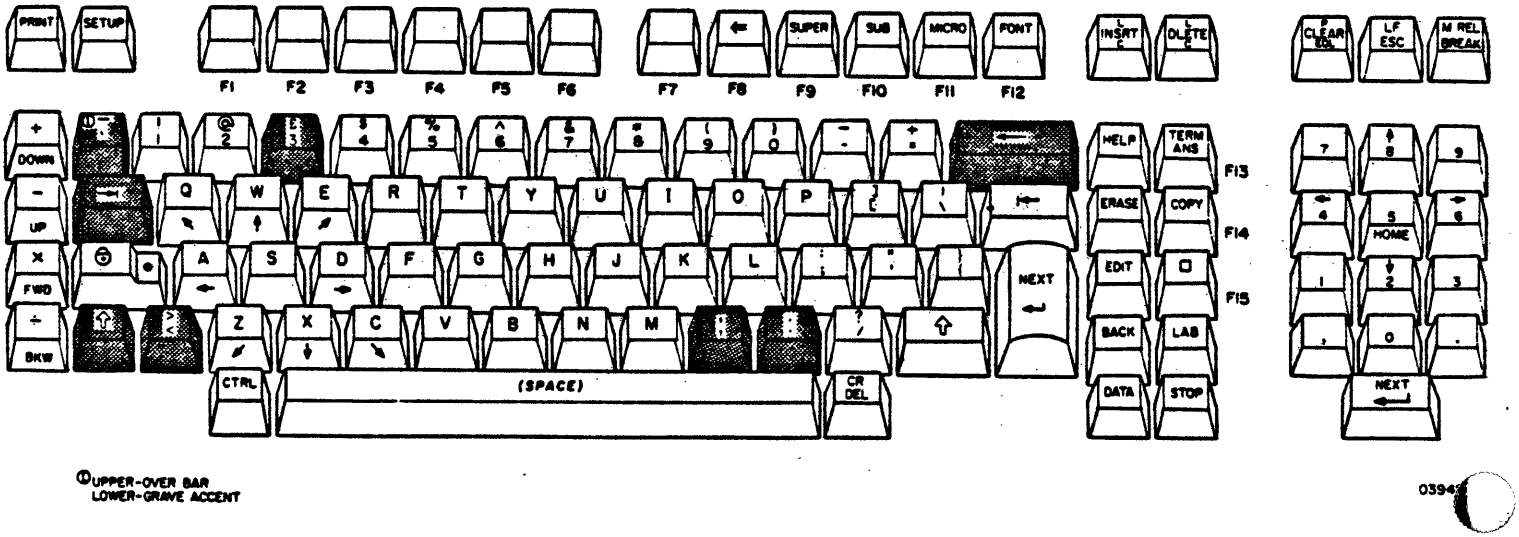


Figure 3.9.5. Multifunction Keyboard, Viking X British Standard Keyboard

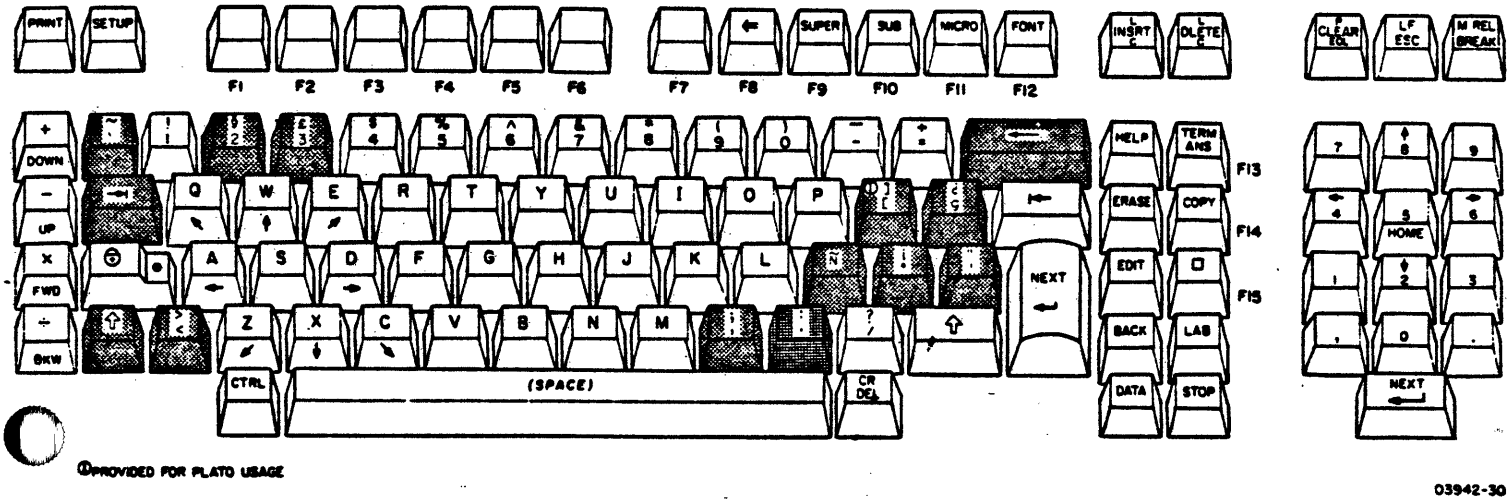


Figure 3.9.6. Multifunction Keyboard, Viking X Spanish Standard Keyboard

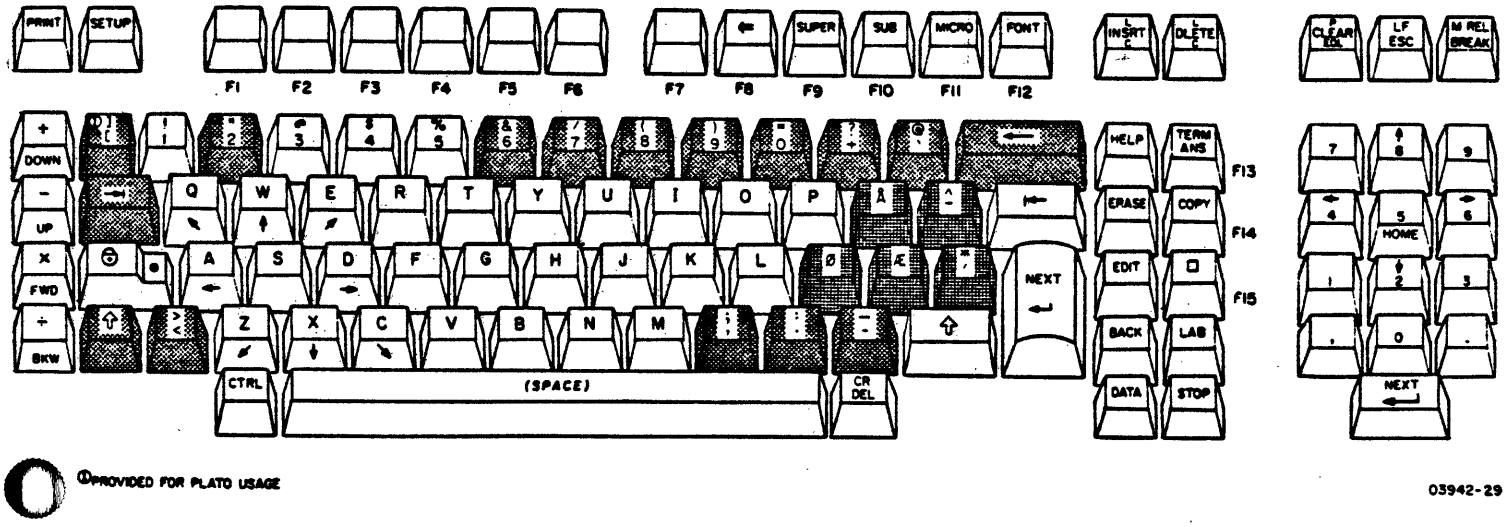


Figure 3.9.7. Multifunction Keyboard, Viking X Danish/Norwegian Standard Keyboard

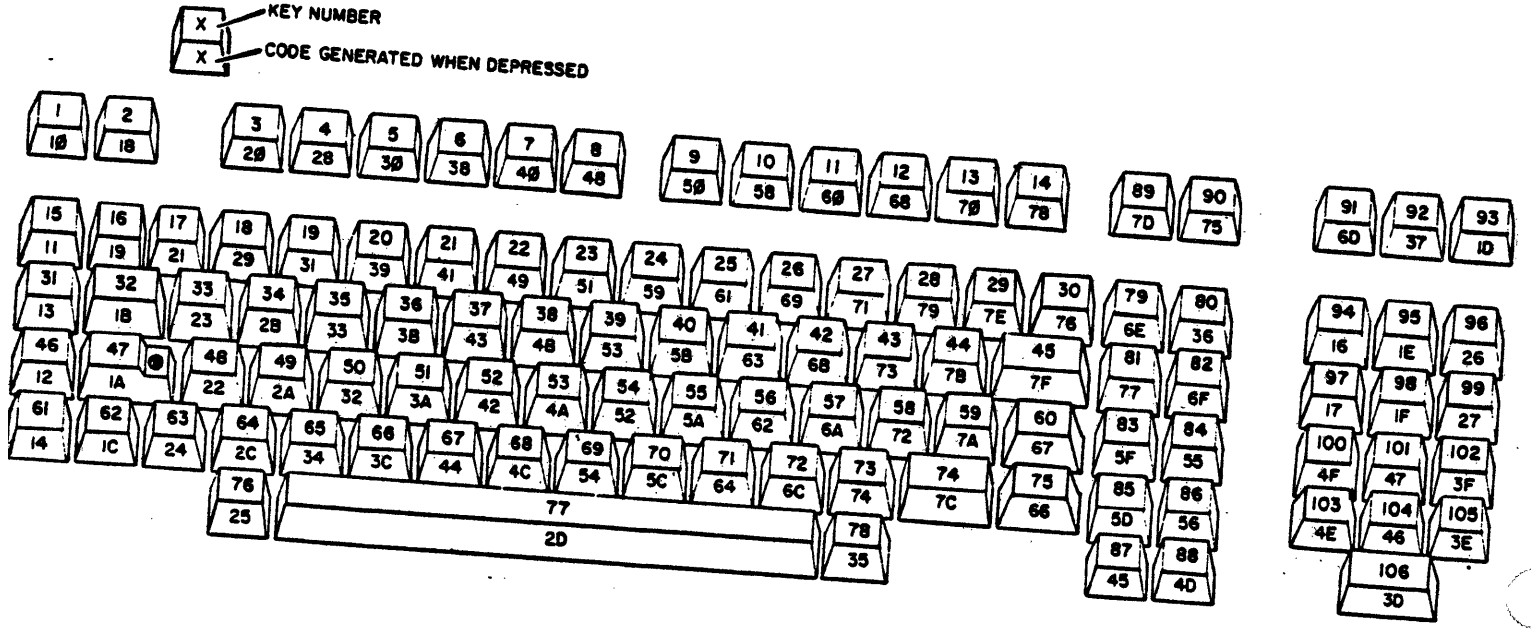


Figure 3.9.8. Keystation Assignments

TABLE 3.9.1. CTRL CHARACTER CODES

b7 → / b6 → / b5 → / BITS					0 0 0	0 0 1	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	0	1	7
0	0	0	0	0	NUL	DLE	
0	0	0	1	1	SOH	DC1	
0	0	1	0	2	STX	DC2	
0	0	1	1	3	ETX	DC3	
0	1	0	0	4	EOT	DC4	
0	1	0	1	5	ENQ	NAK	
0	1	1	0	6	ACK	SYN	
0	1	1	1	7	BEL	ETB	
1	0	0	0	8	BS	CAN	
1	0	0	1	9	HT	EM	
1	0	1	0	10 (A)	LF	SUB	
1	0	1	1	11 (B)	VT	ESC	
1	1	0	0	12 (C)	FF	FS	
1	1	0	1	13 (D)	CR	GS	
1	1	1	0	14 (E)	SO	RS	
1	1	1	1	15 (F)	SI	US	DEL(1)

02016

(1) This character code is used to denote a parity error.

TABLE 3.9.2. ENGLISH ALPHANUMERIC CHARACTER CODES

b7 → / b6 → / b5 → / BITS					0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	2	3	4	5	6	7
0	0	0	0	0	SP	0	@	P	`	p
0	0	0	1	1	!	1	A	Q	a	q
0	0	1	0	2	"	2	B	R	b	r
0	0	1	1	3	#	3	C	S	c	s
0	1	0	0	4	$	4	D	T	d	t
0	1	0	1	5	%	5	E	U	e	u
0	1	1	0	6	&	6	F	V	f	v
0	1	1	1	7	'	7	G	W	g	w
1	0	0	0	8	(	8	H	X	h	x
1	0	0	1	9	)	9	I	Y	i	y
1	0	1	0	10(A)	*	:	J	Z	j	z
1	0	1	1	11(B)	+	;	K	[	k	{
1	1	0	0	12(C)	,	<	L	\	l	¦
1	1	0	1	13(D)	-	=	M	]	m	}
1	1	1	0	14(E)	.	>	N	^	n	~
1	1	1	1	15(F)	/	?	O	_	o	

02016

TABLE 3.9.3. FRENCH ALPHANUMERIC CHARACTER CODES

b7 → / b6 → / b5 → / BITS					0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	2	3	4	5	6	7
0	0	0	0	0	SP	0	à	P	`	p
0	0	0	1	1	!	1	A	Q	a	q
0	0	1	0	2	"	2	B	R	b	r
0	0	1	1	3	£	3	C	S	c	s
0	1	0	0	4	$	4	D	T	d	t
0	1	0	1	5	%	5	E	U	e	u
0	1	1	0	6	&	6	F	V	f	v
0	1	1	1	7	´	7	G	W	g	w
1	0	0	0	8	(	8	H	X	h	x
1	0	0	1	9	)	9	I	Y	i	y
1	0	1	0	10(A)	*	:	J	Z	j	z
1	0	1	1	11(B)	+	;	K	°	k	é
1	1	0	0	12(C)	,	<	L	Ç	l	ù
1	1	0	1	13(D)	-	=	M	§	m	è
1	1	1	0	14(E)	.	>	N	^	n	¨
1	1	1	1	15(F)	/	?	O	_	o	

02015-1

TABLE 3.9.4 GERMAN ALPHANUMERIC CHARACTER CODES

b7 → / b6 → / b5 → / BITS					0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ↓ ROW	2	3	4	5	6	7
0	0	0	0	0	SP	0	§	P	`	p
0	0	0	1	1	!	1	A	Q	a	q
0	0	1	0	2	"	2	B	R	b	r
0	0	1	1	3	#	3	C	S	c	s
0	1	0	0	4	$	4	D	T	d	t
0	1	0	1	5	%	5	E	U	e	u
0	1	1	0	6	&	6	F	V	f	v
0	1	1	1	7	'	7	G	W	g	w
1	0	0	0	8	(	8	H	X	h	x
1	0	0	1	9	)	9	I	Y	i	y
1	0	1	0	10(A)	*	:	J	Z	j	z
1	0	1	1	11(B)	+	;	K	Ä	k	ä
1	1	0	0	12(C)	,	<	L	Ö	l	ö
1	1	0	1	13(D)	-	=	M	Ü	m	ü
1	1	1	0	14(E)	.	>	N	^	n	ß
1	1	1	1	15(F)	/	?	O	_	o	

02015-2

TABLE 3.9.5. SWEDISH/FINNISH ALPHANUMERIC CHARACTER CODES

b7 → / b6 → / b5 → / BITS ↓					0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	2	3	4	5	6	7
0	0	0	0	0	SP	0	É	P	é	p
0	0	0	1	1	!	1	A	Q	a	q
0	0	1	0	2	"	2	B	R	b	r
0	0	1	1	3	#	3	C	S	c	s
0	1	0	0	4	¤	4	D	T	d	t
0	1	0	1	5	%	5	E	U	e	u
0	1	1	0	6	&	6	F	V	f	v
0	1	1	1	7	´	7	G	W	g	w
1	0	0	0	8	(	8	H	X	h	x
1	0	0	1	9	)	9	I	Y	i	y
1	0	1	0	10(A)	*	:	J	Z	j	z
1	0	1	1	11(B)	+	;	K	Ä	k	ä
1	1	0	0	12(C)	,	<	L	Ö	l	ö
1	1	0	1	13(D)	-	=	M	Å	m	å
1	1	1	0	14(E)	.	>	N	Ü	n	ü
1	1	1	1	15(F)	/	?	O	_	o	

02015-7

TABLE 3.9.6. BRITISH ALPHANUMERIC CHARACTER CODES

b7 → / b6 → / b5 → / BITS					0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	2	3	4	5	6	7		
0	0	0	0	0	SP	0	@	P	`	p		
0	0	0	1	1	!	1	A	Q	a	q		
0	0	1	0	2	"	2	B	R	b	r		
0	0	1	1	3	£	3	C	S	c	s		
0	1	0	0	4	$	4	D	T	d	t		
0	1	0	1	5	%	5	E	U	e	u		
0	1	1	0	6	&	6	F	V	f	v		
0	1	1	1	7	'	7	G	W	g	w		
1	0	0	0	8	(	8	H	X	h	x		
1	0	0	1	9	)	9	I	Y	i	y		
1	0	1	0	10(A)	*	:	J	Z	j	z		
1	0	1	1	11(B)	+	;	K	[	k	{		
1	1	0	0	12(C)	,	<	L	\	l	¦		
1	1	0	1	13(D)	-	=	M	]	m	}		
1	1	1	0	14(E)	.	>	N	^	n	~		
1	1	1	1	15(F)	/	?	O	_	o			

02015-8

TABLE 3.9.7. SPANISH ALPHANUMERIC CHARACTER CODES

b7 b6 b5 / BITS b4 b3 b2 b1	COLUMN / ROW	2 (0 1 0)	3 (0 1 1)	4 (1 0 0)	5 (1 0 1)	6 (1 1 0)	7 (1 1 1)
0 0 0 0	0	SP	0	§	P	`	p
0 0 0 1	1	!	1	A	Q	a	q
0 0 1 0	2	"	2	B	R	b	r
0 0 1 1	3	£	3	C	S	c	s
0 1 0 0	4	$	4	D	T	d	t
0 1 0 1	5	%	5	E	U	e	u
0 1 1 0	6	&	6	F	V	f	v
0 1 1 1	7	'	7	G	W	g	w
1 0 0 0	8	(	8	H	X	h	x
1 0 0 1	9	)	9	I	Y	i	y
1 0 1 0	10(A)	*	:	J	Z	j	z
1 0 1 1	11(B)	+	;	K	¡	k	°
1 1 0 0	12(C)	,	<	L	Ñ	l	ñ
1 1 0 1	13(D)	-	=	M	¿	m	Ç
1 1 1 0	14(E)	.	>	N	^	n	~
1 1 1 1	15(F)	/	?	O	_	o	

02015-9

TABLE 3.9.8. DANISH/NORWEGIAN ALPHANUMERIC CHARACTER CODES

b7 → b6 → b5 → / BITS					0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	2	3	4	5	6	7
0	0	0	0	0	SP	0	@	P	`	p
0	0	0	1	1	!	1	A	Q	a	q
0	0	1	0	2	"	2	B	R	b	r
0	0	1	1	3	#	3	C	S	c	s
0	1	0	0	4	$	4	D	T	d	t
0	1	0	1	5	%	5	E	U	e	u
0	1	1	0	6	&	6	F	V	f	v
0	1	1	1	7	'	7	G	W	g	w
1	0	0	0	8	(	8	H	X	h	x
1	0	0	1	9	)	9	I	Y	i	y
1	0	1	0	10(A)	*	:	J	Z	j	z
1	0	1	1	11(B)	+	;	K	Æ	k	æ
1	1	0	0	12(C)	,	<	L	Ø	l	ø
1	1	0	1	13(D)	-	=	M	Å	m	å
1	1	1	0	14(E)	.	>	N	^	n	~
1	1	1	1	15(F)	/	?	O	_	o	

02015-10

TABLE 3.9.9. LINE DRAWING SYMBOL CODES

b7 → / b6 → / b5 → / BITS						0 1 0	0 1 1
	b4 ↓	b3 ↓	b2 ↓	b1 ↓	COLUMN → / ROW ↓	2	3
	0	0	0	0	0		
	0	0	0	1	1		
	0	0	1	0	2		
	0	0	1	1	3		
	0	1	0	0	4		
	0	1	0	1	5		
	0	1	1	0	6		
	0	1	1	1	7		
	1	0	0	0	8		
	1	0	0	1	9		
	1	0	1	0	10 (A)		
	1	0	1	1	11 (B)		
	1	1	0	0	12 (C)		
	1	1	0	1	13 (D)		
	1	1	1	0	14 (E)		
	1	1	1	1	15 (F)		

02016-2

TABLE 3.9.10. PLATO SYMBOL CODES

B7 B6 B5 / T S / B4 B3 B2 B1		1 0 0	1 0 1	1 1 0	1 1 1
	COLUMN / ROW	4	5	6	7
0 0 0 0	0		α	Σ	\
0 0 0 1	1	/	β	..	\
0 0 1 0	2	≡	δ	□	/
0 0 1 1	3	~	λ	○	/
0 1 0 0	4	⇔	μ	◆	—
0 1 0 1	5	≠	π	×	—
0 1 1 0	6	↑	ρ	'	|
0 1 1 1	7	→	σ	,	|
1 0 0 0	8	↓	ω	v	▒
1 0 0 1	9	←	≤	↕	▒
1 0 1 0	10 (A)	×	≥	|	=
1 0 1 1	11 (B)	Σ	θ		=
1 1 0 0	12 (C)	Δ	<		◣
1 1 0 1	13 (D)	∪	°		◣
1 1 1 0	14 (E)	∩	>		◢
1 1 1 1	15 (F)	+	≥		◢

TABLE 3.9.11. ENGLISH KEYBOARD KEYCODES AND LEGENDS

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE	⇧	CTRL	⇧ ·CTRL
1	DS,L		PRINT					
		Small CYBER Mode			1E,11	1E,01	1E,11	1E,01
		Large CYBER Mode			1E,02	1E,01	1E,02	1E,01
2	L		SETUP					
3	D,L		(F1)		1E,71	1E,61	1E,31	1E,21
4	D,L		(F2)		1E,72	1E,62	1E,32	1E,22
5	D,L		(F3)		1E,73	1E,63	1E,33	1E,23
6	D,L		(F4)		1E,74	1E,64	1E,34	1E,24
7	D,L		(F5)		1E,75	1E,65	1E,35	1E,25
8	D,L		(F6)		1E,76	1E,66	1E,36	1E,26
9	D,L		(F7)		1E,77	1E,67	1E,37	1E,27
			⇐					
10	D,L		(F8)		1E,78	1E,68	1E,38	1E,28
			SUPER					
11	D,L		(F9)		1E,79	1E,69	1E,39	1E,29
			SUB					
12	D,L		(F10)		1E,7A	1E,6A	1E,3A	1E,2A
			MICRO					
13	D,L		(F11)		1E,7B	1E,6B	1E,3B	1E,2B
			FONT					
14	D,L		(F12)		1E,7C	1E,6C	1E,3C	1E,2C
15	L,D		+	DOWN **	1E,12,20	1E,12,21	1E,12,22	1E,12,23
16	R,L				Not Used			
17	R	1		!	31	21	31	21
18	R	2		@	32	40	00	00
19	R	3		#	33	23	33	23
20	R	4		$	34	24	34	24
21	R	5		%	35	25	35	25

TABLE 3.9.11. ENGLISH KEYBOARD KEYCODES AND LEGENDS (CONTD)

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE		CTRL	⇧ ·CTRL
22	R	6		^	36	5E	36	5E
23	R	7		&	37	26	37	26
24	R	8		*	38	2A	38	2A
25	R	9		(	39	28	39	28
26	R	0		)	30	29	30	29
27	R	-		_	2D	5F	1F	1F
28	R	=		+	3D	2B	1E	1E
29	R	`		~	60	7E	60	7E
30	R,L		←					
		Small CYBER Mode			19	19	19	19
		Large CYBER Mode			08	08	08	08
31	L,D		--	UP **	1E,12,24	1E,12,25	1E,12,26	1E,12,27
32	R,L,DS		→|		09	09	1E,12,57	1E,12,57
33	R		Q	↖ **	71	51	11	11
34	R		W	↑ **	77	57	17	17
35	R		E	↗ **	65	45	05	05
36	R		R		72	52	12	12
37	R		T		74	54	14	14
38	R		Y		79	59	19	19
39	R		U		75	55	15	15
40	R		I		69	49	09	09
41	R		O		6F	4F	0F	0F
42	R		P		70	50	10	10
43	R,L	[		]	5B	5D	1D	1D
44	R,L	\		¦	5C	7C	1C	1C
45	R,L,DS		←		1E,0B	1E,0B	1E,12,58	1E,12,58
46	D,L		X	FWD **	1E,12,28	1E,12,29	1E,12,2A	1E,12,2B
47			⊕					

TABLE 3.9.11. ENGLISH KEYBOARD KEYCODES AND LEGENDS (CONTD)

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE	⇧	CTRL	⇧ CTRL
48	R		A	← **	61	41	01	01
49	R		S		73	53	13	13
50	R		D	→ **	64	44	04	04
51	R		F		66	46	06	06
52	R		G		67	47	07	07
53	R		H		68	48	08	08
54	R		J		6A	4A	0A	0A
55	R		K		6B	4B	0B	0B
56	R		L		6C	4C	0C	0C
57	R,L	;		:	3B	3A	3B	3A
58	R,L	'		"	27	22	27	22
59	R,L				7B	7D	7B	7D
60	See Key 75				-	-	-	-
61	D,L		÷	BKW **	1E,12,2C	1E,12,2D	1E,12,2E	1E,12,2F
62			⇧					
63	R				Not Used			
64	R		Z	↙ **	7A	5A	1A	1A
65	R		X	↓ **	78	58	18	18
66	R		C	↘ **	63	43	03	03
67	R		V		76	56	16	16
68	R		B		62	42	02	02
69	R		N		6E	4E	0E	0E
70	R		M		6D	4D	0D	0D
71	L	,		<	2C	3C	2C	3C
72	R,L	.		>	2E	3E	2E	3E
73	R,L	/		?	2F	3F	2F	3F

TABLE 3.9.11. ENGLISH KEYBOARD KEYCODES AND LEGENDS (CONTD)

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE	⇧	CTRL	⇧ ·CTRL
74			⇧					
75	L	←		NEXT				
		Small CYBER Mode			0A	0A	0A	0A
		Large CYBER Mode			0D	0D	0D	0D
76			CTRL					
77	R		(Space)		20	20	20	20
78	L	DEL		CR	7F	0D	7F	0D
79	D,L		HELP		1E,5C	1E,58	1E,5C	1E,58
80	D,L	ANS	(F13)	TERM	1E,7D	1E,6D	1E,3D	1E,2D
81	DS,L		ERASE					
		Small CYBER Mode			1E,5D	1E,59	1E,5D	1E,59
		Large CYBER Mode			1F	1E,5D	1E,5D	1E,59
82	D,L		COPY					
			(F14)		1E,7E	1E,6E	1E,3E	1E,2E
83	D,L		EDIT		1E,5E	1E,5A	1E,5E	1E,5A
84	D,L		□					
			(F15)		1E,70	1E,60	1E,30	1E,20
85	D,L		BACK		1E,5F	1E,5B	1E,5F	1E,5B
86	D,L		LAB		1E,12,31	1E,12,32	1E,12,33	1E,12,33
87	D,L		DATA		1E,12,35	1E,12,36		
88	D,L		STOP		1E,49	1E,4A	1E,49	1E,4A
89	DS,L,R	C	INSERT	L	1E,4F	1E,52	1E,4F	1E,52
90	DS,L,R	C	DELETE	L	1E,4E	1E,51	1E,4E	1E,51
91	L	EOL	CLEAR	P	0B	0C	0B	0C
92	L	ESC		LF	1B	0A	1B	0A
93	L	BREAK		M REL	BREAK		BREAK	

TABLE 3.9.11. ENGLISH KEYBOARD KEYCODES AND LEGENDS (CONTD)

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE		CTRL	⇧ ·CTRL
94	R,L,N	7			37		37	
95	R,L,N	8		↑	38	17	38	17
96	R,L,N	9			39		39	
97	R,L,N,	4		←				
	D	Small CYBER Mode			34	19	19	1E,19
		Large CYBER Mode			34	08	34	08
98	R,L,N,	5		HOME**				
	D	Small CYBER Mode			35	08	08	1E,08
		Large CYBER Mode			35	19	35	19
99	R,L,N,	6		→				
	D	Small CYBER Mode			36	18	18	1E,18
		Large CYBER Mode			36	18	36	18
100	R,L,N	1			31		31	
101	R,L,N,	2		↓				
	D	Small CYBER Mode			32	1A	1A	1E,1A
		Large CYBER Mode			32	1A	32	1A
102	R,L,N	3			33		33	
103	R,L,N	,			2C		2C	
104	R,L,N	0			30		30	
105	R,L,N	.			2E		2E	
106	L,N	↵		NEXT				
		Small CYBER Mode			0A	0A	0A	0A
		Large CYBER Mode			0D	0D	0D	0D

TABLE 3.9.11. ENGLISH KEYBOARD KEYCODES AND LEGENDS (CONTD)

KEY NO.	NOTES*	KEY LEGENDS			PRESSED WITH KEY ... GENERATE			
		LOWER	CENTER	UPPER		⇧	CTRL	⇧ ·CTRL

*Key to Notes:

N - Modified if the Numeric Pad parameter set to SHIFT.
R - Auto repeat if TYPAMATIC is on.
L - Host loadable.
D - Delimiter. CR sent when enabled by host.
DS - Delimiter. CR sent when enabled by host in small CYBER.
\- - No function performed.
** - Labeled on skirt of keycap.

TABLE 3.9.12. FRENCH CHANGES

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE	⇧	CTRL	⇧ ·CTRL
16		[		]	1E, 4B	1E, 4D	1E, 4B	1E, 4D
18		2		"	32	22	00	00
19		3		§	33	5D	33	5D
22		6		+	36	2B	36	2B
23		7		/	37	2F	37	2F
24		8		(	38	28	38	28
25		9		)	39	29	39	29
26		0		=	30	3D	30	3D
27		'		?	27	3F	1F	1F
28		^		¨	5E	7E	1E	1E
29					-	-	-	-
43		à		ç	40	5C	1D	1D
44		&		*	26	2A	1C	1C
57		é		è	7B	7D	7B	7D
58		ù		o	7C	5B	7C	5B
59		`		£	60	23	60	23
63		<		>	3C	3E	3C	3E
71		,		;	2C	3B	2C	3B
72		.		:	2E	3A	2E	3A
73		-		_	2D	5F	2D	5F

*Key to Notes:

A - Key is affected by the ALPHA LOCK.

TABLE 3.9.13. GERMAN CHANGES

KEY NO.	NOTES*	KEY LEGENDS			PRESSED WITH KEY ... GENERATE			
		LOWER	CENTER	UPPER		⇧	CTRL	⇧ ·CTRL
16		[		]	1E, 4B	1E, 4D	1E, 4B	1E, 4D
18		2		"	32	22	00	00
19		3		§	33	40	33	40
22		6		&	36	26	36	26
23		7		/	37	2F	37	2F
24		8		(	38	28	38	28
25		9		)	39	29	39	29
26		0		=	30	3D	30	3D
27		B		?	7E	3F	1F	1F
28		´		`	27	60	1E	1E
29					-	-	-	-
38	A		Z		7A	5A	19	19
43	A		Ü		7D	5D	1D	1D
44		+		*	2B	2A	1C	1C
57	A		Ö		7C	5C	7C	5C
58	A		Ä		7B	5B	7B	5B
59		#			23	5E	23	5E
63		<		>	3C	3E	3C	3E
64	A		Y		79	59	1A	1A
71		,		;	2C	3B	2C	3B
72		.		:	2E	3A	2E	3A
73		-		_	2D	5F	2D	5F

*Key to Notes:

A - Key is affected by the ALPHA LOCK.

TABLE 3.9.14. SWEDISH/FINNISH CHANGES

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE			
						⇧	CTRL	⇧ ·CTRL
16		[		]	1E, 4B	1E, 4D	1E, 4B	1E, 4D
18		2		"	32	22	00	00
19		3		#	33	23	33	23
20		4		¤	34	24	34	24
22		6		&	36	26	36	26
23		7		/	37	2F	37	2F
24		8		(	38	28	38	28
O		9		)	39	29	39	29
26		0		=	30	3D	30	3D
27		+		?	2B	3F	1F	1F
28	A		É		60	40	1E	1E
29					-	-	-	-
43	A		Å		7D	5D	1D	1D
44	A		Ü		7E	5E	1C	1C
57	A		Ö		7C	5C	7C	5C
58	A		Ä		7B	5B	7B	5B
59		´		*	27	2A	27	2A
63		<		>	3C	3E	3C	3E
71		,		;	2C	3B	2C	3B
72		.		:	2E	3A	2E	3A
73		-		_	2D	5F	2D	5F

Key to Notes:

O Key is affected by the ALPHA LOCK.

TABLE 3.9.15. BRITISH CHANGES

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE	⇧	CTRL	⇧ ·CTRL
16		\		-	60	7E	60	7E
19		3		£	33	23	33	23
29					-	-	-	-
63		<		>	3C	3E	3C	3E
71		,		,	2C	2C	2C	2C
72		.		.	2E	2E	2E	2E

*Key to Notes:
A - Key is affected by the ALPHA LOCK.

TABLE 3.9.16. SPANISH CHANGES

KEY NO.	NOTES*	KEY LEGENDS LOWER	CENTER	UPPER	PRESSED WITH KEY ... GENERATE	⇧	CTRL	⇧ ·CTRL
16		\		~	60	7E	60	7E
18		2		§	32	40	00	00
19		3		£	33	23	33	23
29					-	-	-	-
43		]		[	1E, 4B	1E, 4D	1D	1D
44		ç		¿	7D	5D	1C	1C
57	A		Ñ		7C	5C	7C	5C
58		•		i	7B	5B	7B	5B
59		'		"	27	22	27	22
63		<		>	3C	3E	3C	3E
71		,		;	2C	3B	2C	3B
72		.		:	2E	3A	2E	3A

*Key to Notes:
A - Key is affected by the ALPHA LOCK.

TABLE 3.9.17. DANISH/NORWEGIAN CHANGES

KEY NO.	NOTES*	KEY LEGENDS			PRESSED WITH KEY ... GENERATE			
		LOWER	CENTER	UPPER		⇧	CTRL	⇧ ·CTRL
16		[		]	1E, 4B	1E, 4D	1E, 4B	1E, 4D
18		2		"	32	22	00	00
22		6		&	36	26	36	26
23		7		/	37	2F	37	2F
24		8		(	38	28	38	28
25		9		)	39	29	39	29
26		0		=	30	3D	30	3D
27		+		?	2B	3F	1F	1F
28		`		@	60	40	1E	1E
29					-	-	-	-
43	A		Å		7D	5D	1D	1D
44		-		^	7E	5E	1C	1C
57	A		Ø		7C	5C	7C	5C
58	A		Æ		7B	5B	7B	5B
59		'		*	27	2A	27	2A
63		<		>	3C	3E	3C	3E
71		,		;	2C	3B	2C	3B
72		.		:	2E	3A	2E	3A
73		-		_	2D	5F	2D	5F

*Key to Notes:

A - Key is affected by the ALPHA LOCK.

3.9.2.2 Character Mode Operation

The basic operation of CYBER mode is in character mode operation. This mode is used to emulate the Viking TTY (Small CYBER Mode). It also supports protect enable.

As keys are pressed the associated codes are sent to the host if online. The associated codes are displayed if in local or half-duplex. As the codes are displayed the attribute word is stored in background memory with modified bit set.

If autotab is disabled and the cursor occupies a protected position, nothing is sent and the alarm will sound when a displayable key is pressed.

If autotabbing is enabled and the cursor occupies a protected position, the cursor will be tabbed to the first unprotected position when a displayable key is pressed.

The keyboard has two types of keys, alphanumeric keys and control/function keys. The alphanumeric keys send codes and display symbols, control/function keys send codes and perform special actions. These special actions are defined later.

The cursor is allowed in protected areas. The host must do a Protect Disable to perform Clear functions. The host cannot store data over protected positions.

When a function requiring the clearing of data is performed, the modified attribute bit is cleared for each position cleared.

CYBER mode supports host loadable code sequences or host loaded controlware. The codes specified by table 3.9.11 can function in one of three ways.

- Normal - As the key is pressed the code in table 3.9.11 will be sent to the host.

- Host Loaded Code Sequence - If the host has loaded an ASCII code sequence for that key, those codes will be sent to the host instead of the codes in table 3.9.11. If the terminal is in half duplex, the codes will not be acted upon by the terminal.

- Host Loaded Controlware - If the host has loaded Z80 code controlware for that key, a call will be made to the controlware.

  For more information on Host Specified Code Sequence or Host Loaded Controlware see paragraph 3.9.2.5.1.

3.9.2.2.1 PRINT Key

Activation of this key causes the transmission of a page print code sequence to the host. If half-duplex is selected, the terminal causes all data from the top of page to end of page to be printed as it appears on the screen. A form feed code is first sent to the printer. All codes 7F through FF (line drawing, PLATO, loadable codes) are replaced by spaces and a carriage return/line feed is inserted at the end of each line. When online, all incoming codes are ignored (not lost) until completion of the print transmission. Received data is placed into the receive buffer, and an X-Off may be sent (see paragraph 3.9.2.5.4 sending X-Off/X-On) if the buffer becomes too full. Print completion is signaled by the terminal transmitting a print complete code (ACK) or if the operation is aborted by actuating SHIFT/M REL; transmission of an abnormal completion sequence (RS, NAK). No response is sent in Large CYBER mode. (Note: Actuating Shift/M REL will first send an X-On (DC1) to the host).

If the PRINT key is actuated in conjunction with the SHIFT key, a print form code sequence is generated. If half-duplex is selected, the terminal sends all data as previously described except dimmed data is replaced with space codes for transfer to the printer.

The keyboard is locked during the print operation. A 250 ms delay is inserted after each CR, LF, FF if the SRTs is off and the Use Printer SRTS is active. If the printer is not ready, DTR off, or goes not ready, nothing will be sent to the printer until DTR goes on or the print is aborted by the M/REL function.

Printing is supported on three different types of printers.

1. Serial Graphics Printer (726-20)
2. Serial Printers (Letter Quality, Matrix, etc.)
3. Graphic Printer (726-10)

There are three ports that can be used for a printer.

1. Dual Serial Port A
2. Dual Serial Port B
3. Parallel Port

When the PRINT key is pressed, the serial printer is tested first, then the parallel printer. The first one that is found to be ready will be used.

3.9.2.2.1 (Contd)

If the serial graphics printer is installed and ready, an ESC 4 command is sent to switch to default character mode before any printing is started.

3.9.2.2.2 SETUP Key

Unshifted or shifted, this key will cause the terminal to display operator mode status on the bottom two lines of the display. The bottom lines will not be lost. When displayed, mode operator parameters can be changed. Activating the F1 (return) key will cause the status line to be deleted, and screen data to return to its original position. (See paragraph 3.3.3.3.) If data is received from the host, it is placed into the COMM INPUT BUFFER (see paragraph 3.9.2.5.4 sending X-OFF/X-ON).

Note: If the mode is exited by pressing F10, F10 the host may be left with the X-OFF active.

3.9.2.2.3 Special Function Keys

Fifteen four-level special function keys (F1 through F15) are available on the keyboard. When pressed, these keys cause a code sequence to be transmitted. The first character is an $1E_{16}$; the second is unique to the individual function key whether it is shifted, unshifted, or activated in conjunction with the CTRL key (refer to the keyboard codes table 3:9.11).

In addition, the following additional host defined actions are available:

- A host selectable CR ($0D_{16}$) code delimiter added to the code sequence defined in table 3.9.11.
- A host specified code sequence or a host defined controlware sequence executed in response to a key activation. The host specified action includes a key identifier, a code sequence or controlware sequence selector and the actual code sequence or controlware sequence. See paragraph 3.9.2.5.1.

3.9.2.2.4 L/INSRT/C Key

Unshifted this key causes an insert character code sequence (see table 3.9.11) to be transmitted; shifted it causes the transmission of an insert line code sequence (see table 3.9.11). See paragraph 3.9.2.4.3.8 if half-duplex is selected. Received code sequence is defined in table 3.9.18.

3.9.2.2.5 L/DLETE/C Key

Unshifted this key causes a delete character code sequence (see table 3.9.11) to be transmitted; shifted it causes the transmission of a delete line sequence (see table 3.9.11). See paragraph 3.9.2.4.3.9 if half-duplex is selected. Received code sequence is defined in table 3.9.18.

3.9.2.2.6 P/Clear/EOL Key

If protect operation is active see paragraph 3.9.2.4.3.4.

When unshifted this key causes the entry of a space code into all display positions from, and including, the current cursor position to the end of the current line. The cursor is not moved. The modified attribute bit is cleared for all character locations cleared.

Shifted, this key causes the entry of a space code into all display positions. The cursor is moved to home position. The modified attribute bit is cleared for all positions.

3.9.2.2.7 LF/ESC Key

Unshifted this key causes an ESC code to be sent to the host. Shifted this key causes a LF code to be sent to the host.

3.9.2.2.8 M REL/BREAK Key

Unshifted, actuation of this key causes the Transmitted Data signal to be held to a space (logical 0) condition for approximately 250 milliseconds. The keyboard is unlocked. If a break is received a parity error symbol is entered at the cursor position and the alarm is actuated (7-bit operation only).

Shifted, actuation of this key causes a manual release operation to be executed. This provides a controlware/ firmware break function. An X-On (DC1) is sent to the host. If a print operation is active, it will be aborted. The keyboard is unlocked and the comm input buffer is cleared.

3.9.2.2.9 Special Action Keys (+, -, X, ÷ , HELP, ERASE, EDIT, BACK, LAB, DATA, STOP)

Eleven special action keys are available on the keyboard. Action keycodes and code sequences as defined by table 3.9.11 are transmitted to the host.

All keys identified in table 3.9.11 that are not Function Keys and support a host specified optional code sequence or controlware sequence support the additional host defined action:

- A host specified code sequence or a host defined controlware sequence executed in response to a key activation. The host specified action includes a key identifying a code sequence or controlware sequence selector and the actual code sequence or controlware sequence.
- ERASE - This key performs a LINE CLEAR and carriage return or a destructive backspace in half duplex. See Protect Operation paragraph 3.9.2.4.3.10.

3.9.2.2.10 NEXT/ ↵ (New Line/Carriage Return) Key

Activation of this key causes a new line code ($0A_{16}$) to be transmitted in small CYBER mode or a carriage return code ($0D_{16}$) to be transmitted in large CYBER mode.

3.9.2.2.11 ⇥ (Tab Forward) Key

If pressed in conjunction with the Control key it will set the current column as a tab stop.

Activation of this key causes the transmission of the tab code (see table 3.9.11). (Note: In small CYBER this is a no operation code).

See Protect Operation paragraph 3.9.2.4.3.5 if protect is enabled. If not enabled the key will move the cursor to the first position following the next low intensity field or next column tab (whichever comes first.) If none are present, the cursor moves to top of page.

3.9.2.2.12 ⇤ (Tab Backward) Key

If pressed in conjunction with the Control key it clears the current column as a tab stop.

Activation of this key causes the transmission of the back tab sequence (see table 3.9.11).

See Protect Operation paragraph 3.9.2.4.3.5 if protect is enabled. If not enabled the key will move the cursor backwards to the start of the current or next nondim field or to the next column tab position (whichever comes first). If none are present, the cursor moves to top of page.

3.9.2.2.13 Cursor Control Keys

The cursor control keys consist of the cursor up (↑), cursor down (↓), cursor left (←), cursor right (→), and HOME keys. They are physically located in the numeric pad and are activated by actuation of the appropriate key with the SHIFT key or SHIFT and Control keys. Refer to the keyboard codes in table 3.9.11 for a list of the codes generated by these keys. The numeric pad keys are also affected by the N PAD NORMAL/SHIFT parameter.

See Protect Operation paragraph 3.9.2.4.3.6 for the functional description.

3.9.2.2.14 CR/DEL Key

Unshifted, actuation of this key causes transmission of a delete code (DEL). Shifted, actuation of this key causes transmission of a carriage return code (CR). See table 3.9.11.

3.9.2.3 Block Mode Operation

The basic terminal CYBER mode includes the capability to perform operator entry and editing on a page basis offline to the host. When the operator completes an activity, a block mode transmission is initiated by the operator to the host.

As alphanumeric keys are pressed, the associated 7-bit code is stored in display memory. Bit 2^7 in display memory will not be modified. Therefore, a graphic, PLATO, RAM generator character will be displayed if the previous code stored there was a graphic, PLATO, or RAM generator character. The attribute word will be stored in background memory with the modified bit set. The cursor will advance to the next position. If the cursor occupied a protected position, a TAB will be performed before storing the data. If the operator initiates a function which requires the clearing of data, the modified attribute bit will be set for each position cleared.

3.9.2.3 (Contd)

As alphanumeric codes are received from the host they will be stored along with the new attribute bits, the modified bit will be cleared. If protect is enabled the attributes will not be stored with received data. If the cursor is at a protected position when data is received, a TAB will be performed before storing the data.

3.9.2.3.1 Host Communications

The host uses two commands to initiate and terminate block mode transmission:

- Enter Block Mode - When block mode is active, the operator enters and/or changes data locally at the terminal on a page basis without host intervention. Block transmission is initiated by the operator when the current page activity is completed.
- Exit Block Mode - Terminates local terminal activity.

Block mode selection can only be activated by host command (not an installation parameter). When the block mode operation is active, the host utilizes the following commands to properly support block mode operation.

- Enable/Disable Keyboard - Enables/disables operator keyboard entry during block mode transmission activity.
- Load/Define Function Keys - This allows the host to define any or all function keys to perform desired block mode code sequence or controlware sequence.

3.9.2.3.2 Terminal Block Mode Operation

When an enter block mode command is received, the terminal disables upline communication to the host. It performs all allowed operator actions, such as data-entry and editing functions locally (offline to the host). These actions are performed on a page basis.

3.9.2.3.2 (Contd)

The terminal remains in this state until the operator initiates a send function by activating anyone of the 15 function keys, ten special action keys (all but the ERASE key). This indicates to the terminal that the operator has completed current page activity and requests transmission to the host. The terminal then performs the following:

- Enables upline communication to the host.
- Disables keyboard to the operator.
- Saves the current cursor position.
- Resets cursor to upper left.
- Sends PROLOGUE codes if loaded.
- If the Send to Current Position command has been received, the terminal will send all unprotected data from start of page up to, but not including, the current position. If the send to current position command has not been received, the terminal will send all unprotected data on the entire screen.
- Restores the cursor to original position.
- Sends the function code sequence for the key pressed.
- Sends current cursor XY position.
- Sends a page block terminator to the host (CR).
- Disables upline communication.
- Enables the keyboard.

9.2.3.3 Block Mode Keyboard Operation

Keyboard operation with block mode active is described in the following sections.

3.9.2.3.3.1 Alphanumeric and Control Code Entry

Alphanumeric key operation in block mode is the same as character and/or protect operation.

3.9.2.3.3.2 Unaffected Block Mode Keys

The following keys perform the same as described by character and/or protect operation with the exception that they are performed offline to the host:

- ⇧ (Shift) key
- ⊕ (Lock) key
- SETUP key
- M REL/BREAK key
- Cursor Control keys
- ← (Backspace) key
- NEXT/↵ key
- ⇤ (Back Tab) key
- ERASE key*
- PRINT key

.9.2.3.3.3 CTRL Key

The CTRL in conjunction with any key performs the same as for character and/or protect operation only locally.

---

he modified bit is set (instead of cleared) in block mode for all ocations that are cleared.

3.9.2.3.3.4 Special Action Keys

Function keys F1 through F15 and Special Action Keys (+, -, X, ÷ , HELP, EDIT, BACK, LAB, DATA, STOP) are used by the operator to initiate a block transfer to the host. The significance of any or all function keys is dependent only upon the host or host application.

3.9.2.3.3.5 L/INSRT/C and L/DLETE/C Keys

Unshifted the insert character or delete character action is performed the same as for standard character and/or protect mode operation.

Shifted the insert line or delete line will:

- Send insert line or delete line keycode sequence
- It does not perform the insert on delete line operation

3.9.2.3.3.6 TAB Forward Key

This key operates the same as character mode except in small CYBER mode this key will cause the tab to be performed.

3.9.2.3.3.7 P/CLEAR/EOL Key

This key operates the same as described in character mode except if the Clear Exit Block Mode command has been received.

If the clear page function is performed and the Clear Exit Block Mode command has been received the following functions will be performed:

1. Disable protect
2. Clear all data including attribute bits
3. Exit Block Mode

3.9.2.4 Protect Operation

The basic terminal CYBER mode includes the capability to protect each character position selectively. This is used to prevent operator input or change at each desired character position. The terminal utilizes a protect attribute for each character position to provide this capability.

3.9.2.4.1 Host Communications

The host uses two commands to specify desired protect attribute bit conditions:

- Start Protect - Store protect bit for each succeeding character received.
- Clear Protect - Clear protect bit for each succeeding character received.

The state of the protect attribute bit by itself has no effect on normal terminal operation. The protect system active condition must be present before the terminal utilizes the protect attribute bit. The host uses two additional commands to select desired protect system conditions.

- Enable Protect System - All protected characters (protect attribute set) are protected from operator action.
- Disable Protect System - All character positions can be entered/changed by operator action. If an operator changes a character location with its protect bit set, the character is entered and the current attribute word is stored.

As alphanumeric codes are received from the host, they are displayed at the cursor position if protect is disabled. If protect is enabled and the position following the current cursor position is protected, a tab is performed after displaying the data.

3.9.2.4.2 Protect System Disable

In CYBER Mode with the protect system off, all terminal keyboard and communications operations are the same as the basic terminal CYBER Mode operation.

3.9.2.4.3 Protect System Enabled (Keyboard Operation)

The terminal has an autotabbing feature which will automatically tab the cursor out of a protected area due to alphanumeric entry (except for cursor up and cursor down keys).

- Automatic field tabbing enabled - Moves the cursor out of a protected field due to alphanumeric entry or input.
- Automatic field tabbing disabled - Allows the cursor to remain in protected fields. This is the power-up default condition.

If the auto field tabbing is enabled, the following functions will leave the cursor in a protected area:

- CURSOR UP
- CURSOR DOWN

The following functions will cause a backward search of the protected area:

- Backspace
- CURSOR LEFT
- Erase character

All other functions will perform a forward tab if the cursor enters a protected position.

Keyboard operation with the protect system enabled is described in the following sections.

3.9.2.4.3.1 Alphanumeric and Control Code Entry

For unprotected character locations, actuation of the alphanumeric or control code key causes the operation for that key to be performed the same as the current mode operation.

For protected character locations, actuation of any alphanumeric key will cause a tab function to be performed before storing the data.

3.9.2.4.3.2 ⇧ , ⊕ , CTRL, M REL/BREAK, and SETUP Keys

The SHIFT, LOCK, Control, Release/BREAK, and SETUP keys perform the same function as the standard character mode operation for all character locations.

3.9.2.4.3.3 CR/DEL and LF/ESC Keys

Activation of these keys cause the same action as for the current mode operation.

3.9.2.4.3.4 P/CLEAR/EOL (Erase Page and Erase End of Line) Key

When unshifted this key causes the entry of a space code into all unprotected display positions from, and including, the current cursor position to the end of the current unprotected field or the end of line. The cursor is not moved. The modified attribute bit is cleared in character mode and set in block mode for all character locations cleared.

When shifted this key causes the entry of a space code into all unprotected display positions. The cursor is moved to the home position. The modified attribute bit is cleared in character mode and set in block mode for all character locations cleared.

3.9.2.4.3.5 →| , |← (Forward Tab and Back Tab) Keys

The →| (Forward Tab) key moves the cursor to the beginning of the next unprotected field, the next unprotected column tab or the home position if none found. If home is protected another tab is performed.

The |← (Back Tab) key causes the cursor to move left to the beginning of the current unprotected field or the next unprotected column tab. If the cursor is at the beginning of an unprotected field or at a protected character location, the cursor will move to the beginning of the previous unprotected field, the next unprotected column tab or upper-left position if none found. If the upper-left position is protected another back tab is performed.

3.9.2.4.3.6 Cursor Control Keys and Backspace Key (←)

Five keys in the numeric cluster are used to enable cursor movement when enabled in conjunction with the SHIFT key and N PAD parameter. These are described as follows.

- Cursor Up - The shifted numeric 8 moves the cursor up one line. When the cursor up is activated in line 1, the cursor will move to the current column position in the last line. If the character position that the cursor is to occupy is protected, the cursor will move to the protected position.

- Cursor Down - The shifted numeric 2 key moves the cursor down one line. When the cursor down is activated and the cursor is in the bottom line, the cursor will move to the current column position in top line. If the character position that the cursor is to occupy is protected, the cursor will move to the protected position.

- Cursor Left or Backspace - The shifted numeric 4 key or Backspace key moves the cursor left one character position. If the cursor is in column 1 when the key is activated the cursor will move to the last column position up one line. If cursor is at upper left, it will move to last column of bottom line. If the position the cursor is to occupy is protected, the cursor will move to the protected position if autotabbing is disabled, or a backtab will be performed if autotabbing is enabled.

- Cursor Right - The shifted numeric 6 key moves the cursor right one character position. If the cursor is in the last column

3.9.2.4.3.6 (Contd)

position when the key is activated the cursor will move to column 1 and down one line. If the cursor is at the last column of the bottom line, it moves to upper left if page operation is selected or causes the screen to scroll in roll operation. If the position the cursor is to occupy is protected, the cursor will move to the protected position if autotabbing is disabled, or a forward tab will be performed if autotabbing is enabled.

- HOME - The shifted numeric 5 key moves the cursor to the home position as determined by the parameter bit setting. If the position the cursor is to occupy is protected, the cursor will move to the protected position if autotabbing is disabled, or a forward tab will be performed if autotabbing is enabled.

3.9.2.4.3.7 NEXT/ ↵ (New Line) Key

Small CYBER - The NEXT/New Line key moves the cursor to the first location of the next line.

Large CYBER - Moves the cursor to the first location of the current line. If the Auto LF is enabled a line feed is performed.

If the new position is protected and the autotabbing is enabled, a forward tab will be performed.

3.9.2.4.3.8 L/INSRT/C Key

When unshifted this key causes the entry of a space code in the present cursor position. The character that occupied that position and all characters to the right of the cursor are moved one position to the right. This character shift to the right is continued to the end of the line or to the end of the unprotected field whichever occurs first. The rightmost character is then lost. This key is ignored and the audible alarm is activated if the cursor currently occupies a protected position. The space that was inserted will retain the old attribute in background memory.

3.9.2.4.3.8 (Contd)

When shifted this key causes the entry of a line of space codes into the display line presently occupied by the cursor. The line of data that occupied the cursor line is then moved down one line position. This line shift is continued until the bottom line or until a line with protected data is encountered. The data in the bottom line, or just above the line with any protected data is lost. This shifted key is ignored and the audible alarm is activated if the cursor currently occupies a line with any protected character positions. The background memory will not be changed. The modified attribute bit is cleared in character mode and set in block mode for all character locations changed.

3.9.2.4.3.9 L/DLETE/C Key

Unshifted, this key causes the deletion of the character code in the present cursor position. The character code to the right of the cursor is moved one position to the left and this character shift to the left continues to the end of the unprotected field or to the end of the line, whichever occurs first. The rightmost position shifted left is then replaced with a space code. This key is ignored and the audible alarm is activated if the cursor currently occupies a protected position. The new space code will retain the old attribute in background memory.

Shifted, this key causes the deletion of line of codes in the line presently occupied by the cursor. The lines below this line are then shifted up one line position. This shift continues until the bottom line or until a line with any protected data is encountered. The line position of the last line shifted up is then over replaced with space codes. This shifted key is ignored and the audible alarm is activated if the cursor currently occupies a line with any protected position. The background memory will not be changed if the Use Old Attribute is enabled.

3.9.2.4.3.10 ERASE Key

The ERASE key causes the entry of a space code into all unprotected display positions in the current unprotected field. This includes

3.9.2.4.3.10 (Contd)

all unprotect positions from current cursor position to the beginning of the field or the beginning of the line and all unprotected positions from current cursor position to the end of the field or end of the line (whichever comes first). The cursor is moved to the beginning of the field. The attribute memory is not changed except the modified attribute bit is cleared in character mode and set in block mode for all locations cleared.

If the cursor currently occupies a protected position, an audible alarm is activated, the cursor is left unchanged, and no additional action is taken.

If Large CYBER mode is selected and this key is pressed without the shift or control an Erase character is performed. The cursor will be backspaced and if the new position is not protected the position will be cleared, if the position is protected and the autotabbing is enabled, a back tab will be performed before the erase.

3.9.2.4.3.11 Function Keys

The function keys generate the same basic code sequences as standard character mode operation and initiates the send in block mode operation.

3.9.2.4.3.12 PRINT Key

Unshifted this key operates the same as standard character mode operation.

Shifted this key operation is the same as previously defined except that dimmed or protected characters are replaced with space codes.

3.9.2.4.3.13 Special Action Keys (+, -, X, ÷ , HELP, EDIT, BACK, LAB, DATA, STOP)

The special action keys operate the same as for the current mode operation.

3.9.2.4.4 Protect System Active Display Operation

Display operation is controlled by the character attributes (blink, protect, underscore, dim, inverse, and blank) the character set and Edit Control Commands (line drawing, external loadable characters, scroll/page field, line length and format).

The character attribute commands enable the video display characteristic named with the protect system active. The line drawing and extended character commands cause the display to substitute the selected character set for part of the standard ASCII set.

The line length command selects 80-or 132-character line operation - all other functions are not affected.

Protect mode operation allows some areas of the screen to be protected from operator entry. These areas are defined by the protected attribute bit.

3.9.2.5 CYBER Mode Host Received Commands

Table 3.9.18 summarizes all host-receive commands and I/O responses. Some host receive commands require a more detailed definition which can be found in this section.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
NOOP	NUL	00	No operation performed.
Print Form	SOH	01	Transfers all nondimmed displayed data to printer from beginning of current line to end of page. Dimmed data is sent as space code (20). Keyboard locks, comm data is received but ignored until end of operation (not lost). Printing may be aborted by actuation of SHIFT/M REL. Print completion is signaled by terminal transmitting an 06 (ACK) or, if the operation is aborted due to actuating SHIFT/M REL, by transmission of an 1E, 15 (RS, NAK) sequence. If there is no printer DTR when the Print Form command is received an RS, NAK is sent. There is no completion response in large CYBER mode.
NOOP Small CYBER	STX	02	No operation.
Write Cursor Address Large CYBER	STX	02	See Write Cursor Address (DLE).
Enable Blink	ETX	03	Blinks characters whose blink bit is set to 1 (refer to Start Blink command). Following power-up or page erase, blink is automatically enabled.
Disable Blink	EOT	04	Disables character blinking on display page.
Read Cursor Address	ENQ	05	Causes terminal to send cursor address header code (1F) followed by codes containing column and row address. Column position transfers first and is numbered from left to right (00 through 4F) for 80 column mode. In 132 column mode a 7E code preceeds the column position address producing a code sequence of

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Read Cursor Address (Contd)			7E, 00, 00 through 4F for the first 80 columns 01, 00 through 33 for columns 81 through 132. The next code is line position numbering from top to bottom (00 through 1D). Row/ column addresses may be biased to avoid codes 00 through 1F by enabling code bias parameter selection. When CODE BIAS is enabled, cursor position 00 equals 20. Addressing continues in normal binary progression through 6F for 80 column mode. The 132 column mode sequence is 7E, 20, 20 through 7E, 21, 53 for columns 0 through 132 respectively. The line position address is 20 through 3D for both 80 and 132 column modes.
NOOP Small CYBER	ACK	06	No operation.
Start Underline Large CYBER	ACK	06	Sets the underline attribute bit to 1.
Alarm	BEL	07	Sounds audible alarm for 250 milliseconds.
Home Small CYBER	BS	08	Moves cursor to home position as defined by parameter setting.
Cursor Left Large CYBER	BS	08	Moves cursor left one character position. Stored data is not affected. If new position is protected and autotab is enabled, the cursor will move backwards to the first unprotected position.
NOOP Small CYBER	HT	09	No Operation.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
TAB Large CYBER	HT	09	Causes cursor to be advanced to the first position following the next low-intensity field or next column tab (whichever comes first) if protect is not enabled. Causes cursor to be advanced to the next unprotected field or the next unprotected column tab if protect is enabled. Cursor will move to top of page if none present. The cursor will not be left in a protect position. No completion response sent in large CYBER mode.
New Line Small CYBER	LF	0A	Moves cursor to first character position in next line.
Cursor Down Large CYBER	LF	0A	Moves cursor down one line while remaining in the same position. If on the last line, screen will scroll and cursor moved to first column if roll enabled, cursor moves to top line if page enabled.
EOL (Erase to End of Line)	VT	0B	Erases all unprotected characters from, and including current cursor position to end of current unprotected field or the end of that line. Enters 20 in affected positions. The background memory is cleared. Modified attribute bit for all cleared character positions are cleared. The modified bit is set in block mode if keyboard input.
EP (Erase Page)	FF	0C	Erases all unprotected characters on screen. Cursor moves to home position. Enters 20 in affected positions. Clears background memory and enables blink if previously disabled. Return to enter normal data (clears enter blink, underscore, reduced intensity, dim, and blank). Modified attribute bits are cleared, or set in block mode if keyboard input.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Carriage Return	CR	0D	Moves cursor to first character position in line that it is on. If the Auto Line Feed parameter is selected a LF is performed.
Start Blink	SO	0E	Sets blink bit to 1 in those succeeding characters received and stored in terminal memory.
Stop Blink	SI	0F	Sets blink bit to 0 in succeeding characters received.
Write Cursor Address Small CYBER	DLE	10	Interprets next characters as cursor column and row address. Cursor moves to position defined by addresses. Column address is numbered from left to right (00 through 4F) for 80 column mode. In 132 column mode, a 7E code preceeds the column position address producing a code sequence of 7E, 20, 00 through 4F for columns 0 through 80, and 7E, 21, 00 through 33 for columns 81 through 132. Line position is numbered from top to bottom (00 through 1D). If column position code is greater than 4F in 80 column mode or 01, 33 in 132 column mode, cursor control logic wraps around. Line position operates in a similar manner (e.g., 1F equals 01). Row and column addresses may be biased in same manner as described for Read Cursor Address.
NOOP Large CYBER	DLE	10	No Operation.
Page Print Small CYBER	DC1	11	Transfers to printer all displayed data from current line to end of page. Keyboard is locked and received data ignored until end of operation (not lost). Printing may be aborted by pressing SHIFT/M REL. Print completion is signaled by terminal transmitting an 06 or if the operation is aborted

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Page Print (Contd)			by actuating SHIFT/M REL by transmission of RS, NAK (1E, 15) sequence. If there is no printer DTR when the Page Print command is received an RS, NAK is sent. No completion response is sent in large CYBER mode.
X-On* Large CYBER	DC1	11	Enables transmission to the host or initiates continuation of suspended transmission from the host. See paragraph 3.9.2.5.4.
Roll Enable	DC2	12	Enables roll mode; screen scrolls up one line each time cursor overflows bottom line or if a new line code is received when cursor is on bottom line, cursor moves to first character position on bottom line. Bottom line clears; top line is lost. Powering-on terminal enables scroll feature.
Roll Disable Small CYBER	DC3	13	Enables page mode; moves cursor to home position when new line code is received and cursor is on bottom line.
X-Off* Large CYBER	DC3	13	Causes the terminal to temporarily halt transmission to the host until the X-On is received. When sent to the host means data cannot be acted upon. See paragraph 3.9.2.5.4.
Start Underscore Small CYBER	DC4	14	Sets underscore bit to 1. Each succeeding displayed character received is underlined on the screen.
NOOP Large CYBER	DC4	14	No Operation.

*X-On (DC1) and X-Off (DC3) can be received at anytime. If they are received during a multiple code sequence, they will perform the X-On and X-Off functions and will not be interpreted as part of the multiple code sequence.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
End Underscore	NAK	15	Sets underscore bit to 0. Each succeeding displayed character received is not underlined.
NOOP Small CYBER	SYN	16	No operation.
Roll Disable Large CYBER	SYN	16	Roll disable (see DC3).
Cursor Up	ETB	17	Moves cursor up one line while remaining in same column (character) position. Stored data is not affected.
Skip	CAN	18	Moves cursor right one character position. Stored data is not affected. If new position is protected and autotab is enabled, a tab will be performed.
Cursor Left Small CYBER	EM	19	Moves cursor left one character position. Stored data is not affected. If new position is protected and autotab is enabled, the cursor will move backwards to the first unprotected position.
Home Large CYBER	EM	19	Moves cursor to home as determined by the the parameter bit.
Cursor Down	SUB	1A	Moves cursor down one line while remaining in same column (character) position. If cursor is on the last line it will wrap around to the top. Stored data is not affected.
NOOP	ESC	1B	No operation.
Start Dim	FS	1C	Sets dim bit to 1. Each succeeding displayed character received is dimmed on the screen.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
End Dim	GS	1D	Sets dim bit to 0. Each succeeding displayed character received is displayed at full intensity on the screen.
NOOP Small CYBER	US	1F	No operation.
Backspace Large CYBER	US	1F	Moves cursor left one position and clears the data. Protected data is not cleared. If new position is protected and auto tab is enabled, the cursor moves backwards to the next unprotected position.
NOOP	DEL	7F	No operation.
Print Form	RS, SOH	1E, 01	See Print Form (SOH).
Page Print	RS, STX	1E, 02	See Page Print (DC1).
Tab Small CYBER	RS, EOT	1E, 04	If protect is not active, this will cause the cursor to advance to the first position following next low-intensity field or next column tab (whichever comes first). If none are present, moves to top of page. If protect is active, moves to the next unprotected area or the next unprotected column tab. If none are present, moves to top of page. The cursor will be tabbed again if the upper left is protected. Completion response is identical to Read Status response. No response is sent in in large CYBER mode.
NOOP Large CYBER	RS,EOT	1E,04	No operation.
Enable CR Delimiter	RS, ENQ	1E, 05	Caused a CR delimiter (0D) to be added to certain Host responses.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Home	RS, BS	1E, 08	See Home BS, (08).
Define Function or Action Key Code Sequence or Controlware Sequence	RS, HT, (V), (W) (X), (Y...), (Z)	1E, 09, (V), (W) (X), (Y...), (Z)	Causes a code sequence or controlware sequence to be defined by the host. See paragraph 3.9.2.5.1. V = Key identifier and address pointer. W = Function. X = Address. Y = Code sequence or controlware Z = Specified delimiter. The terminal will respond with an ACK if all codes received okay and an RS, NAK if not. No response is sent in large CYBER mode.
Back Tab	RS, VT	1E, 0B	Causes the cursor to move back to the first position following a preceding low-intensity field, following a preceding protected field position, at preceding column tab or to Home position if none are encountered. See Back Tab key for more detailed definition. Completion response is identical to Read Status response. No response is sent in large CYBER mode.
Read Attribute	RS, SO	1E, 0E	Causes terminal to respond with two characters containing attributed character at cursor position. Cursor is not advanced; stored data is not affected. First word format 0 - Not used 1 - Underscore 2 - Blink 3 - Dim 4 - 1 5 - 1 6 - 0 = Standard Character (table 3.9.1 or table 3.9.2-8) 1 = Special Character (line drawing, PLATO, or RAM extended character.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Read Attribute (Contd)			Second Word Format 0 - Modified 1 - Protected 2 - Blank 3 - Inverse 4 - 1 5 - 1 6 - 0
Read Parameter	RS, SI	1E, 0F	See RS, DC3.
Read Data	RS, DLE	1E, 10	Causes data word stored in memory at cursor position to be transferred to interface. Cursor is not advanced. Seven data bits are transferred. Determining if the code represents an alphanumeric character, line drawing, extended character, or control code requires that the attribute character be read. Refer to read attribute command.
Page Print Small CYBER	RS, DC1	1E, 11	See Page Print (DC1).
Read Parameter Small CYBER	RS, DC3	1E, 13	Causes terminal to transmit settings of terminal operating parameters. Settings are sent out in data words preceded by sequence 02, 06, 25 and terminated with a Read Status response. See table 3.9.19. No response sent in large CYBER mode.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Read Status	RS, DC4	1E, 14	Causes terminal to respond 02, 06, 06 (STX, ACK, ACK) if all preceding self-test operations were completed successfully. The response 02, 06, 15 (STX, ACK, NAK) is transferred if any self-test failed.
Initiate Test	RS, SYN	1E, 16	Causes terminal to perform self-test (Test 2) operation; no response to further commands until self-test is completed. Terminal signals completion of self-test by automatically sending a Read Status response. Refer to Self-Test Routines paragraph for further description. This command should not be done in modes that have loaded controlware in the terminal.
Skip	RS, CAN	1E, 18	See Skip (CAN, 18).
Backspace	RS, EM	1E, 19	See Backspace (EM, 19).
Cursor Down	RS, SUB	1E, 1A	See Cursor Down (SUB, 1A).
Line Drawing	RS, FS	1E, 1C	Causes terminal to interpret any following data words received from 20 to 3F as line drawing characters. Refer to table 3.9.9 for codes.
Basic Char	RS, GS	1E, 1D	Causes terminal to interpret received data as normal characters.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Enable Send to Current Position	RS, SP	1E, 20	Causes the terminal to send all unprotected data from the top of screen to but not including the current cursor position during a block mode send.
Disable Send to Current Position	RS, !	1E, 21	Causes the terminal to send all unprotected data on the page during a block mode send. (Default condition.)
Enable Automatic Tabbing	RS, "	1E, 22	Causes the cursor to automatically tab out of protected fields, except for cursor-up and cursor-down functions.
Disable Automatic Tabbing	RS, #	1E, 23	Allows the cursor to remain in protected fields. (Default condition.)
Enable Clear Key to Exit Block Mode	RS, $	1E, 24	Causes the clear page function to disable protect, clear screen, and exit block mode if enabled.
Disable Clear Key	RS, %	1E, 25	Causes the clear page function to clear all unprotected data. (Default condition.)
Enable Automatic Carriage Return	RS, &	1E, 26	Causes the cursor to automatically move to the next line after the last position of a line is filled. (Default condition.)
Disable Automatic Carriage Return	RS, '	1E, 27	Causes the cursor to remain in the last line position of a line until a control code is received that moves it.
Enter RAM Extended Character Mode	RS, (, (X)...	1E, 28 (X)	Causes the terminal to display all codes between 40 through 7F from the RAM character generator. Codes outside of this range will perform the normal operation.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Exit RAM Extended Character Mode	RS,)	1E, 29	Causes the terminal to display normal ASCII codes for all codes between 40 through 7F. (Default condition.)
Clear to EOL Extend Attribute	RS, *	1E, 2A	This function will clear to the end of line just like the EOL (VT, 0B) command except the background memory will be set to the current attributes.
Clear to EP Extend Attribute	RS, +	1E, 2B	This function will clear to end of page just like the clear all data (RS P, 1E 50) command except the background memory will be set to the current attributes.
Use Old Attribute Enable	RS, ,	1E, 2C	This function will enable the reusing of the old attribute during host and keyboard data entry and during all clear operations.
Use Old Attribute Disabled	RS, -	12, 2D	This function will disable the reusing of the old attribute. As data is entered during host and keyboard data entry, the new attribute is stored. During clear operations the attribute is cleared. This is the default condition.
Clear All Host Loaded Codes	RS, .	1E, 2E	Causes all previously loaded codes/controlware to be cleared. This includes host loaded subroutines, host specified codes for keys, host loaded controlware for loaded keys, validation controlware, prologue loaded codes and host functions.
NOOP	RS, /	1E, 2F	

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Enable Code Bias	RS, 0	1E, 30	Causes the terminal to add and subtract 20 Hex when sending and receiving XY positioning or set scroll field information. The default condition is set in mode parameter F5-2.
Disable Code Bias	RS, 1	1E, 31	Causes the terminal to accept XY positioning and set scroll field information without the 20 Hex bias.
Enable Host Loaded Code	RS, 2	1E, 32	Causes all host loaded codes/controlware to be used.
Disable Host Loaded Code	RS, 3	1E, 33	Causes all host loaded codes/controlware to be ignored. All host loaded keys, subroutines and controlware will remain loaded but not used.
NOOP	RS, 4 thru RS, ;	1E, 34 thru 1E, 3E	No operation.
Reserved	RS, <	1E, 3C	Hebrew Usage
Reserved	RS, =	1E, 3D	Hebrew Usage
Reserved	RS, 7	1E, 3E	Hebrew Usage

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Clear field o Low Intensity	RS, ?	1E, 3F	Causes terminal to clear all unprotected data from cursor position to end of page for all data or only unprotected high- or low-intensity areas as selected. No response is provided to I/O commands during operation. Modified attribute bits for all cleared character positions are cleared. The "Read Status" is sent back to indicate operation complete. No response is sent in large CYBER mode.
o High Intensity	RS, @	1E, 40	
o All Data	RS, P	1E, 50	
Initiate Host DLL	RS, A	1E, 41	Initiates a host specified downline load (DLL). Control will be passed to the ASCII Network Loader (paragraph 3.6) (Note: The ASCII Network Loader changes to 8-bit data). If the load completes successfully, control is transferred to the loaded controlware. If unsuccessful, terminal responds with RS, NAK (1E, 15). See paragraph 3.6 for ASCII Network Loader. (Note: This function is not operational if initiated from keyboard).
Exit Host DLL	RS, B	1E, 42	Reserved for host command to loaded controlware.
Model Report Request Large CYBER	RS, C,(n)	1E, 43, (n)	n = 30 Terminal installation parameters n = 31-36 Requesting that modes NVM only n = 37 Active status from RAM The terminal sends the following code sequence to the host system 1E Header Code 6F Header Code

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Model Report Request Large CYBER (Contd)			23 Indicates model report request data follows 21 Indicates a Viking X terminal XXX Configuration Code; See paragraph 3.9.2.5.2 YYY Firmware code ZZZ Termination code
NOOP Small CYBER	RS, C	1E, 43	No operation.
Start Inverse	RS, D	1E, 44	Set inverse bit of each succeeding character received to 1.
End Inverse	RS, E	1E, 45	Clear inverse bit of each succeeding character received.
Print I/O	RS, F	1E, 46	Causes terminal to direct all received data, and transmitted data in half duplex, or local, to printer interface. Completion response is identical to Read Status, No response is sent in large CYBER mode.
Set All Protect Bits	RS, G	1E, 47	This command will Disable Protect and set the protected bit in the background code for every character position. Note: If the protect enable command is received before any unprotected data is displayed the terminal will lock up.
NOOP	RS, I	1E, 49	No operation.
NOOP	RS, J	1E, 4A	No operation.
NOOP	RS, K	1E, 4B	No operation.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
NOOP	RS, M	1E, 4D	No operation.
Delete Character	RS, N	1E, 4E	Deletes one character. All characters to the right of the cursor are shifted left one position. If protect enable is active, shift occurs only up to protected data and the old attribute is reused for the last position.
Insert Character	RS, O	1E, 4F	Inserts one space character. Character in cursor position and all characters to the right of the cursor are shifted right one position. If protect enable is active, shift occurs only up to protected data and the old attribute is reused for the new position.
Clear o All Data	RS, P	1E, 50	See Clear Fields.
Delete Line	RS, Q	1E, 51	Causes all unprotected line data and associated highlight fields below cursor and within the logical page or unprotected area limits to be moved up one position; current line is lost; buttom line is cleared. No response to I/O commands during operation. Completion response is identical to Read Status response. No response is sent in large CYBER mode. Modified attribute bits for all cleared character positions are cleared.
Insert Line	RS, R	1E, 52	Causes all unprotected line data and associated highlight field on current line to be relocated one line down; bottom line within logical page or unprotected area is lost; current line is cleared. No response

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Insert Line (Contd)			to I/O commands is provided during operation. Insert line timing and completion response are identical to delete line. Modified attribute bits for all cleared character positions are cleared.
Load RAM Extended Character Generator	RS,S,(W), (X), (Y), (Z)	1E, 53,(W) (X), (Y), (Z)	Causes the terminal to interpret the characters following the RS, S, [1E, 53] (W) (X), (Y), (Z) command as information concerning the RAM character generator. Loading the generator requires the character be specified (40 through 7F, six bits, 64 characters). It also requires the starting scan be specified (one of sixteen numbered top to bottom, four bits) the dot patterns may then be specified (eight possible dots); left to right, lowest to highest order bit position. The data words are formatted as follows: o Word 1 (W) - Character Code. Code must be between 40 through 7F. Codes outside this field cause an RS NAK to be sent to the host when the termination code is received. o Word 2 (X) - Start Scan Count. Bits 2^0 through 2^3 contain the start count. 2^4 must be 0, 2^5 must be 1, 2^6 must be 0. o Word 3 (Y) - Dot Pattern. Dot Patterns are sent in groups of 2. Bits 2^0 through 2^3 of the first word are the right 4 dots and 2^0 through 2^3 of the second word are the left 4 dots. Bit 2^4 must be 0, 2^5 must be 1, 2^6 must be 0 for first word and 1 for the second word.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Load RAM Extended Character Generator (Contd)			If an error is received an RS, NAK will be sent to host when the termination code is received. o Word 4 (Z) - Termination Code CR. An ACK will be sent to host if no errors received otherwise an RS, NAK is returned. No response is sent in large CYBER mode. (See paragraph 3.9.2.5.6.)
Extended Character	RS, T,(X)	1E, 54,(X)	Causes terminal to interpret (X) as character to be displayed from RAM character generator. Code must be in field 40 through 7F. Codes outside of this field cause entry of parity error symbol. Restriction: Extended characters cannot be simultaneously displayed with PLATO characters.
Field Scroll Up	RS, U	1E, 55	Causes each line to be relocated up one position between upper-and lower-field delimiters. Uppermost line in scroll field is lost; bottom line in scroll field is cleared. No response to I/O commands is provided during operation. Completion response is identical to Read Status. No response is sent in large CYBER mode.
Field Scroll Down	RS, V	1E, 56	Causes each line to be relocated down one position between upper-and lower-field delimiters. Lowest line is lost; uppermost line in scroll field is cleared. No response to I/O commands is provided during operation. Completion response is identical to Read Status. No response is sent in large CYBER mode.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Set Scroll Field	RS,W,(U,)(L)	1E, 57, U, L	Causes terminal to store upper (U) and lower (L) line addresses of scroll page field. Refer to write cursor address command for line addressing definition. Receipt of line numbers other than 1 through 30 causes entry of line 30 (lower) and 1 (upper). Address biasing is supported if selected. Note: This works in conjunction with Field Scroll Up and Down.
NOOP	RS, X	1E, 58	No operation.
Erase	RS, Y	1E, 59	See RS,] (1E, 5D).
NOOP	RS, Z	1E, 5A	No operation.
NOOP	RS, [	1E, 5B	No operation.
NOOP	RS, \	1E, 5C	No operation.
Erase	RS,]	1E, 5D	All character locations in the current unprotected field are cleared to spaces and the cursor is moved to the beginning of the unprotected field.
NOOP	RS, ^	1E, 5E	No operation.
NOOP	RS, _	1E, 5F	No operation.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Blind Printer	RS, DEL	1E, 7F	Causes terminal to stop transferring received and transmitted data to printer. Initial value selected by parameter. RS, DEL is transmitted to printer. The completion response is identical to Read Status. No response is sent in large CYBER mode.
NOOP	RS,DC2,SP thru RS,DC2,?	1E, 12, 20 thru 1E, 12, 3F	No operation.
Enter Small CYBER mode	RS, DC2, A	1E, 12, 41	Enter Small CYBER mode of operation.
Enter Large CYBER mode	RS, DC2, B	1E,12, 42	Enter Large CYBER mode of operation.
NOOP	RS, DC2, C	1E, 12, 43	No operation.
Start Block Mode Send	RS, DC2, D	1E, 12, 44	The terminal sends all unprotected data characters. See Block Mode Send for format of data. (See paragraph 3.9.2.3.2.) A CR delimiter indicates the end of operation.
Reserved	RS, DC2, E	1E, 12, 45	No operation.
Reserved	RS, DC2, F	1E, 12, 46	No operation.
Set 132 Character Line	RS, DC2, G	1E, 12, 47	Causes the terminal to display 132 characters/line. If the initial line length is 80 characters per line, the display is cleared and cursor is moved to Home.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Set 80 Character Line	RS, DC2, H	1E, 12, 48	Causes the terminal to display 80 characters/line. If the initial line length is 132 characters per line, the display is cleared and cursor is moved to Home.
Start Protect	RS, DC2, I	1E, 12, 49	Set Protect bit of each succeeding character received to a 1.
Clear Protect	RS, DC2, J	1E, 12, 4A	Clear Protect bit of each succeeding character received to a 0.
Enable Protect	RS, DC2, K	1E, 12, 4B	Protected characters (with their protect bit set) are protected from operator action and can only be changed by host action.
Disable Protect	RS, DC2, L	1E, 12, 4C	Disables protected characters on the display page. If an operator changes a character location, its protect bit is determined by the state of the start/clear protect bit flag.
Disable Keyboard	RS, DC2, M	1E, 12, 4D	Disable keyboard entry, until reenabled by host or a reset condition.
Enable Keyboard	RS, DC2, N	1E, 12, 4E	Enable keyboard entry.
Disable Display	RS, DC2, O	1E, 12, 4F	Disables change to display refresh memory for normal terminal operation. All incoming commands are ignored until the Enable Display is received.
Enable Display	RS, DC2, P	1E, 12, 50	Enables normal display operation.
Disable Touchpanel	RS, DC2, Q	1E, 12, 51	Disables input from the touchpanel.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Enable Touchpanel	RS, DC2, R	1E, 12, 52	Enables input from the touchpanel. (See paragraph 3.9.2.6).
Mode Select	RS, DC2, S, (n)	1E, 12, 53, (n)	Selects mode n = 30-37 (0-7) and transfers control to selected mode. Mode enable and mode security are by passed. See Auto-Select parameter in Terminal Installation parameter (paragraph 3.3.3.1). If n is outside of range an RS, NAK and delimiter is returned.
PLATO Character	RS, DC2, T, (X)	1E, 12, 54, (X)	Causes terminal to interpret (X) as PLATO character to be displayed. Code must be in field 40 thru 7F. Codes outside this field will cause entry of parity error symbol. Restriction: Cannot simultaneously display extended and PLATO characters. See table 3.9.10.
Select Bidirectional Port N	RS, DC2, U, (N)	1E, 12, 55, (N)	Selects bidirectional port N where N = 0-1. When selected the port can transmit transparent bidirectional data until a deselect is issued. See paragraph 3.9.2.5.3 for definition and response.
Write New Mode Parameters	RS, DC2, V, (Y), (Z)	1E, 12, 56, (Y), (Z)	Causes the terminal to write the RAM (dynamic) parameter memory specified. Y = Write data to parameter memory in format specified by paragraph 3.9.2.5.5. Z = Delimeter. CR Note: To change NVM see RS, DC2, o.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Set Column Tab	RS, DC2, W	1E, 12, 57,	Causes the terminal to set a column tab for the current column.
Clear Column Tab	RS, DC2, X	1E, 12, 58,	Causes the terminal to clear the column tab position of current column.
Clear All Tabs	RS, DC2, Y	1E, 12, 59	Clear all column tabs.
Disable CR Delimiter	RS, DC2, Z	1E, 12, 5A	Disables the CR delimiter for multiple code and controlware sequences.
Start Blank	RS, DC2, [	1E, 12, 5B	Set the blank attribute bit.
End Blank	RS, DC2, \	1E, 12, 5C	Clear the blank attribute bit.
Select 24 lines	RS, DC2,]	1E, 12, 5D	Set 24 lines.
Select 30 lines	RS, DC2, ^	1E, 12, 5E	Set 30 lines.
NOOP	RS, DC2 -	1E, 12, 5F	No operation.
NOOP	RS, DC2 '	1E, 12, 60	No operation.
Enter Block Mode	RS, DC2, a	1E, 12, 61	Enter block mode operation.
Exit Block Mode	RS, DC2, b	1E, 12, 62	Exit block mode operation.

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
NOOP	RS, DC2, c	1E, 12, 63	No operation.
NOOP	RS, DC2, d	1E, 12, 64	No operation.
Turn On Indicator	RS, DC2, e, (N)	1E, 12, 65, (N)	Causes terminal to turn on indicator specified by (N). N = 30: Alert indicator N = 31: Programmable indicator 1 N = 32: Programmable indicator 2 N = 33: Programmable indicator 3 N = 34: Message indicator
Turn Off Indicator	RS, DC2, f, (N)	1E, 12, 66, (N)	Causes terminal to turn off indicator specified by (N). N = 30: Alert indicator N = 31: Programmable indicator 1 N = 32: Programmable indicator 2 N = 33: Programmable indicator 3 N = 34: Message indicator
NOOP	RS, DC2, g	1E, 12, 67	No operation.
Driver Request	RS, DC2, h	1E, 12, 68	Causes the terminal to test for presence of a driver. A Status response is sent to the host or control is passed to the driver. o RS, NAK if transfer not successful. (See paragraph 3.9.2.7).

TABLE 3.9.18. CYBER MODE RECEIVE AND I/O RESPONSES (CONTD)

COMMAND NAME	ASCII MNEMONIC	HEX CODE	TERMINAL RESPONSE
Enable Typamatic	RS, DC2, i	1E, 12, 69	Enable typamatic keys defined by table 3.9.11.
Disable Typamatic	RS, DC2, j	1E, 12, 6A	Disable typamatic keys defined by table 3.9.11.
Shift Numeric Pad	RS, DC2, k	1E, 12, 6B	Causes the numeric keypad to operate as if the shift key were active.
Normal Numeric Pad	RS, DC2 l	1E, 12, 6C	Returns the numeric keypad to normal operation.
Start Validation	RS, DC2 m	1E, 12, 6D	Sets the character validation attribute bit for each character stored. (See paragraph 3.9.2.1.9.)
End Validation	RS, DC2 n	1E, 12, 6E	Clear the character validation attribute bit for each character stored.
Store Mode Parameters in NVM	RS,DC2 o	1E, 12, 6F	Causes the active mode parameters in RAM to be stored into the NVM memory as the new default parameters.
Host Execute Loaded Controlware	RS,DC2 p-DEL	1E, 12 70-7F	If the host has loaded controlware for the appropriate function, a call will be made to the starting address (see paragraph 3.9.2.5.1). If the host has not loaded any controlware for the appropriate function this will be a No operation.

NOTES:
1. Multiple words response sequences are subject to character pacing as described in Transmitted Data paragraph.
2. All RS, ACK and RS, NAK response to the host will be followed by a CR if the CR delimiter is enabled.

TABLE 3.9.19. READ PARAMETER DATA WORD FORMAT

	WORD 1	WORD 2	WORD 3	WORD 4	WORD 5
b0	0 = PAGE 1 = ROLL	0 = EOL BELL 1 = DISABLE BELL	0 = PAR ODD 1 = PAR EVEN	Baud Rate 2^3	1
b1	0 = HALF DUP 1 = FULL DUP	0 = AUTO LF 1 = Normal	0 = 2 STOP BITS 1 = 1 STOP BIT	Baud Rate 22	1
b2	PRINTER DSR (READY)	1	0 = PARITY DISABLE 1 = PARITY ENABLE	Baud Rate 21	0 = DTR SWITCHED 1 = DTR CONSTANT
b3	BIDIRECTION PORT DSR (READY) *	1	0 = DATA ONLY 1 = NORMAL	Baud Rate 20	0 = RTS SWITCHED 1 = RTS CONSTANT
b4	1	1	1	1	1
b5	1	1	1	1	1
b6	1	1	1	1	1

*In order for this bit to reflect the accurate state, the Select Bidirectional Port command must be executed and terminated.

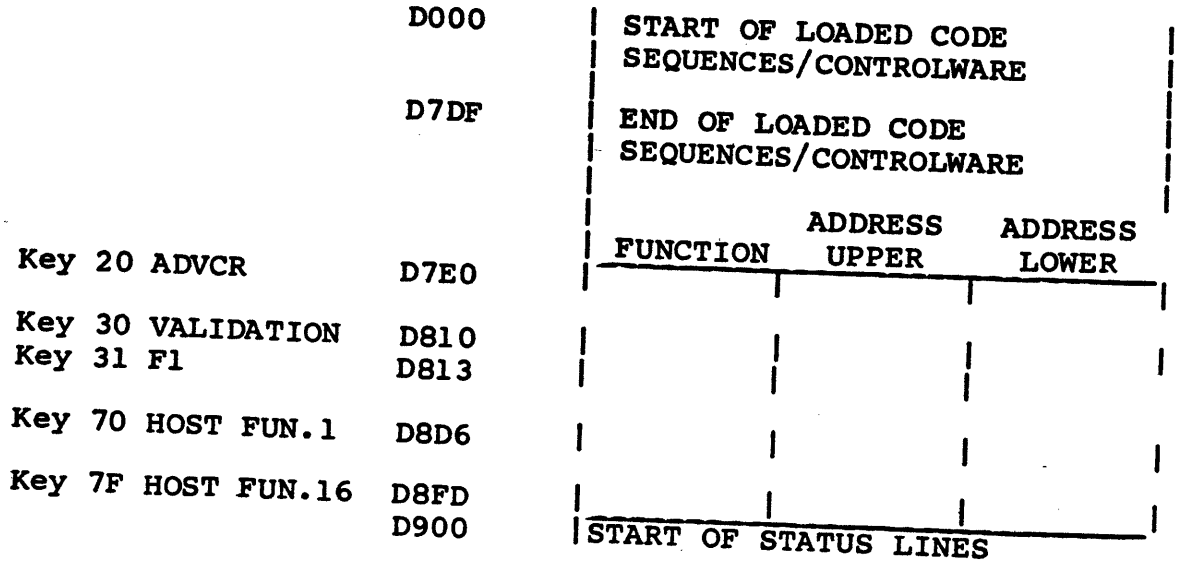
3.9.2.5.1 Host Loaded Code Sequence/Controlware

There are 16 resident subroutines that can be redefined by host-loaded controlware. There are 16 host-loaded controlware functions that can be initiated by host command. And there are 58 keys on the keyboard that can be redefined by the host.

Note: It is not intented to have external users redefining the resident subroutines. These features are added to make it easier for internal users (such as CP/M, PLATO, 401X) to modify operating modes. An explanation of these subroutines will not be done in this ERS since internal users (CP/M, PLATO, 401X) have listings. It is also recommended to lock the keyboard while loading controlware.

The host can specify if a key is to act as previously defined, send a different code sequence, or execute loaded controlware. A 2K block of RAM is reserved for this function (D000 to D7DF bank 4). If the disk controlware is not going to be used, the 3K between C000 to CAFF can be used for defining the keys. The last 288 locations make up a table used by the firmware to determine which operation is to be performed on each key.

Example of the host loaded area and table:



An enable and disable command will allow or disable the using of the loaded codes/controlware (RS, 2) (RS, 3). The host can also send a command that will clear all previously loaded codes/controlware (RS, .) (1E, 2E).

3.9.2.5.1 (Contd)

- Host Interface - The host can specify keys and load code sequences or controlware in the following manner.

  - RS, HT, (V), (W), (X), (Y...), Z

    -- V = Key identifier
    -- W = Function
    -- X = Address
    -- Y = Code sequence or controlware code
    -- Z = Terminator code

  - V (Key Identifier)

"V"	Key Number	Description of Key or Function	Initiate a Send in Block Mode
20		ADVCR (Advance Cursor)	
21		CLEAR (Clear Screen)	
22		CRDOWN (Cursor Down)	
23		CRLEFT (Cursor Left)	
24		CR UP (Cursor Up)	
25		DELC (Delete Character)	
26		DELL (Delete Line)	
27		INSRTC (Insert Character)	
28		INSRTL (Insert Line)	
29		KBDINP (Keyboard Input)	
2A		PRINTB (Print Code in B)	
2B		PRINTC (Print next Character)	
2C		DISPB (Display the code in B)	
2D		SEND (Send)	
2E		TAB BK(Tab Backwards)	
2F		TAB FW(Tab Forwards)	
30		VALIDATION	
31	3	F1	*
32	4	F2	*
33	5	F3	*
34	6	F4	*
35	7	F5	*

*This key will initiate a send in block mode.

3.9.2.5.1 (Contd)

"V"	Key Number	Description of Key or Function	Initiate a Send in Block Mode
36	8	F6	*
37	9	F7	*
38	10	F8 ⇐	*
39	11	F9 SUPER	*
3A	12	F10 SUB	*
3B	13	F11 MICRO	*
3C	14	F12 FONT	*
3D	80	F13 TERM ANS	*
3E	82	F14 COPY	*
3F	84	F15 □	*
40	32	TAB →|	
41	45	TAB |←	
42	67+106	NEXT ←┘	
43	15	+	*
44	31	-	*
45	46	X	*
46	61	÷	*
47	79	HELP	*
48	81	ERASE	
49	83	EDIT	*
4A	85	BACK	*
4B	86	LAB	*
4C	87	DATA	*
4D	88	STOP	*
4E	89	INSRT	
4F	90	DLETE	
50	91	CLEAR	
51	1	PRINT	
52	100	1	
53	101	2 ↓	
54	102	3	
55	97	4 ←	
56	98	5 HOME	
57	99	6 →	
58	94	7	

*This key will initiate a send in block mode.

3.9.2.5.1 (Contd)

"V"	Key Number	Description of Key or Function	Initiate a Send in Block Mode
59	95	8 ↑	
5A	96	9	
5B	104	0	
5C	103	,	
5D	105	.	
5E		NOT USED	
5F		PROLOGUE	
60	2	SETUP	
61	92	ESC. LF	
62	93	BREAK/MREL	
63	30	←	
64	78	CR DEL	
65	43	[ ]	
66	44	| \	
67	57	: ;	
68	58	" '	
69	59	{ }	
6A	71	, <	
6B	72	. >	
6C	73	/ ?	
6D		NOT USED	
6E		NOT USED	
6F		NOT USED	
70		HOST CONTROLWARE FUNCTION	
71		HOST CONTROLWARE FUNCTION	
72		HOST CONTROLWARE FUNCTION	
73		HOST CONTROLWARE FUNCTION	
74		HOST CONTROLWARE FUNCTION	
75		HOST CONTROLWARE FUNCTION	
76		HOST CONTROLWARE FUNCTION	
77		HOST CONTROLWARE FUNCTION	
78		HOST CONTROLWARE FUNCTION	
79		HOST CONTROLWARE FUNCTION	
7A		HOST CONTROLWARE FUNCTION	
7B		HOST CONTROLWARE FUNCTION	
7C		HOST CONTROLWARE FUNCTION	
7D		HOST CONTROLWARE FUNCTION	
7E		HOST CONTROLWARE FUNCTION	
7F		HOST CONTROLWARE FUNCTION	

3.9.2.5.1 (Contd)

- W (Function)

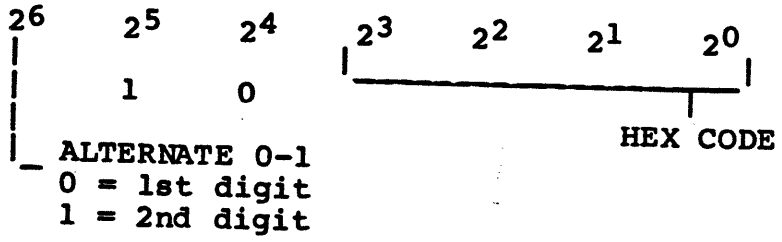
  -- 30 = Disable - send normal code - default value
  -- 31 = Host specified code sequence (send only)
  -- 32 = Host defined controlware
  -- 33 = Host Validation controlware
  -- 34 = Host specified code sequence (send and do if half duplex)

Default for all keys is 30.

- X (Address)

NOTE: This parameter is not required if W = 30.

This parameter is four codes wide. It contains the address where the code sequence/controlware starts. The address is converted to a modified hex value for each digit sending the highest digit first. The modified hex value is:



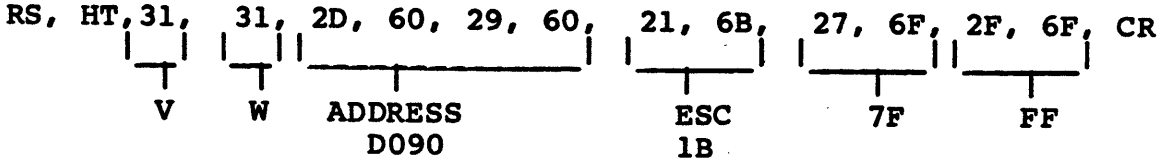
Example: Address D090 - RS, HT, V, W, 2D, 60, 29, 60

- Y (Code Sequence/Controlware Code)

Note: This parameter is not required if W = 30. This is the information that is stored in RAM starting at the address previously loaded. These words are formatted like the address.

3.9.2.5.1 (Contd)

- If information being loaded is a code sequence, the last word (two codes) will be a FF. Following is an example of how the host would change F1 to send ESC, 7F when pressed (store code at D090). The codes are stored in memory.



- If information being loaded is controlware, the FF is not needed. Information is stored until the termination code is detected.

  If a parity error, framing error, or improper bit 6 occurs, data will be ignored until the termination code is received at which time an RS, NAK will be sent back to the host. If no error occurred, an ACK will be returned. No response will be returned in large CYBER mode.

  -Z (Termination Code)

  CR (0D) is the termination code.

- Keyboard Operation Character Mode - As each key is pressed it will be tested first to see if it is a key that the host can modify. If it is, the firmware will next test the function code in the table.

  - If it is a disable code (30), the normal operation will be performed.

  - If it is a host specified code sequence (31), the controlware will go to the address specified and send codes until the FF is found.

  - If it is a host defined controlware (32), a call will be made to the address specified.

3.9.2.5.1 (Contd)

- If it is a host specified code sequence (34), (send and do), the controlware will go to the address specified and send codes until the FF is found and act upon all codes as if in half duplex operation.

o Keyboard Operation Block Mode

As each key is pressed it will be tested first to see if it is a key that the host can modify. If it is, the firmware will next test the function code in the table.

- If it is a disable code (30), the normal operation will be performed.

- If it is a host specified code sequence (31) the block send is initiated. The Host Specified Code Sequence will be sent inplace at the normal function key code.

- If it is a host defined controlware (32), a call will be made to the address specified.

3.9.2.5.2 Model Report Request (MRR)

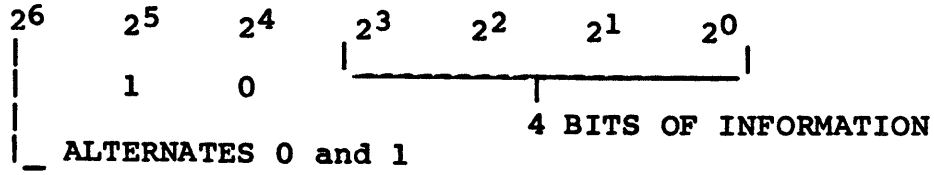
The host can request the terminals model, configuration, and parameters using this request (RS, C, (n)) in large CYBER mode only. The CYBER mode will respond to this request with the following:

```
1E      HEADER CODE
6F      HEADER CODE
23      INDICATES MODEL REPORT REQUEST DATA
21      INDICATES A VIKING X TERMINAL
XXX_|
  | |
  | |-- CONFIGURATION AND PARAMETERS   (See CONFIGURATION AND
  | |                                    PARAMETERS below)
XXX_|
 Y      FIRMWARE REVISION LEVEL
 Z      TERMINATION CODE
```

Each code sent contains 4 bits of information.

3.9.2.5.2 (Contd)

EXAMPLE



CONFIGURATION AND PARAMETERS

- Word 1

  2^0, 2^1, 2^2, 2^3 > Current Mode Active

  0

- Word 2

  2^0 = Not Used
  2^1 = Not Used
  2^2 = Battery Low
  2^3 = ROM PACK Option Installed. 0 = ROM PACK IN

- Word 3

  2^0 = Channel A DSR
  2^1 = Channel A CTS
  2^2 = Channel B DSR
  2^3 = Channel B CTS

  > If no dual port present all bits = 0

- Word 4

  2^0 = Not Used
  2^1 = Not Used
  2^2 = Not Used
  2^3 = Not Used

The next 32 words are determined by the n value.
If n = 30 the Terminal Installation Parameters from NVM are sent.
If n = 31-36 the Mode Installation Parameters from NVM are sent.

3.9.2.5.2 (Contd)

If n = 37 the Active Mode Parameters from RAM are sent.

If n = 30:

Terminal Parameters	Bit 0-3	Word Number in MRR*
Not Used	0	5
Touchpanel Option In	1	5
Dual Serial Interface Option In	2	5
Graphic Printer Attached (726-10)	3	5
Flexible Disk Option Attached	0	6
Serial Graphic Printer Attached (726-20)	1	6
1200 Baud Internal Modem Option In	2	6
Not Used	3	6
Graphic Option In	0	7
Parallel Option In	1	7
Not Used	2	7
Fixed Disk Option In	3	7
Auto Select Enabled	0	8
Use Printer SRTS	1	8
Run Internal Modem Loopback	2	8
Tone Dial	3	8
Monitor Printer Ready	0	9
Monitor Bidirectional Ready (DSR)	1	9
Not Used	2	9
Not Used	3	9
Not Used	0	10
Not Used	1	10
Not Used	2	10
Not Used	3	10
Auto Select Number	0-2	11
Not Used	3	11
Delta X Display Displacement	0-2	12
Not Used	3	12

*MRR = Model Report Request.

3.9.2.5.2 (Contd)

Terminal Parameters	Bit 0-3	Word Number in MRR*
Delta Y Display Displacement	0-3	13
Language	0-2	14
Not Used	3	14
Terminal ID Digit #1	0-3	15
Terminal ID Digit #2	0-3	16
Terminal ID Digit #3	0-3	17
Terminal ID Digit #4	0-3	18
Port A 7/8 Data Bits	0	19
Port A Odd/Even, Space/Mark	1	19
Port A Parity Enabled/Disable	2	19
Port A Printer/Bidirectional	3	19
Port A Baud Rate	0-3	20
Port B 7/8 Data Bit	0	21
Port B Odd/Even, Space/Mark	1	21
Port B Parity Enabled/Disable	2	21
Port B Printer/Bidirectional	3	21
Port B Baud Rate	0-3	22
Not Used	0-3	23
Not Used	0-3	24
Not Used	0-3	25
Not Used	0-3	26
Not Used	0-3	27
Not Used	0-3	28
Not Used	0-3	29
Not Used	0-3	30
Not Used	0-3	31
Not Used	0-3	32
Not Used	0-3	33
Not Used	0-3	34
Not Used	0-3	35
Not Used	0-3	36

*MRR - Model Report Request.

3.9.2.5.2 (Contd)

If n = 31 to 36 only that modes parameters are sent from NVM.
If n = 37 the active Mode Parameters are sent from RAM.

Mode Parameters	Bit 0-3	Word Number in MRR**	Word Number in WNMP***	Affected By WNMP***
Mode Disabled/Enabled	0	5	1	*
Access Disabled/Enabled	1	5	1	*
Use Default Source/File/Phone	2	5	1	*
Run Internal/Load External	3	5	1	*
Load from Host/Disk	0	6	2	*
Host/Internal Modem Interface	1	6	2	*
Dial Once/Continuous	2	6	2	*
Auto Dial Disabled/Enabled	3	6	2	*
Host 7/8 Data Bits	0	7	3	*
Host Parity Disabled/Enabled	1	7	3	*
Host Parity Odd/Even	2	7	3	*
Host 1/2 Stop Bits	3	7	3	*
DTR Constant/Switched	0	8	4	Yes
RTS Constant/Switched	1	8	4	Yes
Typamatic On/Off	2	8	4	Yes
Data Only Off/On	3	8	4	Yes
Home Upper/Lower Left	0	9	5	Yes
Auto LF On/Off	1	9	5	Yes
Pacing Disabled/Enabled	2	9	5	Yes
Bias Disabled/Enabled	3	9	5	Yes
Auto Advance On/Off	0	10	6	Yes
Not Used	1	10	6	Yes
Not Used	2	10	6	Yes
CYBER/ROM Pack	3	10	6	*
Online/Local	0	11	7	Yes
Printer Deselected/Select	1	11	7	Yes
Margin Alert Off/On	2	11	7	Yes
Alert Soft/Load	3	11	7	*

*Data is stored in RAM but does not affect the current operation.
**MRR - Model Report Request.
***WNMP - Write New Mode Parameters.

3.9.2.5.2 (Contd)

Mode Parameters	Bit 0-3	Word Number in MRR**	Word Number in WNMP***	Affected By WNMP***
Alpha/Shift Lock	0	12	8	Yes
Numeric Pad Normal/Shifted	1	12	8	Yes
Page/Roll Screen	2	12	8	Yes
Small/Large CYBER	3	12	8	Yes
Background Dark/Light	0	13	9	*
Cursor Line/Box	1	13	9	*
Cursor Blink/Solid	2	13	9	*
Not Useable	3	13	9	*
Half/Full Duplex	0	14	10	Yes
80/132 Characters Per Line	1	14	10	*
24/30 Lines	2	14	10	*
Transparent Off/On	3	14	10	Yes
Auto Dial Digit #1	0-3	15	11	*
Auto Dial Digit #2	0-3	16	12	*
Auto Dial Digit #3	0-3	17	13	*
Auto Dial Digit #4	0-3	18	14	*
Auto Dial Digit #5	0-3	19	15	*
Auto Dial Digit #6	0-3	20	16	*
Auto Dial Digit #7	0-3	21	17	*
Auto Dial Digit #8	0-3	22	18	*
Auto Dial Digit #9	0-3	23	19	*
Auto Dial Digit #10	0-3	24	20	*
Auto Dial Digit #11	0-3	25	21	*
Auto Dial Digit #12	0-3	26	22	*
Default File Number #1	0-3	27	23	*
Default File Number #2	0-3	28	24	*
Transmit Baud Rate	0-3	29	25	*
Receive Baud Rate	0-3	30	26	*
Access Code Digit #1	0-3	31	27	*
Access Code Digit #2	0-3	32	28	*
Access Code Digit #3	0-3	33	29	*
Access Code Digit #4	0-3	34	30	*
Not Used	0-3	35	31	*
Not Used	0-3	36	32	*

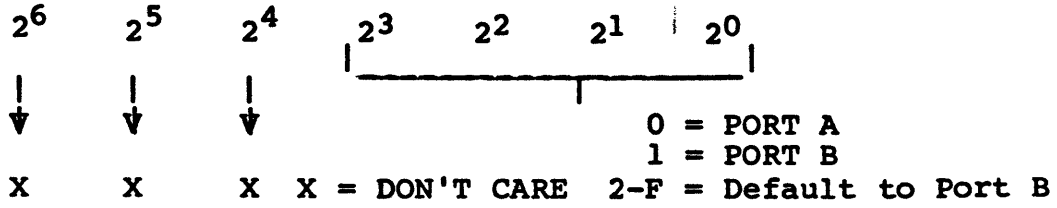
*Data is stored in RAM but does not affect the current operation.
**MRR - Model Report Request.
***WNMP - Write New Mode Parameters.

3.9.2.5.2 (Contd)

- o Y Firmware Revision Level - Two codes will be sent:
  - 1st code 1 to F = Release level; first release = 4
  - 2nd code 1 to F = Revision level; first revision = 0
- o Z Termination Code
  - CR (0D)

3.9.2.5.3 Host Select Bidirectional Port

In CYBER mode the host can select and send or receive information to either Port A or Port B of the optional bidirectional RS-232-C ports. The parameter bits for both ports must be set up before entering CYBER mode. The host must make sure the transmit buffer is empty by ensuring X-On is active. If the "Monitor Bidirectional Ready" parameter is active, data will be sent only if the Ready is active. The host can determine if the bidirectional Ready is active by doing a read parameter (RS, SI). If the printer is selected, the receive data will also be sent to the printer. When the terminal receives the host select bidirectional port sequence, it will interpret the next code (port) as follows:



At this point the terminal will return either an ACK or RS, NAK. DTR, RTS and CO will be sent to the selected port.

The ACK is returned if:

- o The monitor bidirectional Ready parameter is disabled.
- o The monitor bidirectional Ready is enabled and the DSR is active.

3.9.2.5.3 (Contd)

The RS, NAK is returned if:

- The monitor bidirectional ready parameter is enabled and the ready is not active.

A carriage return will be returned if the enable CR delimiter command has been received.

At this time all data received from the host will be sent to the selected port and will not be acted upon by the display, except the DC1 and DC3 in large CYBER mode. As data is received from the port it is placed into the comm output buffer to be sent to the host. The standard host communication protocol is used to send the data as if it came from the keyboard (Full/Half duplex, Constant/Switched RTS, Data Only).

X-On/X-Off is supported between the terminal and device connected to the bidirectional port. A DC1 or DC3 received from the bidirectional port will not be passed to the host but will cause the terminal to stop sending to the bidirectional port when the X-Off is received and start sending again when the X-On is received.

Caution: Data may be lost if an X-Off is received from the host and the bidirectional device sends more than 192 characters.

If an RS is received from the host, it is not sent to the port. The next code is examined.

- If it is an RS, a single RS will be sent to the port, this allows the host to send an RS to the port.
- If it is a DC2, the bidirectional port will be deselected. DTR, RTS, and CO will remain active.
- If it is anything except the DC2, the code will be sent to the port and the previous RS ignored.
- If a parity error is received from the host, a 7F is sent to the port.

3.9.2.5.4 X-Off/X-On

- Receiving X-Off/X-On - Transmit off/Transmit on (X-Off/X-On) is supported by Large CYBER mode. Each operating mode is defined in the following text.

- Character mode - When the X-Off is received from the host, all codes being sent to the host will be placed in the comm output buffer until the buffer becomes full. At this time the keyboard is locked. When the X-On is received, the buffer will send and the keyboard unlocked.

- Block Mode - When the X-Off is received from the host, no information will be sent to the host; keyboard entry is still allowed. If a send function is initiated the comm output buffer will be filled and no other operations will be performed until the X-On is received. When X-On is received, transmission will continue; the keyboard will remain locked until cleared by the completion of block send.

- Bidirection Port - When the bidirectional port is selected. X-On must be active.

In large CYBER mode the X-On and X-Off can be placed any where in the data stream.

- Sending X-Off/X-On - This feature is supported in both large and small CYBER modes. The terminal has a receive buffer of 992 characters. If this buffer ever reaches 768 characters the X-Off will be sent to the host and the X-ON sent when the count goes down to 256.

3.9.2.5.5 Write New Mode Parameters (WNMP)

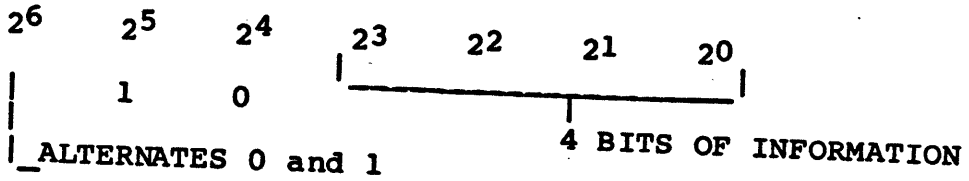
The host can temporarily override the CYBER mode installation parameters by changing them in the active RAM table. (RS, DC2, V.)

Note: The host can change the Nonvolatile Memory table by sending a store mode parameters in NVM command.

Before writing new parameters, a Model Report Request should be performed (RS, C, 7) to get the active status from RAM. Then changes can be made and all data sent back in the Write New Mode Parameters command (see Model Report Request paragraph 3.9.2.5.2 for bit and words).

3.9.2.5.5 (Contd)

When CYBER mode receives the write new mode parameter command, it will input up to 32 codes and replace the active mode parameter words with them. The 32 words correspond to the 32 groups found in paragraph 3.3.3.2 (Mode Installation Parameters) and Model Report Request paragraph 3.9.2.5.2. The 32 codes are received in the following format.



The first code received should have $2^6 = 0$. If an error is received during the code sequence, data will be ignored until the termination code is received at which time an RS, NAK is sent to the host. If no errors are detected, an ACK is sent to the host. See the column labeled "Affected by WNMP" to determine if parameter is affected. (See paragraph 3.9.2.5.2 Model Report Request.)

Note: No response is sent in large CYBER mode.

3.9.2.5.6 Load RAM Extended Character Generator

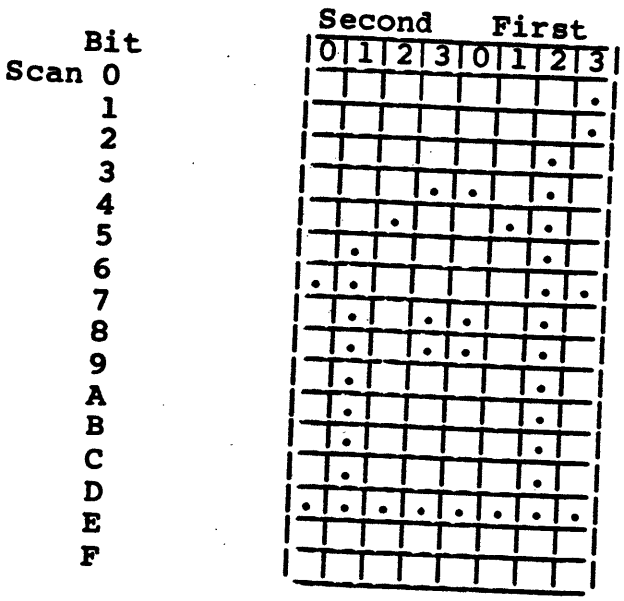
The host can define its own character by loading character patterns in RAM. Once the pattern has been loaded the host can display it by sending an RS, T, (X), where X is the code that was loaded. The X code must be between 40 and 7F hex, or a parity error symbol will be displayed.

Restrictions: The hardware cannot simultaneously display extended RAM characters and PLATO characters. The hardware will be selected to display either the extended RAM character or the PLATO character when the command is received to display the associated character.

3.9.2.5.6 (Contd)

To load the RAM extended character, follow this procedure:

1. Draw the desired character in an 8 by 16 matrix.



2. The top row of dots is scan 0. The right half of the character is the first word. The left half of the character is the second word. The leftmost dot of a word is 2**0. The rightmost dot of a word is 2**3.

3. Select the character code that will be represented by the new symbol. (Must be between 40 and 7F hex.) In our example we will use 40.

4. Send the RS, S, code (1E, 53, 40).

5. Send the scan count, remember to add 20 hex. For scan 0, send 20.

6. Send the data. Each scan has two bytes. Remember to add 20 hex to the first and 60 hex to the second bytes.

3.9.2.5.6 (Contd)

Example for the dot pattern shown:

Scan 0	28,60
1	28,60
2	24,60
3	25,68
4	26,64
5	24,62
6	2C,63
7	25,6A
8	25,6A
9	24,62
A	24,62
B	24,62
C	24,62
D	2F,6F
E	20,60
F	20,60

7. Send a carriage return (CR) code (0D) to terminate. The CR may be sent at any time if not all scans need to be changed.

3.9.2.6 Touchpanel Operation/Raster Alignment

The basic terminal CYBER mode includes the capability to support touchpanel operation. General support is described as follows:

- The touchpanel has 16 vertical and 16 horizontal strips. Each strip is 0.5 inches wide. Where the vertical and horizontal strips intersect is a 0.5-inch square cell. With 80 characters-per-line, the cell covers two lines by four characters. With 132 characters-per-line, the cell covers two lines by 6.2 characters.
- Touchpanel activated selection to a defined single character position located within the activated cell. Normally, this is intended to be the bottom center character located in the touchpanel cell. The exact X, Y positions are described later in this section.
- The hardware supports the displaying of 32 lines. When 30 or 24 lines are displayed, they are centered on the screen.

3.9.2.6 (Contd)

Note: The displayable area of 30 lines by 80 characters is 7.5 inches high by 10 inches wide. The area covered by the touchpanel is 8 inches by 8 inches. This means one inch on each side is not covered by the touchpanel and 0.25 inch on the top and bottom have no display under the touchpanel.

When 30 lines are displayed the top line is under the bottom half of the top strip of the touchpanel, and the last line is under the top half of the bottem strip. When 24 lines are displayed the top two and bottom two strips of the touchpanel have no data under them.

The following tables show the X and Y positions (decimal) that are used when positioning the cursor.

Char/ Line	TP STRIPS LEFT TO RIGHT															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
80	11	15	19	23	27	31	35	39	43	47	51	54	58	62	66	70
132	20	26	33	39	45	51	57	64	70	76	82	88	95	101	107	113

Lines/ Screen	TP STRIPS TOP TO BOTTOM															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
24	1	1	2	4	6	8	10	12	14	16	18	20	22	24	24	24
30	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	30

3.9.2.6.1 Host Communications

The host utilizes two special commands to support touchpanel operation. The host can enable or disable the function. If enabled, operation is supported by operator initiated selection input to the host. The host can request terminal configuration status to determine presence of the touchpanel option.

3.9.2.6.2 Terminal Operation

When a touchpanel operation is active, the following actions occur:

- The operator determines desired position.
- The operator activates touchpanel at the desired position.
- The terminal computes X, Y position activated.
- The terminal moves cursor to X, Y position activated.
- The terminal sends a select function to the host. The select function sends an RS, M code (1E, 4D) sequence to the host.
- The terminal sends a "Read Cursor Address" function to the host to specify X, Y cursor position. Refer to table 3.9.18 for definition.
- Sends termination character - CR (0D).

3.9.2.7 Flexible Disk Operation (Intended Use)

The flexible disk controlware is stored on disk on the auto-track of the diskette. The disk must be inserted and made ready before operation begins. The host or an operator can load the controlware.

The operator can load the controlware by simultaneously pressing CTRL/DATA. An X-Off code will be sent to the host. If the controlware has not been loaded, a load is attempted. If the load fails a message DISK LOAD FAIL will be displayed and an X-On sent to the host. If the controlware has been loaded or the load is completed control is transferred to the starting address + 3. When control is returned an X-On is returned.

The host can initiate the load, (see CYBER Mode Receive and I/O Response table for code). If the controlware has not been loaded a load is attempted. If the load fails a message DISK LOAD FAIL will be displayed and an RS, NAK sent back to host. If the controlware has been loaded, control will be transferred to starting address.

3.9.3 Interfaces

CYBER mode will interface to a host using either the 1200/1200 internal modem or host RS-232-C interface and to an operator using the keyboard or touchpanel.

3.9.4 Aborts and Recovery

A print operation can be aborted by pressing SHIFT/M REL.

A break can be transmitted to the host by pressing the BREAK key.

A terminal lock-up condition can be recovered by pressing the RESET switch and starting over.

3.9.5 Errors

If parity errors, overrun errors, or framing errors are received while alphanumeric display information is being received in 7-bit operation, a rubout character will be displayed.

If a parity error is received from the keyboard, the code is ignored.

3.9.6 Performance

CYBER mode should be able to receive information at 19.2K baud without any nulls inserted. If a printer is selected, data will be sent to the printer without any delays, the host must implement any timing restraints or deselect the printer and do a host command to print page.

3.9.7 Installation Parameters

The terminal installation and CYBER mode installation (mode 1) must be set up before operation begins.

4.0 PRODUCT-LEVEL DESCRIPTION

4.1 Publications Affected

CDC-PUB 62940034	721 On-Site/Service Center Manual
CDC-PUB 62940020	Reference/On-Site HRM
CDC-PUB 62940037	Technical Support HMM
CDC-PUB 62940019	Operator's Guide/Installation Manual

4.2 Equipment Configuration

The minimum/target hardware configuration supported by this firmware is the Viking X terminal with no options running in CYBER mode. Operation with the Resident Firmware is not hardware configuration dependent.

The maximum configuration supported by this firmware is the Viking X terminal with the following options:

- ROM Pack Option
- Dual Serial I/O - ASCII Printer or Bidirectional
- Parallel I/O - Flexible Disk Subsystem - Graphic Printer
- Touchpanel - Graphic Option Required
- 1200/1200 Internal Modem Interface

4.3 Interfaces to Software

4.3.1 Memory Layout

The terminal has more than 64K bytes of RAM and ROM in its maximum configuration, since a 16-bit address bus allows only 64K of direct addressing, memory bank controls are added.

4.3.1 (Contd)

Figure 4.3.1 shows all of the present memory broken up into 16K banks. The 64K of addressing is broken up in 4 blocks (see figure 4.3.2). Block 0 starts at address 0000; block 4 starts at 4000; block 8 starts at 8000; and block C starts at C000. Banks can be selected into certain blocks to achieve the desired mode configuration. See figure 4.3.3 for some mode configurations.

When the terminal is powered on or reset, banks 0, 2, 3 and 4 are selected in blocks 0, 4, 8, and C, respectively. The following bank selections will take place in the resident firmware depending upon type of load.

- o CYBER Mode - No bank selection is performed.
- o Load from ROM Pack - Bank 5 is selected in block 8.
- o Load from Host - When the ASCII loader is selected, no bank selecting is performed. This could accommodate a load from 4000 of bank 2, and all of bank 3. At the completion of the load, control is tranferred to the first address designated in the load. If the loaded controlware does not want to use the ASCII display (banks 0 and 4), it must select the desired bank configuration.
- o Load from Disk - When the disk loader is selected, no bank selecting is performed. At the completion of the disk load, control is transferred to the address specified by the first two words from the disk. If the loaded controlware does not want to use the ASCII display (banks 0 and 4), it must select the desired bank configuration.

EXAMPLE for loading PLATO:

The resident loader will select banks 0, 2, 3, 4 in block 0, 4, 8, C respectively. The code would be loaded into bank 3 (block 8) and control transferred to it. The loaded controlware selects banks 7 and 8 in block 0 and 4.

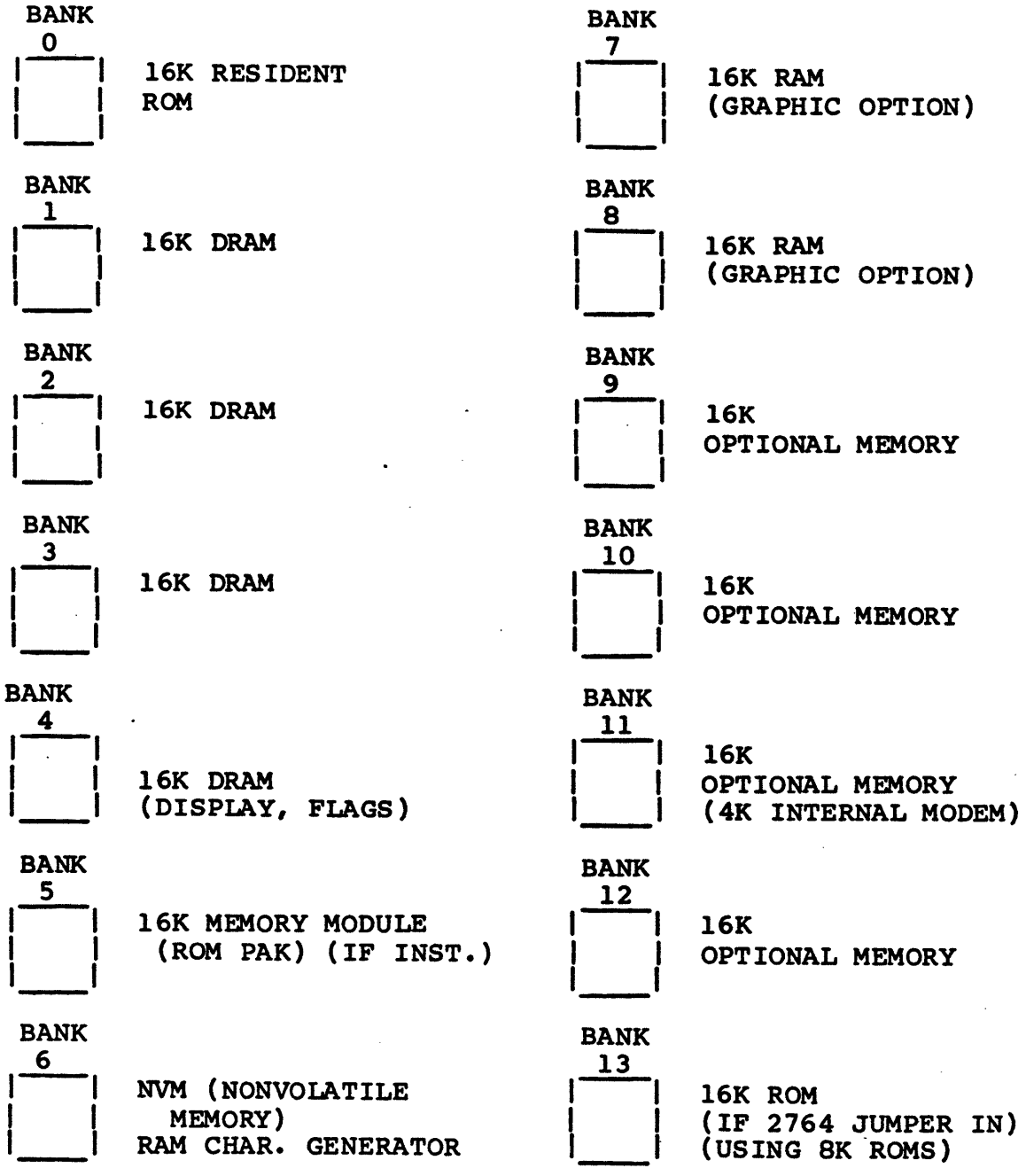


Figure 4.3.1. Bank Configurations

		POSSIBLE BANK SELECTIONS	
BLOCK 0	0000	00	BANK 0 RESIDENT ROM
		01	BANK 7 16K GRAPHIC RAM
		02	BANK 1 16K RAM
		03	NOT USED
BLOCK 4	4000	00	BANK 6 NVM
		01	BANK 8 16K GRAPHIC RAM
		02	BANK 13 16K ROM (8K ROMS IN)
		03	BANK 2 16K RAM
BLOCK 8	8000	00	BANK 5 MEMORY MODULE (ROM PAK)
		01	BANK 3 16K RAM
		02	BANK 11 16K OPTIONAL MEMORY
		03	BANK 9 16K GRAPHIC RAM*
BLOCK C	C000	00	BANK 4 16K DISPLAY RAM
		01	BANK 6 NVM
		02	BANK 12 16K OPTIONAL MEMORY
		03	BANK 9 16K GRAPHIC RAM**

*DEFAULTS TO BANK 7 IF GRAPHIC OPTION IS INSTALLED.

**DEFAULTS TO BANK 8 IF GRAPHIC OPTION IS INSTALLED.

Figure 4.3.2. Block Configuration

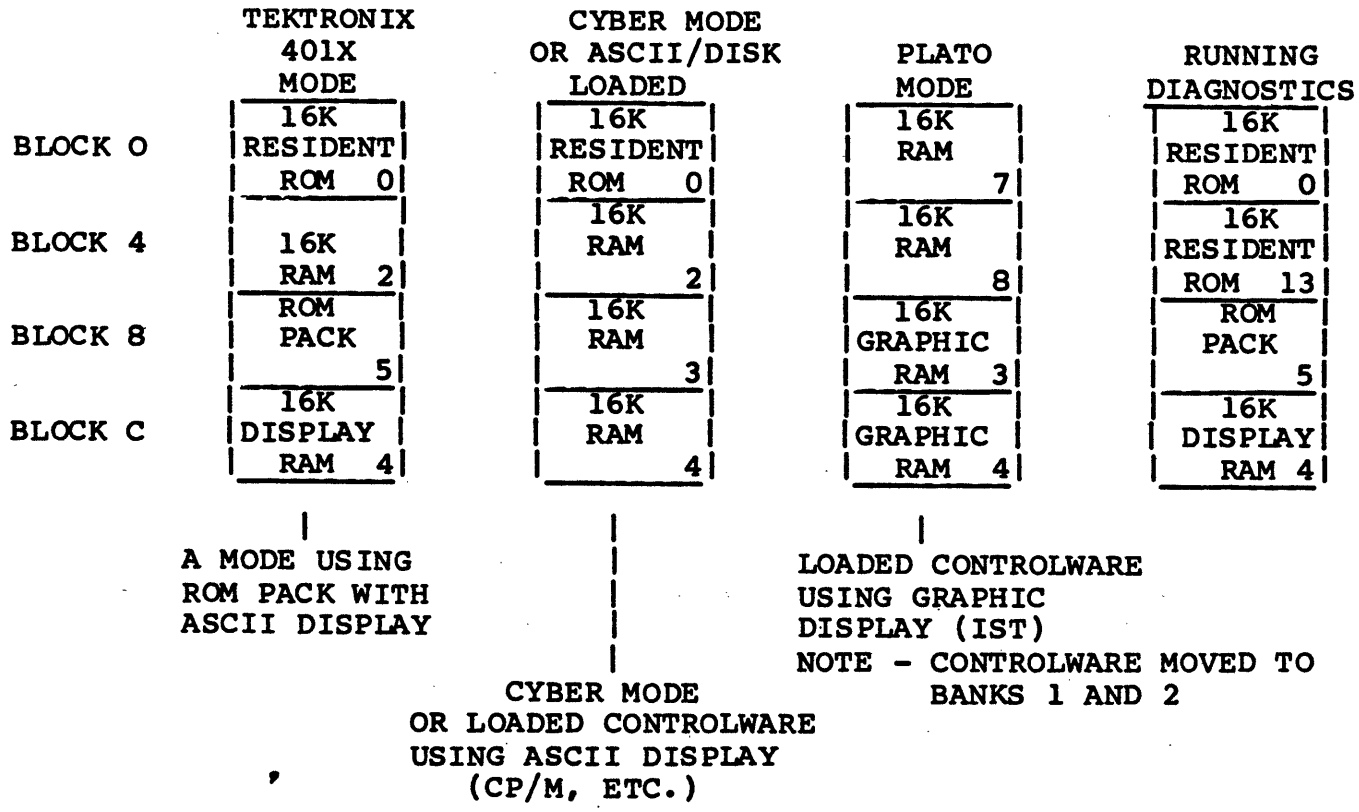


Figure 4.3.3. Memory Configurations

4.3.2 Bank 4 Layout

Bank 4 contains 16K of dynamic random-access memory (DRAM). The ASCII display hardware uses this bank of memory for display refresh. The CYBER mode uses this bank also for flags, buffers, stack pointer and interrupt table. Figure 4.3.4 shows the layout.

Bank 4 contains 16K of DRAM that is used by CYBER mode to display information. The data is arranged in lines. A line can be anywhere in the 16K area, but must start on an even address. The data is stored at even addresses and the attributes are stored at the next odd addresses.

A table is setup in the middle of the memory that tells the hardware where each line starts. See figure 4.3.5 for an example of how the table and display DRAM are setup in CYBER mode.

ADDRESS		SIZE
C000 CAFF	DISK OPERATING CONTROLWARE	4096
CB00 CEFF	RESERVED FOR CP/M	1024
CF00 CFFF	RESERVED FOR INTERNAL MODEM	256
D000 D7DF	HOST LOADABLE CODES/CONTROLWARE	2014
D7E0 D8FF	HOST LOADABLE AREA TABLE	288
D900 DB0F	2 STATUS LINES	528
DB10 DB1F	KEYBOARD INPUT BUFFER	16
DB20 DEFF	COMM INPUT BUFFER	992
DF00 DFBF	COMM OUTPUT BUFFER	192
DFC0 DFFF	STACK POINTER	64
E000 E03B	DISPLAY TABLE	60
E03C E03F	LOAD FLAGS	4
E040 E0FF	ACTIVE RAM AND FLAGS	192
E100 E10F	INTERRUPT TRAPS	16
E110 FFFF	30 X 132 X 2 DISPLAY DATA	7920

Figure 4.3.4. Bank 4 Layout

ADDR	TABLE		ADDR	DISPLAY RAM
E000	1 0	<---------- E110		
E001	E 1	LINE 1		DATA+ATTRI LINE 1
E002	1 8			
E003	E 2	LINE 2	<---- E218	LINE 2
E004	20			
E005	E3	LINE 3	E320	LINE 3
E006	28			
E007	E4	LINE 4	E428	LINE 4
E008	30			
E009	E5	LINE 5	E530	LINE 5
E00A	38			
E00B	E6	LINE 6	E638	LINE 6
E00C	40			
E00D	E7	LINE 7	E740	LINE 7
E00E	48			
E00F	E8	LINE 8	E848	LINE 8
E010	50			
E011	E9	LINE 9	E950	LINE 9
E012	58			
E013	EA	LINE 10	EA58	LINE 10
E014	60			
E015	EB	LINE 11	EB60	LINE 11
E016	68			
E017	EC	LINE 12	EC68	LINE 12
E018	70			
E019	ED	LINE 13	ED70	LINE 13
E01A	78			
E01B	EE	LINE 14	EE78	LINE 14
E01C	80			
E01D	EF	LINE 15	EF80	LINE 15
E01E	88			
E01F	F0	LINE 16	F088	LINE 16
E020	90			
E021	F1	LINE 17	F190	LINE 17
E022	98			
E023	F2	LINE 18	F298	LINE 18
E024	A0			
E025	F3	LINE 19	F3A0	LINE 19
E026	A8			
E027	F4	LINE 20	F4A8	LINE 20

Figure 4.3.5. Initial Display Memory Layout

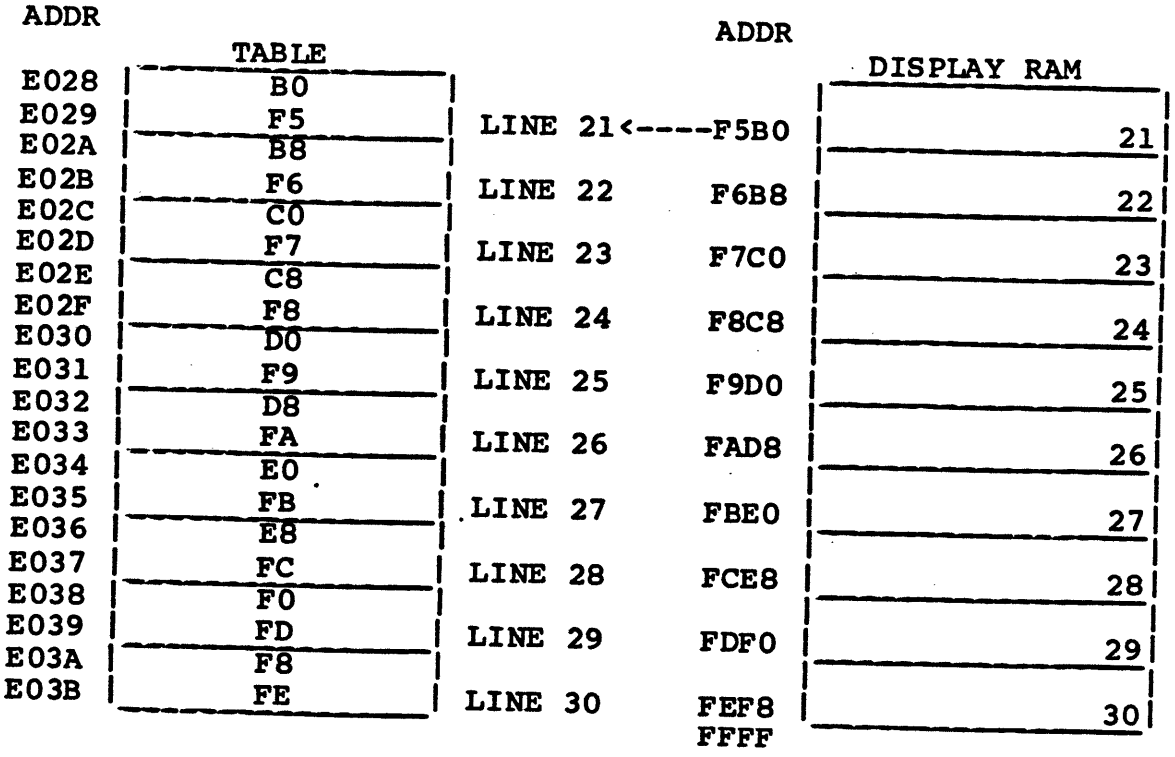


Figure 4.3.5. Initial Display Memory Layout (Contd)

4.3.3 User Interface to Resident Subroutines

The resident ROM firmware contains routines that can be used by user loaded controlware. A jump table has been placed at the beginning so that changes can be made to the resident firmware without requiring all external users to change their programs. The table in 4.3.3.1 shows the fixed address that an external user can call. Note: These addresses are to remain fixed and any new jumps are to be added to the end of the list.

4.3.3.1 Entry Point Jump Table

Address	Name	Description
0000	INIT	; INITIALIZATION
0003	INIT00	; INITIALIZATION 00
0006	INIT01	; INITIALIZATION 01
0009	INIT02	; INITIALIZATION 02
000C	CRT80	; SET CRT TO 80 CHR/LINE
000F	CRT132	; SET CRT TO 132 CHR/LINE
0012	CINIT	; COMM INITIALIZATION
0015	KINIT	; KEYBOARD INITIALIZATION
0018	PINIT	; PRINTER INITIALIZATION
001B	INTDIS	; INTERRUPT DISABLE
001E	INTENA	; INTERRUPT ENABLE
0021	CMTRAP	; COMM INTERRUPT TRAP
0024	KBTRAP	; KEYBOARD INTERRUPT TRAP
0027	TMTRAP	; TIMER INTERRUPT TRAP
002A	TPTRAP	; TOUCHPANEL INTERRUPT TRAP
002D	ADVCR	; ADVANCE CURSOR
0030	ADVMD	; ADVANCED MODE
0033	ALARM	; ALARM
0036	ALARMI	; ALARM IF ENABLED
0039	BDISPN	; DISPLAY B - PERFORM FUNCTION
003C	BFTB	; COMM BUFFER TO B
003F	BLDADD	; BUILD ADDRESS
0042	CLEAR	; CLEAR
0045	CLREOL	; CLEAR TO END OF LINE
0048	CLREOP	; CLEAR TO END OF PAGE
004B	CRDOWN	; CURSOR DOWN
004E	CRGRTN	; CARRIAGE RETURN
0051	CRLEFT	; CURSOR LEFT
0054	CRLNFD	; CARRIAGE RETURN LINE FEED
0057	CRUP	; CURSOR UP
005A	DISPB	; DISPLAY B - STORE ON SCREEN
005D	DLYEN1	; DELAY ENABLE 1
0060	DLYEN2	; DELAY ENABLE 2
0063	DSTRNG	; DATA STRING
0066	HASCII	; HEX TO ASCII
0069	KBDAS	; CONVERT NEXT KEYBOARD CODE TO ASCII
006C	KBDASC	; KEYBOARD TO LOWERCASE ASCII
006F	KINPUT	; KEYBOARD INPUT
0072	MODENE	; DISPLAY MODE NOT ENABLED
0075	PABI	; PORT A BIDIRECTIONAL
0078	PBBI	; PORT B BIDIRECTIONAL

4.3.3.1 (Contd)

Address	Name	Description
007B	PRINTB	; PRINT B
007E	RESET	; RESET
0081	SCROLL	; SCROLL
0084	SEND	; SEND NEXT CODE FROM COMM BUFFER
0087	SENDB	; STORE B IN COMM SEND BUFFER
008A	SETDE	; SET CURSOR TO DE
008D	SETCR	; SET CURSOR
0090	ST_TM	; START DELAY TIMER
0093	TABBK	; TAB BACKWARDS
0096	TABFW	; TAB FORWARD
0099	TABCLR	; TAB CLEAR
009C	TABSET	; TAB SET
009F	TPINP	; TOUCHPANEL INPUT
00A2	SENDB8	; STORE B IN COMM SEND BUFFER
00A5	MNTOR	; USER ENTRY TO MONITOR
00A8	ADVINI	; ADVANCED MODE INITIALIZATION
00AB	KBDINP1	; ADVANCED MODES KEYBOARD INPUT
00AE	CMTRPU	; COMM INTERRUPT TRAP-USER
00B1	KBTRPU	; KEYBOARD INTERRUPT TRAP-USER
00B4	TMTRPU	; TIMER INTERRUPT TRAP-USER
00B7	TPTRPU	; TOUCHPANEL INTERRUPT TRAP-USER
00BA	TIPRAM	; MOVE TERMINAL INSTALLATION
00BD	CRTOUT	; OUTPUT VALUES TO 5037 CRT CONTROLLER
00C0	ADDB15	; ADD BIAS IF ENABLES
00C3	BFTDSP	; PROCESS ONE CODE FROM COMM BUFFER
00C6	KBDLCK	; LOCK KEYBOARD
00C9	KBDUNL	; UNLOCK KEYBOARD
00CC	PILSR	; INPUT PRINTER LSR
00CF	PRINTC	; PRINT NEXT CHARACTER
00D2	PTTRAP	; PRINTER INPUT TRAP
00D5	RSETXY	; RESET CURSOR TO OLD XY
00D8	SAVE XY	; SAVE CURRENT XY POSITION
00DB	TBLKKY	; TEST IF BLOCK MODE + KEYBOARD INPUT
00DE	REL	; RELEASE NUMBER (ASCII)
00DF	REV	; REVISION NUMBER (ASCII)
00E0	CK1	; CHECKSUM
00E1	MODESL	; MODE SELECTION MENU
00E4	RTNBKS	; RETURN TO (BANKS) SELECTED
00E7	CLINIT	; COMM LINE INITIALIZATION
00EA	KBDINP2	; KEYBOARD INPUT #2
00ED	CDIAL3	; AUTO DIAL 3.0
00F0	CDIAL4	; AUTO DIAL 4.0
00F3	CBLDDIR	; BUILD 60 DIGIT PHONE NUMBER

4.3.3.1 (Contd)

Address	Name	Description
00F6	CTSTMD	; INTERNAL MODEM TEST MODE
00F9	CLWRCYB	; FORCE LOWER CYBER
00FC	HANGUP	; INTERNAL MODEM HANG UP
00FF	CUSRDL	; AUTO DIAL - USER CONTROLWARE
0102	CUSRSTS	; MODEM STATUS
0105	CUSRMDM	; SET MODEM CONTROL PARAMETERS
0108	CANSWR	; INTERNAL MODEM AUTO ANSWER
010B	CANSWRB	; AUTO ANSWER ON TWO RINGS
010E	CADIALZ	; AUTO DIAL - USE MODE DEFAULT PARAMETERS
0111	CUTONE	; AUTO DIAL TONE
0114	CADIALY	; AUTO DIAL - USE 60 DIGIT NUMBER
0117	CATODLX	; AUTO DIAL
011A	CATODLY	; AUTO DIAL
011D	CANSW70	; GO OFF-HOOK

4.3.3.2 Common Variables

Common variables and flags are stored in Bank 4 and can be read or changed by the resident or user programs. They are broken up in terminal parameters, mode parameters and flags.

The terminal parameters are moved from NVM to the RAM area during initialization (before any mode is selected). The mode parameters are moved to the RAM area when the mode has been determined (before the mode has been loaded). The flags can be cleared by calling Advanced Mode Initialization (ADVINI).

4.3.3.3 Flag and Parameter Table

```
;*********************************************************
;
;  M O D E   I N S T A L L A T I O N   R A M / E Q U
;
;*********************************************************
E040    RAMST   .EQU    0E040H
E040    MBYTE1  .EQU    RAMST
0001    MODEEN  .EQU    01              ; MODE ENABLED
0002    SECEN   .EQU    02              ; SECURITY ENABLED
0004    OPSLSF  .EQU    04              ; OPERATOR SELECT SOURCE/FILE
0008    LDEN    .EQU    08              ; LOAD ENABLED (FROM HOST OR DISK)
E041    MBYTE2  .EQU    MBYTE1+1
0001    LDDISK  .EQU    01              ; LOAD FROM DISK
0002    INTMDM  .EQU    02              ; USE INTERNAL 1200-BAUD MODEM
0004    CDIAL   .EQU    04              ; CONTINIOUS DIAL
0008    AUTODL  .EQU    08              ; AUTO DIAL
E042    MBYTE3  .EQU    MBYTE2+1
0001    H8BIT   .EQU    01              ; HOST 8 BITS
0002    HPEN    .EQU    02              ; HOST PARITY ENABLED
0004    HPEVEN  .EQU    04              ; HOST PARITY EVEN
0008    H2STOP  .EQU    08              ; HOST 2 STOP BITS
E043    MBYTE4  .EQU    MBYTE3+1
0001    DTRSW   .EQU    01              ; DTR SWITCHED
0002    RTSSW   .EQU    02              ; RTS SWITCHED
0004    RPTDIS  .EQU    04              ; REPEAT DISABLED (TYPAMATIC OFF)
0008    DTONLY  .EQU    08              ; DATA ONLY OPERATION
E044    MBYTE5  .EQU    MBYTE4+1
0001    HOMELL  .EQU    01              ; HOME LOWER LEFT
0002    AUTOLF  .EQU    02              ; AUTO LINE FEED ENABLED
0004    PACEEN  .EQU    04              ; PACING ENABLED
0008    BIASEN  .EQU    08              ; BIAS ENABLED
E045    MBYTE6  .EQU    MBYTE5+1
0001    AADVDS          01              ; AUTOMATIC ADVANCE DISABLED
        ;               02              ; NOT USED
        ;               04              ; NOT USED
0008    RUNPAK  .EQU    08              ; 0 = RUN CYBER  1 = RUN ROM PACK
        ;*********************************************************
        ;               O P E R A T E R   P A R A M E T E R S
        ;*********************************************************
E046    OBYTE1  .EQU    MBYTE6+1
0001    LOCAL   .EQU    01              ; LOCAL
0002    PTSEL   .EQU    02              ; PRINTER SELECTED
0004    MRGEN   .EQU    04              ; MARGIN ALERT ENABLED
0008    ALERTL  .EQU    08              ; ALERT LOUD
E047    OBYTE2  .EQU    OBYTE1+1
```

4.3.3.3 (Contd)

```
0001    SFLOCK  .EQU    01              ; SHIFT LOCK
        NPADIV  .EQU    02              ; NUMERIC PAD SHIFTED
0004    ROLLSC  .EQU    04              ; ROLL SCREEN
000B    PAGESC  .EQU    0BH             ; .PAGE SCROLL
0008    LARGE   .EQU    08              ; LARGE CYBER
E048    OBYTE3  .EQU    OBYTE2+1
0001    BGLITE  .EQU    01              ; BACKGROUND LIGHT
0002    CRBOX   .EQU    02              ; CURSOR BOX
0004    CRSLD   .EQU    04              ; CURSOR SOLID ON
        ;       .EQU    08              ; NOT USABLE
E049    OBYTE4  .EQU    OBYTE3+1
0001    FULL    .EQU    01              ; FULL DUPLEX
0002    CL132   .EQU    02              ; 132 CHARACTERS PER LINE
0004    LN30    .EQU    04              ; 30 LINES
0008    TRANS   .EQU    08              ; TRANSPARENT
        ;*************************************************************
        ;       M O R E   M O D E   P A R A M E T E R S
        ;*************************************************************
E04A    ADILE   .EQU    OBYTE4+1        ; AUTO-DIAL NUMBER
E056    DFILE   .EQU    ADILE+12        ; DEFAULT FILE NUMBER
E058    TBAUD   .EQU    DFILE+2         ; TRANSMIT BAUD RATE
E059    RBAUD   .EQU    TBAUD+1         ; RECEIVE BAUD RATE
E05A    SECURE  .EQU    RBAUD+1         ; SECURITY CODE
E060    OEND    .EQU    0E060H          ; END OF OPERATOR PARAMETERS
        ;*************************************************************
        ;       T E R M I N A L   P A R A M E T E R S
        ;*************************************************************
E060    TBYTE1  .EQU    OEND
0001            .EQU    01H             ; SPARE
0002    TPOPT   .EQU    02H             ; TOUCHPANEL OPTION IN
0004    DSOPT   .EQU    04H             ; DUAL SERIAL OPTION IN
0008    GPOPT   .EQU    08H             ; GRAPHIC PRINTER OPTION IN
E061    TBYTE2  .EQU    TBYTE1+1
0001    FDOPT   .EQU    01H             ; FLEXIBLE DISK OPTION IN
0002    SGPOPT  .EQU    02H             ; GRAPHIC PRINTER OPTION IN
0004    IMOPT   .EQU    04H             ; INTERNAL 1200 MODEM OPTION IN
0008            .EQU    08H             ; SPARE
E062    TBYTE3  .EQU    TBYTE2+1
0001    GOPT    .EQU    01H             ; GRAPHIC OPTION IN
0002    PAROPT  .EQU    02H             ; PARALLEL OPTION IN
0004            .EQU    04H             ; SPARE
0008    FXDOPT  .EQU    08H             ; FIXED DISK OPTION IN
E063    TBYTE4  .EQU    TBYTE3+1        ; SPARE
0001    ASELEN  .EQU    01H             ; AUTO SELECT ENABLE
```

4.3.3.3 (Contd)

```
0002    DLSRTS  .EQU    02H             ; DELAY ON PRINTER SRTS
        RILOOP  .EQU    04H             ; RUN INTERNAL MODEM LOOPBACK
        TDIAL   .EQU    08H             ; TONE DIAL
E064    TBYTE5  .EQU    TBYTE4+1
0001    MPTDSR  .EQU    01              ; MONITOR PRINTER Ready
0002    MBIDSR  .EQU    02              ; MONITOR BIDIRECTIONAL Ready
E065    TBYTE6  .EQU    TBYTE5+1
E066    ASEL    .EQU    TBYTE6+1        ; AUTO SELECT 0-7 (DEFAULT MODE)
E067    XDELTA  .EQU    ASEL+1          ; SCREEN MOVE X DELTA
E068    YDELTA  .EQU    XDELTA+1        ; SCREEN MOVE Y DELTA 0-F
E069    LANG    .EQU    YDELTA+1        ; LANGUAGE 0-7
E06A    ID      .EQU    LANG+1          ; TERMINAL ID NUMBER 0000-FFFF
E06E    CHAPAR  .EQU    ID+4            ; CHANNEL A PARAMETERS
0001    DS8BIT  .EQU    01H             ; 7/8 DATA BITS
0002    PAREV   .EQU    02H             ; PARITY EVEN
0004    PARDIS  .EQU    04H             ; PARITY DISABLED
0008    BIDIR   .EQU    08H             ; BIDIRECTIONAL PORT
E06F    CHABD   .EQU    CHAPAR+1        ; CHANNEL A BAUD 0-F
E070    CHBPAR  .EQU    CHABD+1         ; CHANNEL B PARAMETERS
E071    CHBBD   .EQU    CHBPAR+1        ; CHANNEL B BAUD 0-F
E080    TEEND   .EQU    0E080H          ; TERMINAL EQUATE END
        ;*********************************************************
        ;       BIDIRECTIONAL PORT
        ;*********************************************************
E080    BDATAR  .EQU    TEEND           ; BIDIR DATA IN/OUT
0001    IER     .EQU    01H             ; INTERRUPT ENABLE REGISTER
0002    IIR     .EQU    02H             ; INTERRUPT ID REGISTER INPUT
0003    LCR     .EQU    03H             ; LINE CONTROL REGISTER OUTPUT
0004    MCR     .EQU    04H             ; MODEM CONTROL REGISTER OUTPUT
0005    LSR     .EQU    05H             ; LINE STATUS REGISTER INPUT
0006    MSR     .EQU    06H             ; MODEM STATUS REGISTER INPUT
        ;
        ;*********************************************************
        ;       COMM I/O STORED IN RAM
        ;*********************************************************
E081    CDATAR  .EQU    BDATAR+1        ; COMM DATA IN/OUT
        ;
E082    PDATAR  .EQU    CDATAR+1        ; PRINTER DATA IN/OUT
        ;
        ;*********************************************************
        ;
        ;       I N P U T   B U F F E R S
        ;
        ;*********************************************************
E083    BFCNT   .EQU    PDATAR+1        ; NUMBER OF CHARACTERS IN COMM BUFFER
```

4.3.3.3 (Contd)

```
E085    BFINAD  .EQU    BFCNT+2         ; ADDRESS OF NEXT OPEN SLOT IN BUFFER
E087    BFOTAD  .EQU    BFINAD+2        ; ADDRESS OF NEXT CHARACTER TO BE TAKEN
        ;                                 FROM COMM INPUT BUFFER
E089    KBCNT   .EQU    BFOTAD+2        ; NUMBER OF CHARACTERS IN KEYBOARD
        ;                                 BUFFER
E08A    KBINAD  .EQU    KBCNT+1         ; ADDRESS OF NEXT OPEN SLOT IN BUFFER
E08C    KBOTAD  .EQU    KBINAD+2        ; ADDRESS OF NEXT CHARACTER TO BE TAKEN
        ;                                 FROM KEYBOARD INPUT BUFFER
E08E    TXCNT   .EQU    KBOTAD+2        ; NUMBER OF CHARACTERS IN TRANSMIT
        ;                                 BUFFER
E08F    TXINAD  .EQU    TXCNT+1         ; ADDRESS OF NEXT OPEN SLOT IN BUFFER
E091    TXOTAD  .EQU    TXINAD+2        ; ADDRESS OF NEXT CHARACTER TO BE TAKEN
        ;                                 FROM TRANSMIT BUFFER
        ;*************************************************************
        ;
        ;       D E L A Y S
        ;
        ;*************************************************************
E093    ALRACT  .EQU    TXOTAD+2        ; 250 MS ALARM DELAY ACTIVE
001F    ALRTM   .EQU    31              ; 31 X 8 = 248
E094    BRKACT  .EQU    ALRACT+1        ; 250MS. BREAK DELAY ACTIVE
001F    BRKTM   .EQU    31              ; 31 X 8 = 248
E095    KBDACT  .EQU    BRKACT+1        ; 1 SEC. KEYBOARD DELAY IS ACTIVE
007D    KBDTM   .EQU    125             ; 125 X 8 = 1 SEC
E096    KBRACT  .EQU    KBDACT+1        ; 60MS. KEYBOARD REPEAT IS ACTIVE
0008    KBRTM   .EQU    8               ; 8 X 8 = 64
E097    PCDACT  .EQU    KBRACT+1        ; 8 MS. PACING DELAY ACTIVE
E098    PNTACT  .EQU    PCDACT+1        ; 200MS. PRINTER DELAY ACTIVE
0019    PNTTM   .EQU    25              ;
E099    TXDACT  .EQU    PNTACT+1        ; 8MS. TRANSMIT DELAY IS ACTIVE
E09A    UD1ACT  .EQU    TXDACT+1        ; USER DELAY 1 ACTIVE
E09B    UD1ADD  .EQU    UD1ACT+1        ; USER DELAY 1 ADDRESS
E09D    UD2ACT  .EQU    UD1ADD+2        ; USER DELAY 2 ACTIVE
E09E    UD2ADD  .EQU    UD2ACT+1        ; USER DELAY 2 ADDRESS
        ;*************************************************************
        ;
        ;       I N T E R R U P T   M A S K
        ;
        ;*************************************************************
E0A0    INTMSK  .EQU    UD2ADD+2        ; INTERRUPT MASK
        ;
0001    INTCM   .EQU    01H             ; INT. 0 COMM MASK
0002    INTIM   .EQU    02H             ; INT. 1 INTERNAL MODEM
0004    INTDP   .EQU    04H             ; INT. 2 DUAL RS-232-C PORT MASK
0008    INTPP   .EQU    08H             ; INT. 3 PARALLEL PORT/FIXED DISK MASK
```

4.3.3.3 (Contd)

```
0010    INTTP   .EQU   10H          ; INT. 4 TOUCHPANEL MASK
0020    INTKB   .EQU   20H          ; INT. 5 KEYBOARD MASK
0040    INTTM   .EQU   40H          ; INT. 6 TIMER MASK
0080    INTPE   .EQU   80H          ; INT. 7 PARITY ERROR
        ;*************************************************************
        ;
        ;       K E Y B O A R D   T A B L E
        ;
        ;*************************************************************
E0A1    KNSNC   .EQU   INTMSK+1     ; ADDRESS OF NO SHIFT, NO CONTROL TABLE
E0A3    KSNC    .EQU   KNSNC+2      ; ADDRESS OF SHIFT, NO CONTROL TABLE
E0A5    KNSC    .EQU   KSNC+2       ; ADDRESS OF NO SHIFT, CONTROL TABLE
E0A7    KSC     .EQU   KNSC+2       ; ADDRESS OF SHIFT, CONTROL TABLE
        ;*************************************************************
        ;
        ;       D I S P L A Y   R A M
        ;
        ;*************************************************************
E0A9    ATTRIB  .EQU   KSC+2        ; ATTRIBUTES WORD
        BLANK   .EQU   01H          ;   2**0=BLANK
        UNDLN   .EQU   02H          ;   2**1=UNDERSCORE
        INVERS  .EQU   04H          ;   2**2=INVERSE
        BLINK   .EQU   08H          ;   2**3=BLINK
        DIM     .EQU   10H          ;   2**4=DIM
        MODIFY  .EQU   20H          ;   2**5=MODIFIED DATA
        VALID   .EQU   40H          ;   2**6=VALIDATE CHARACTER
        PROTD   .EQU   80H          ;   2**7=PROTECT
E0AA    ATTSAV  .EQU   ATTRIB+1     ; A PLACE TO SAVE ATTRIB
E0AB    BLKMD   .EQU   ATTSAV+1     ; BLOCK MODE ACTIVE
E0AC    BLKSND  .EQU   BLKMD+1      ; BLOCK SEND ACTIVE
E0AD    BSCRPE  .EQU   BLKSND+1     ; BACKSPACE CURSOR IN PARAMETER ENTRY
        ;                             MODE
E0AE    CCDSR   .EQU   BSCRPE+1     ; CURRENT COMM DSR
E0AF    CEOL    .EQU   CCDSR+1      ; 1= CLEAR TO EOL ACTIVE
E0B0    CHNCHG  .EQU   CEOL+1       ; CHANGE IN NUMBER OF CHARACTERS
E0B1    CHRCNT  .EQU   CHNCHG+1     ; CHARACTER COUNT 0-4F, 0-83
E0B2    CHRSAV  .EQU   CHRCNT+1     ; A PLACE TO SAVE CHARACTER COUNT
E0B3    CLRTYP  .EQU   CHRSAV+1     ; TYPE OF CLEAR
        ;                             00= ALL
        ;                             02= UNDERSCORE
        ;                             08= BLINK
        ;                             10= DIM
        ;                             1F= NORMAL
E0B4    COMPNT  .EQU   CLRTYP+1     ; COMM PRINT ACTIVE
E0B5    CONT    .EQU   COMPNT+1     ; 1=CONTROL KEY ACTIVE
```

4.3.3.3 (Contd)

```
E0B6    CPSLK   .EQU    CONT+1      ; 0=CAPS LOCK NOT ACTIVE
E0B7    CURSOR  .EQU    CPSLK+1     ; CURSOR ADDRESS
E0B9    DLMENA  .EQU    CURSOR+1    ; DELIMITER ENABLED
E0BA    DRVADD  .EQU    DLMENA+1    ; 0= DRIVER NOT LOADED, ELSE ADDRESS OF
        ;                             DRIVER
E0BC    DSPDIS  .EQU    DRVADD+2    ; DISPLAY DISABLED
E0BD    ERROR   .EQU    DSPDIS+1    ; 2**0 = SECURITY CODE INCORRECT
E0BE    FLAG1   .EQU    ERROR+1     ; FLAG WORD 1
        STOCR   .EQU    01H         ; 2**0 SEND TOP TO CURSOR
        AUTOFT  .EQU    02H         ; 2**1 AUTO FIELD TABBING
        CBLKMD  .EQU    04H         ; 2**2 CLEAR KEY TO EXIT BLOCK MODE
        BAUDCH  .EQU    08H         ; 2**3 BAUD RATE HAS CHANGED
        PTXOFF  .EQU    10H         ; 2**4 PRINTER XOFF RECEIVED
        HLCDIS  .EQU    20H         ; 2**5 HOST LOADED CODES DISABLE
        PNTBLD  .EQU    40H         ; 2**6 PRINT B IS BEING LOADED
        EXTATT  .EQU    80H         ; 2**7 EXTEND ATTRIBUTES ON CLEAR
        ;
E0BF    FLAG2   .EQU    FLAG1+1     ; FLAG WORD 2
        FLDSCR  .EQU    01H         ; 2**0 FIELD SCROLL ACTIVE
        SRDOWN  .EQU    02H         ; 2**1 SCROLL DOWN
        TABFLG  .EQU    04H         ; 2**2 TAB SEARCH FLAG
        ALLPROT .EQU    08H         ; 2**3 ALL PAGE IS PROTECTED
        OLDATT  .EQU    10H         ; 2**4 USE ODD ATTRIBUTES
        ;
E0C0    GRACHR  .EQU    FLAG2+1     ; GRAPHIC CHARACTERS
        GRCHR   .EQU    01H         ; 2**0 GRAPHIC CHR ENABLED
        RAMCHR  .EQU    02H         ; 2**1 RAM CHR ENABLED
        ;
E0C1    HDCSER  .EQU    GRACHR+1    ; HOST DEFINED CODE SEQUENCE
E0C2    HMSGA   .EQU    HDCSER+1    ; HOST MESSAGE ACTIVE
E0C3    HMSGSV  .EQU    HMSGA+1     ; HOST MESSAGE STORAGE
        EAANSW  .EQU    20H         ; 2**5 ENABLE AUTO ANSWER
        BIDACT  .EQU    40H         ; 2**6 BIDIRECTIONAL DATA ACTIVE
        SDOHLC  .EQU    80H         ; 2**7 SEND AND DO HOST LOADED CODES
E0C7    INDON   .EQU    HMSGSV+4    ; INDICATOR ON ACTIVE
E0C8    KBCODE  .EQU    INDON+1     ; KEYBOARD CODE FROM TABLE
E0C9    KBINP   .EQU    KBCODE+1    ; 1=KEYBOARD INPUT ACTIVE
E0CA    KBLKD   .EQU    KBINP+1     ; 2**0=KEYBOARD LOCKED
        ;                             2**1=COMM LOCKED
E0CB    FLAG3   .EQU    KBLKD+1     ; NOT USED
        AAACT   .EQU    01H         ; 2**0 AUTO ANSWER ACTIVE
        BIXOFF  .EQU    02H         ; 2**1 BIDIRECTIONAL X-OFF RECEIVED
E0CC    LASTKY  .EQU    FLAG3+1     ; LAST KEY FROM KEYBOARD
E0CD    LASTLN  .EQU    LASTKY+1    ; LAST LINE, 23 OR 29
E0CE    LIGHTS  .EQU    LASTLN+1    ; CURRENT LIGHTS, 1=ON 0=OFF
```

4.3.3.3 (Contd)

```
E0B6    CPSLK   .EQU    CONT+1      ; 0=CAPS LOCK NOT ACTIVE
E0B7    CURSOR  .EQU    CPSLK+1     ; CURSOR ADDRESS
E0B9    DLMENA  .EQU    CURSOR+1    ; DELIMITER ENABLED
E0BA    DRVADD  .EQU    DLMENA+1    ; 0= DRIVER NOT LOADED, ELSE ADDRESS OF
        ;                             DRIVER
E0BC    DSPDIS  .EQU    DRVADD+2    ; DISPLAY DISABLED
E0BD    ERROR   .EQU    DSPDIS+1    ; 2**0 = SECURITY CODE INCORRECT
E0BE    FLAG1   .EQU    ERROR+1     ; FLAG WORD 1
        STOCR   .EQU    01H         ; 2**0 SEND TOP TO CURSOR
        AUTOFT  .EQU    02H         ; 2**1 AUTO FIELD TABBING
        CBLKMD  .EQU    04H         ; 2**2 CLEAR KEY TO EXIT BLOCK MODE
        BAUDCH  .EQU    08H         ; 2**3 BAUD RATE HAS CHANGED
        PTXOFF  .EQU    10H         ; 2**4 PRINTER XOFF RECEIVED
        HLCDIS  .EQU    20H         ; 2**5 HOST LOADED CODES DISABLE
        PNTBLD  .EQU    40H         ; 2**6 PRINT B IS BEING LOADED
        EXTATT  .EQU    80H         ; 2**7 EXTEND ATTRIBUTES ON CLEAR
        ;
E0BF    FLAG2   .EQU    FLAG1+1     ; FLAG WORD 2
        FLDSCR  .EQU    01H         ; 2**0 FIELD SCROLL ACTIVE
        SRDOWN  .EQU    02H         ; 2**1 SCROLL DOWN
        TABFLG  .EQU    04H         ; 2**2 TAB SEARCH FLAG
        ALLPROT .EQU    08H         ; 2**3 ALL PAGE IS PROTECTED
        OLDATT  .EQU    10H         ; 2**4 USE ODD ATTRIBUTES
        ;
E0C0    GRACHR  .EQU    FLAG2+1     ; GRAPHIC CHARACTERS
        GRCHR   .EQU    01H         ; 2**0 GRAPHIC CHR ENABLED
        RAMCHR  .EQU    02H         ; 2**1 RAM CHR ENABLED
        ;
E0C1    HDCSER  .EQU    GRACHR+1    ; HOST DEFINED CODE SEQUENCE
E0C2    HMSGA   .EQU    HDCSER+1    ; HOST MESSAGE ACTIVE
E0C3    HMSGSV  .EQU    HMSGA+1     ; HOST MESSAGE STORAGE
        EAANSW  .EQU    20H         ; 2**5 ENABLE AUTO ANSWER
        BIDACT  .EQU    40H         ; 2**6 BIDIRECTIONAL DATA ACTIVE
        SDOHLC  .EQU    80H         ; 2**7 SEND AND DO HOST LOADED CODES
E0C7    INDON   .EQU    HMSGSV+4    ; INDICATOR ON ACTIVE
E0C8    KBCODE  .EQU    INDON+1     ; KEYBOARD CODE FROM TABLE
E0C9    KBINP   .EQU    KBCODE+1    ; 1=KEYBOARD INPUT ACTIVE
E0CA    KBLKD   .EQU    KBINP+1     ; 2**0=KEYBOARD LOCKED
        ;                             2**1=COMM LOCKED
E0CB    FLAG3   .EQU    KBLKD+1     ; NOT USED
        AAACT   .EQU    01H         ; 2**0 AUTO ANSWER ACTIVE
        BIXOFF  .EQU    02H         ; 2**1 BIDIRECTIONAL X-OFF RECEIVED
E0CC    LASTKY  .EQU    FLAG3+1     ; LAST KEY FROM KEYBOARD
E0CD    LASTLN  .EQU    LASTKY+1    ; LAST LINE, 23 OR 29
E0CE    LIGHTS  .EQU    LASTLN+1    ; CURRENT LIGHTS, 1=ON 0=OFF
```

4.3.3.3 (Contd)

```
E0CF    LOCK    .EQU    LIGHTS+1    ; 1 = FIRST TIME DOWN, 2 = SECOND TIME
        ;                             DOWN
E0D0    LOCKLT  .EQU    LOCK+1      ; 0 = LOCK LIGHT OFF, 2 = LOCK LIGHT ON
E0D1    LNCNT   .EQU    LOCKLT+1    ; CURRENT LINE COUNT 0-17
E0D2    LNNCHG  .EQU    LNCNT+1     ; CHANGE IN NUMBER OF LINES
E0D3    LNSAV   .EQU    LNNCHG+1    ; A PLACE TO SAVE LINE COUNT
E0D4    LNSIZE  .EQU    LNSAV+1     ; LINE SIZE, 79 OR 131
E0D5    MLTCNT  .EQU    LNSIZE+1    ; THE COUNTER USED WHEN MULTIPLE INPUT-
        ;                             ACTIVE
E0D6    MLTACT  .EQU    MLTCNT+1    ; MULTIPLE CODE SEQUENCE ACTIVE
E0D7    MLTADD  .EQU    MLTACT+1    ; CALL ADDRESS STORED HERE
E0D9    MODEST  .EQU    MLTADD+2    ; MODE START IN CMOS OR RAM
E0DA    PCRLF   .EQU    MODEST+1    ; PRINT CR, LF
E0DB    PNTNXT  .EQU    PCRLF+1     ; THIS CODE IS TO BE PRINTED NEXT
E0DC    POSPRO  .EQU    PNTNXT+1    ; POSITION IS PROTECTED
E0DD    PRINTA  .EQU    POSPRO+1    ; 1= PRINT ALL ACTIVE
        ;                           ; 3= PRINT NORMAL ACTIVE
E0DE    PROTE   .EQU    PRINTA+1    ; PROTECT IS ENABLED
E0DF    RPTACT  .EQU    PROTE+1     ; 1=REPEAT ACTIVE
E0E0    RSRCV   .EQU    RPTACT+1    ; RS LAST CODE RECEIVED
E0E1    RXOFF   .EQU    RSRCV+1     ; RECEIVED X-OFF
E0E2    SAVEA   .EQU    RXOFF+1     ; STORAGE LOCATION A
E0E3    SAVEB   .EQU    SAVEA+1     ; STORAGE LOCATION B
E0E4    SAVEHL  .EQU    SAVEB+1     ; STORAGE LOCATION HL
E0E5    SCRSV   .EQU    SAVEHL+1    ; STORAGE LOCATION FOR SCROLL
E0E6    SHIFT   .EQU    SCRSV+1     ; SHIFT FLAG
        SFT     .EQU    01H           2**0 = SHIFT KEY 1 DOWN
        SFTLK   .EQU    02H         ; 2**1 = SHIFT LOCK ACTIVE
        SFT2    .EQU    04H         ; 2**2 = SHIFT KEY 2 DOWN
E0E7    SPFLAG  .EQU    SHIFT+1     ; 1= LINE TESTED, NOT ALL SPACES TO EOL
E0E8    SRLFST  .EQU    SPFLAG+1    ; 1ST LINE OF SCROLL FIELD . 0-17
E0E9    SRLLST  .EQU    SRLFST+1    ; LAST LINE OF SCROLL FIELD . 1-18
E0EA    STALN   .EQU    SRLLST+1    ; STATUS LINE ACTIVE
E0EB    SXOFF   .EQU    STALN+1     ; SENT X-OFF
E0EC    TABLE   .EQU    SXOFF+1     ; 0 = ADV .TBL, 1=TABLE 1, 2=TABLE 2
E0ED    TABST   .EQU    TABLE+1     ; 1 = TAB SET ACTIVE
E0EE    TIPE    .EQU    TABST+1     ; TERMINAL INSTALLATION PARA . ENTRY
E0EF    TOGAL   .EQU    TIPE+1      ; 2**4=0, 2**5=1, 2**6=TOGAL
E0F0    TXEMPF  .EQU    TOGAL+1     ; TRANSMIT EMPTY
E0F1    XPOS    .EQU    TXEMPF+1    ; X POSITION FROM COMM
E0F2    BANKS   .EQU    XPOS+1      ; CURRENT BANKS SELECTED
E0F3    T3RUN   .EQU    BANKS+1     ; TIMER 3 RUNNING
E0F4    T3TCV   .EQU    T3RUN+1     ; TIMER 3 TIME CONSTANT VARIABLE
E0F5    FNCODE  .EQU    T3TCV+1     ; FUNCTION KEY CODE TO SEND AFTER
                                      BLOCK SEND
```

4.3.3.3 (Contd)

```
E0F6    SAVECR  .EQU    FNCODE+1        ; SAVE CURSOR POSITION FOR SEND TOP TO
                                          CURSOR
E0F8    NOPTR   .EQU    SAVECR+2        ; NO PRINTER ASSIGNED
E0F9    PTSTAT  .EQU    NOPTR+1         ; PRINTER STATUS
        COMSER  .EQU    01H             ; 2**1 COMM TO SERIAL PRINTER
        COMPAR  .EQU    02H             ; 2**2 COMM TO PARALLEL ACTIVE
        LOCSER  .EQU    04H             ; 2**3 LOCAL SERIAL PRINTER
        LOCPAR  .EQU    08H             ; 2**4 LOCAL PARALLEL PRINTER
        NOPTRI  .EQU    010H            ; 2**5 NO SERIAL OR PARALLEL PRINTER
E0FA    SAVE8   .EQU    NOPTR+1         ; SAVE ALL 8 BITS OF COMM INPUT
        ;*****************************************************************
        ;
        ;       L O A D   F L A G S
        ;
        ;*****************************************************************
        ;
E0FC    LINFO   .EQU    0E03CH          ; LOAD INFO
        ASCIIL  .EQU    01H             ; ASCII LOADER
        DISKL   .EQU    02H             ; DISK LOADER
        ROML    .EQU    04H             ; ROM PACK
        RS232C  .EQU    10H             ; USING RS232C HOST INT.
        I1200   .EQU    40H             ; USING INTERNAL 1200/1200
E0FD    FILEN   .EQU    LINF0+1         ; FILE NUMBER
E0FE    MDACT   .EQU    FILEN+1         ; MODE ACTIVE
        MD      .EQU    07H             ; MODE
E0FF    ERRORF  .EQU    MDACT+1         ; ERROR FLAG
        DERROR  .EQU    01H             ; DIAGNOSTIC ERROR
        BATTL   .EQU    02H             ; BATTERY LOW
FFFF    RAMEND  .EQU    0FFFFH
```

4.3.3.4 INIT Initialization

This routine is entered after power-on or depressing of the reset switch. See paragraph 3.1 for a definition of what this routine will do.

In general INIT will:

- Set up the 8255 to have all ports as outputs.
- Set the Stack Pointer to E000 hex.
- Select Banks 0, 2, 3, 4.

4.3.3.4 (Contd)

- o Turn off alarm, enable ASCII video with internal clock, disable graphic video.
- o Move terminal installation parameters from NVM to active RAM flags.
- o Go to Test 1.
- o After returning from Test 1.
- o Select Bank 0, 2, 3, 4.
- o Clear Flags - Except LIGHTS and ERROR F.
- o Select Interrupt Mode 2.
- o Enable Timer and Keyboard Interrupt.
- o Test Error Flag
  - Go to Mode Select without clear if error set (MDSLNC).
- o Test Auto Select
  - Go to Mode Select with clear if not enabled (MODESL).
  - Go to Default mode select if set (DFMODE).

4.3.3.5 INIT00 Initialization 00

This routine is used to set up for interrupts.

In general INIT00 will:

- o Clear timer 3 of interrupts.
- o Set (T3TCV) for 8 ms time constant.
- o Call enable blink (ABLKE) output in 8255.
- o Move the interrupt trap addresses to the interrupt trap table at E100 hex.
- o Select Mode 2 interrupts.
- o Call keyboard initialization (KINIT).

4.3.3.5 (Contd)

- Set interrupt mask to allow keyboard and timer interrupts.
- Return.

4.3.3.6 INIT01 Initialization 01

This routine is used to set up the 5037 for 30 lines by 80 characters.

In general INIT01 will:

- Turn off keyboard lock light.
- Call CRT80 to select 30 lines by 80 characters.
- Select blinking, box cursor with normal background.
- Calls INIT02 to clear comm send and receive buffers. See paragraph 4.3.3.7.
- Return.

4.3.3.7 INIT02 Initialization 02

This routine is used to reset comm send and receive buffers.

In general INIT02 will:

- Clear comm send and receive buffer counts (BFCNT, TXCNT).
- Set comm send and receive buffer pointers to start (BFINAD, BFOTAD, TXINAD, TXOTAD).
- Return.

4.3.3.8 CRT80 Set CRT to 80 Char/Line

This routine is used to set up the 5037 CRT controller chip for 80 characters per line.

In general CRT80 will:

- Select 80 characters in Port C of the 8255.
- Set (LNSIZE) = 4F hex (79).
- Test (OBYTE4) for 24 or 30 lines
  - Output 7 values to the 5037 depending on 24/30 lines, (XDELTA) and (YDELTA).
- Call clear screen (CLEAR).
- Return.

4.3.3.9 CRT132 Set CRT to 132 Char/Line

This routine is used to set up the 5037 CRT controller chip for 132 characters per line.

In general CRT132 will:

- Select 132 characters in Port C of 8255.
- Set (LNSIZE) = 83 hex (131).
- Test (OBYTE4) for 24 or 30 lines
  - Output 7 values to the 5037 depending on 24/30 lines, (XDELTA) and (YDELTA).
- Call clear screen (CLEAR).
- Return.

4.3.3.10 CINIT Comm Initialization

This routine is used to select and set up the proper 8250 UART for Comm interface. There are two possible Comm interfaces.

1. The Resident Data set.
2. The 1200/1200 Auto-Dial modem.

In general CINIT will:

- First determine which interface is going to be used. If the option card is not installed for the interface selected, control is sent to Mode Not Enabled (MODENE).
- The flag (CDATAR) is set to the device number for the 8250 selected. 40 = Resident Interface, C0 = Internal Modem.
- The interrupt trap table is set to CMTRAP. The transmit baud rate is sent to the 8250. Timers 1 and 2 are set for the receive baud rate. (Needed for resident only.)
- Output to the 8250 line control register LCR to select 7/8 bits, parity enabled/disabled, parity even/odd, and 1/2 stop bits.
- Enable receive data interrupt in the 8250.
- Light or clear the DSR indicator.
- Output to the 8250 modem control register MCR to select proper data terminal ready (DTR).
- Request to send (RTS) and secondary RTS (SRTS).
- Clear interrupts in the 8250.
- Delay about one half second to allow 8250 to settle.
- Return.

4.3.3.11 KINIT Keyboard Initialization

The routine is used to set up the 8250 UART to the keyboard.

In general KINIT will:

- Clear keyboard buffer count (KBCNT).
- Set buffer in and out addresses to start (KBINAD) (KBOTAD).
- Set 8250 to 9600 baud.
- Select 8 bits, 1 stop bit, odd parity.
- Select receive data interrupt in 8250.
- Output to the modem control register to select language and alert volumn.
- Call unlock keyboard (KBDUNL).
- Select the residents keyboard tables.
- Clear interrupts.
- Return.

4.3.3.12 PINIT Printer Initialization

This routine is used to set up the proper 8250 on the Dual Serial Board to talk to a serial printer.

In general PINIT will:

- Test (CHAPAR) if printer is on Port A
  - Set (PDATAR) = 80 if Port A - Jump over Test B.
- Test (CHBPAR) if printer is on Port B
  - Set (PDATAR) = 90 if Port B.

4.3.3.12 (Contd)

- o If neither have a printer, clear printer selected flag (OBYTE1).
- o Output baud rate to selected Port.
- o Set up the Line Control Register LCR for 7/8 bits, parity enabled/disabled, paritiy even/odd and 1 stop bit.
- o Set up the modem control register MCR with DTR, RTS and Carrier On.
- o Disable interrupts in the 8250.
- o Delay 1/2 second to settle the 8250.
- o Return.

4.3.3.13 INTDIS Interrupt Disable

This routine will disable the mask for a specified interrupt.

In general INTDIS will:

- o Get the current interrupt mask.
- o Remove the proper mask bit.
- o Save new mask (INTMSK).
- o Output new mask to Port B of the 8255.
- o Return.

4.3.3.14 INTENA Interrupt Enable

This routine will enable the mask for the device specified and store the address of the trap.

In general INTENA will:

- Store DE in the proper interrupt trap table.
- Get the current interrupt mask (INTMSK).
- Add the proper bit in B.
- Save new mask (INTMSK).
- Output new mask to Port B of the 8255.
- Return.

4.3.3.15 CMTRAP Comm Interrupt Trap

This routine will input one character from the Comm 8250, test it for errors and store the proper code in the receive buffer.

In general CMTRAP will:

- Input the data from the proper Comm interface (CDATAR).
- Accept the data only if
  - Data only is active
  - DSR and CO are active
  - DSR and Constant RTS are active
  - DSR and Switched RTS and full duplex.

4.3.3.15 (Contd)

- o If a Break is received
  - Sound the alarm
  - Drop RTS if needed
  - Clear send and receive buffers.
- o Place a parity error code (FF) in buffer if
  - Overrun error
  - Parity error
  - Framing error
  - Break received.
- o Enable interrupts.
- o Return.

4.3.3.16 KBTRAP Keyboard Interrupt Trap

This routine will input one code from the keyboard 8250 UART and place it into the keyboard buffer. If code has an error status set, the code is not put into the buffer.

4.3.3.17 TMTRAP Timer Interrupt Trap

This routine is entered whenever the timer interrupt occurs. It tests to see which delays are active. It will take the appropriate action when a delay has finished. If a delay is not finished the timer will be started again.

Each delay has a flag indiciating the delay is active. The number stored in an active flag is the number of times remaining to go through the timer before the delay is finished.

4.3.3.17 (Contd)

Example: The alarm is a 250 ms delay. The timer length set by CYBER mode is 8 ms. Therefore 250 divided by 8 equals 32. 32 decimal equals 20 hex. So to sound the alarm 250 ms:

- The alarm must be turned on
- 20 stored in the active flag (ALRACT)
- The Start Timer (STTM) called.

The length of the timer can be changed by a user by storing the time constant in location (T3TCV) before calling (STTM).

Here is a list of delays and what happens when each times out.

- User delay 2 (UD2ACT) - A call is made to address stored in (UD2ADD) when finished.
- Keyboard delay (KBDACT) - This is a 1 second delay which starts the Keyboard Repeat delay when finished.
- Keyboard Repeat delay (KBRACT) - A call is made to KBDRPT to process another character, and the Repeat delay is started again.
- Alarm delay (ALRACT) - The alarm will be turned off when finished.
- Transmit delay (TXDACT) - A call is made to SENDTM to drop RTS when finished.
- Printer delay (PNTACT) - The (PNTACT) is cleared when finished.
- Pacing delay (PCDACT) - The (PCDACT) is cleared when finished.
- Break delay (BRKACT) - The Break signal is dropped from the Comm interface when finished.
- User delay 1 (UD1ACT) - A call is made to address stored in (UD1ADD) when finished.

Note: A user can call DLYEN1 or DLYEN2 to start user delays 1 or 2.

4.3.3.18 TPTRAP Touchpanel Interrupt Trap

This routine will move the cursor under the area touched and send the XY position on the Comm line.

In general TPTRAP will:

- Save all registers.
- Call TPINP - See paragraph 4.3.3.57.
- Move cursor to DE.
- Send RS, M, X, Y and CR if enabled.
- Restore all registers.
- Return.

Note: The user can call TPINP if it is not desired to move the cursor and send the XY position.

4.3.3.19 ADVCR Advance Cursor

This routine will advance the cursor to the next position.

- The alarm is sounded when the cursor enters the eighth position from end of line or last line and the margin alert is enabled.
- If cursor is at the end of line it is moved to the start of next line.
- If cursor is at the end of the last line:
  - its moved to upper left if page mode selected.
  - the screen is scrolled if scroll mode selected.

4.3.3.20 ADVMD Advanced Mode (CYBER Mode)

This is the entry point to advanced mode (CYBER Mode). It does not return if called. See the definition of CYBER Mode if needed.

4.3.3.21 ALARM Alarm for 250 ms

This routine will turn on the alarm and start the alarm delay for 250 ms.

4.3.3.22 ALARMI Alarm if Margin Bell Enabled

This routine will call ALARM if a keyboard input is active and the margin alert parameter flag is active.

4.3.3.23 BDISPN Display B

This routine will display (or process) the code in the B register. Function code will be processed.

4.3.3.24 BFTB Buffer to B

This routine will take the next code out of the Comm buffer and return with the code in the B register and interrupt disabled.

4.3.3.25 BLDADD Build Address

This routine will calculate the starting address of a line.

4.3.3.26 CLEAR Clear Screen

This routine will clear 30 lines by 132 character per line, enable the blink, and clear the attribute word. The cursor will be reset to home position.

4.3.3.27 CLREOL Clear to End of Line

This routine will clear data from current position to the end of line.

- If protect is enabled - only unprotected data is cleared.
- The background code is cleared - except in Block mode with keyboard input the modified bit is set.

4.3.3.28 CLREOP Clear to End of Page

This routine will clear data from current position to the End of Page.

- If protect is enabled - only unprotected data is cleared.
- The background code is cleared - except in Block mode with keyboard input the modified bit is set.

4.3.3.29 CRDOWN Cursor Down

This routine will move the cursor to the same relative position on the next line. If cursor is on the last line:

- Page mode - move cursor to top line.
- Roll mode - scroll screen and move cursor to start of last line.

4.3.3.30 CRGRTN Carriage Return

This routine will move the cursor to the beginning of the current line. If the Auto Line Feed parameter is active the cursor is moved to the beginning of the next line.

4.3.3.31 CRLEFT Cursor Left

This routine will move the cursor left one position. If in the first position of a line it will move to the last position of the line above. If in the first position of top line it will move to last position of last line.

4.3.3.32 CRLNFD Carriage Return Line Feed

This routine will move the cursor to the first position of current line and call CRDOWN. See paragraph 4.3.3.29.

4.3.3.33 CRUP Cursor Up

This routine will move the cursor up one line in the same relative position. If on the top line, cursor is moved to same position on bottom line.

4.3.3.34 DISPB Display the Code in B

This routine will store the code in the B register at the current cursor position and store the current attributes in the background memory:

4.3.3.34 (Contd)

- o If the current position is protected a keyboard input alarm will sound and code not stored.
- o If the graphic flag is active - 2**7 is added to codes between 20 and 3F hex.
- o If keyboard input is active the modified bit is added to the background code.

The cursor is advanced to next position if code was stored.

Note: Function codes are displayed.

4.3.3.35 DLTEN1 Delay Enable 1

This routine will save the number of times the user wants to go through the timer (8 ms if not modified) and save the address it will call when the delay is finished. When the delay is finished a call will be made to the user address and the user must do a return as soon as possible.

4.3.3.36 DLYEN2 Delay Enable 2

Sams as DLYEN1. See paragraph 4.3.3.35.

4.3.3.37 DSTRNG Data String

This routine will take data from memory starting at address in HL and call BDISPN (see paragraph 4.3.3.23). HL is incremented after each call until an FF HEX code is found.

4.3.3.38 HASCII Hex to ASCII Conversion

This routine will conver the lower 4 bits in the A register to its ASCII value.

4.3.3.39 KBDAS Keyboard to ASCII

This routine will wait for the next keyboard interrupt by calling KINPUT (see paragraph 4.3.3.41). If the code is not a Shift, Lock, or Control key the appropriate code will be taken from the keyboard table.

4.3.3.40 KBDASC Keyboard to Lower Case ASCII

This routine will select the proper code from the No Shift No Control keyboard table and return with code in A.

4.3.3.41 KINPUT Keyboard Input

This routine will loop waiting for a code in the keyboard buffer. It will input the code to register B and return.

4.3.3.42 MODENE Mode Not Enabled

This routine will display "FAILURE LOADING MODE" and display the mode selection menu.

This routine will not return, it requires the operator to fix any problem and select another mode.

4.3.3.43 PABI Port A Bidirectional

This routine will set up Port A as the bidirectional RS-232-C port. It requires HL to be present to BDATAR.

In general PABI will:

- Store 80 at (HL).
- Output baud rate to the 8250 UART.
- Set up the Line Control (LCR) for
  - 7/8 bit
  - Parity enabled/disabled
  - Parity even/odd
  - One stop bit
- Set up the Modem Control Register (MCR) with DTR, RTS and Carrier On.

4.3.3.44 PBBI Port B Bidirectional

Same as PABI except for Port B is initialized. (See paragraph 4.3.3.43.)

4.3.3.45 PRINTB Printer Code in B Register

This routine will send the code in the B register to the printer if printer is selected and the UART has a data ready. It will loop waiting for data ready.

4.3.3.46 RESET Reset Cursor

This routine will move the cursor to the upper-left or lower-left depending on the cursor home parameter.

4.3.3.47 SCROLL Scroll Screen

This routine will scroll a field. The top and bottom lines must be preset.

(SRLFST) = Top line to scroll.

(SRLLST) = Bottom line to scroll.

(FLDSCR) = Direction of Scroll 0 = scroll up, 1 = scroll down. The cursor is moved to lower left if total scroll up.

4.3.3.48 SEND Send Next Code From Comm Buffer

This routine will send one byte of data if:

- o Pacing delay not active.
- o The host has not sent an X-OFF code.
- o UART Has a data request.
- o Data only parameter active.
- o DTR and DSR and RTS and CTS are active.
  - If DSR is not active the keyboard is locked.

The routine will first send data from transmit buffer. If nothing is in the buffer the send is assumed to be a block mode send and the code is then taken from the screen.

4.3.3.49 SENDB Send the Code in B Register

This routine will place the code in the B register into the transmit buffer if online is active.

Return with NZ if local.
Return with Z if online and code is in buffer.

Before placing the code in the buffer bit 7 is cleared if space parity selected or set if mark parity selected.

Note: This routine will only send a 7-bit code. To send 8-bits see SENDB8 (paragraph 4.3.3.58).

4.3.3.50 SETDE Set Cursor to Location in DE

This routine will move the cursor to location specified by DE. D = Character Count, E = Line Count.

4.3.3.51 SETCR Set Cursor

This routine will move the cursor to the location specified by Character Count (CHRCNT) and Line Count (LNCNT).

4.3.3.52 STTM Start Timer

This routine will start the delay timer by outputing the variable count stored in (T3TCV). This location is set for 8 ms during initialization. If the timer is currently running it will not be restarted.

4.3.3.53 TABBK

This routine will move the cursor backwards to the next tab set position or to the start of the next non-dim field if protect is disabled or to the start of the next unprotected field if protect is enabled. The cursor will stop at upper-left if no found. If the cursor is at upper-left it will start search from lower-right corner.

4.3.3.54 TABFW Tab Forward

This routine will move the cursor forward to the next tab set position or to the next non-dim position following a DIM position of protect is disabled or to the next unprotected position following a protected position if protect is enabled. The cursor will be moved to upper-left if none are found.

4.3.3.55 TABCLR Tab Clear

This routine will clear the current column as a tab stop.

4.3.3.56 TABSET Tab Set

This routine will set the current column as a tab stop.

4.3.3.57 TPINP Touchpanel Input

This routine will input touchpanel data and return with the actual data in B, the character count in D and the line count in E.

4.3.3.58 SENDB8 Send the 8-Bit Code in B Register

This routine will place the code in the B register into the transmit buffer if online is active.

Return with NZ if local.

Return with Z if online and code in buffer.

4.3.3.59 MNTOR User Entry to Monitor

This entry will make one pass through the MDNITOR Routine and return. The monitor will:

- Print one character if print is active.
- Process one character if data in receive buffer.
- Process one keyboard code if data in keyboard buffer.
- Send one code if data in send buffer.
- Send one code if block mode send active.
- Update the DSR indicator.

4.3.3.60 ADVINI Advanced Mode Initialization

This routine will do the following initialization before returning:

- Clear RAM flags and host load table.
- Set up to use resident keyboard tables.
- Turn off keyboard lock light.
- Set up the 5037 according to 24/30 lines and 80/132 characters.

4.3.3.60 (Contd)

- o Select cursor type.
- o Call INIT00 (see paragraph 4.3.3.5).
- o Call INIT02 (see paragraph 4.3.3.7).
- o Call PINIT (see paragraph 4.3.3.12).
- o Select keyboard and timer interrupt masks.
- o Call CINIT (see paragraph 4.3.3.10).

4.3.3.61 KBDINP1 Keyboard Input (CYBER Mode)

This routine will process the next keyboard code using all of the CYBER mode function table.

In general it will:

- o Input the next code.
- o Convert code using tables.
- o Send the proper CYBER mode code(s) by placing them in the send buffer.
- o If half duplex - process code(s) internally.

4.3.3.62 CMTRPU Comm Interrupt Trap for User

This routine does the same as CMTRAP (see paragraph 4.3.3.15) except it will not enable interrupts before returning.

4.3.3.63 KBTRPU Keyboard Interrupt Trap for User

The routine is the same as KBTRAP (see paragraph 4.3.3.16) except it will not enable interrupts before returning.

4.3.3.64 TMTRPU Timer Interrupt Trap for User

This routine does the same as TMTRAP (see paragraph 4.3.3.17) except registers must be saved before calling and it will not enable interrupts before returning.

4.3.3.65 TPTRPU Touchpanel Interrupt Trap for User

This routine does the same as TPTRAP (see paragraph 4.3.3.18) except it will not enable interrupts before returning.

4.3.3.66 TIPRAM Move Terminal Installation Parameters to RAM

This routine will move the terminal installation parameters from NVM to there active locations in RAM.

Bank 6 must be selected in Block 4 and Bank 1 must be selected in Block C before calling this routine.

4.3.3.67 CRTOUT CRT Output

This routine will output seven values to the 5037 CRT controller chips. A register pair is used to point to the starting value in memory.

4.3.3.68 ADDBIS Add Bias if Enabled

This routine will add 20 HEX to register B if the bias parameter is set.

4.3.3.69 BFTDSP Process One Code from Communication Buffer

This routine will process the next code from the Comm Input Buffer.

4.3.3.70 KBDLCK Lock the Keyboard

This routine will set the keyboard locked flag and turn on the indicator.

4.3.3.71 KBDUNL Unlock the Keyboard

This routine will clear the keyboard locked flag and turn off the indicator.

4.3.3.72 PILSR Input Printers LSR

This routine will input the Line Status Resister from the RS-232-C Printer.

4.3.3.73 PRINTC Print Next Character

This routine will print the character at the cursor and advance the cursor to the next position.

4.3.3.74 PTTRAP Printer Input Trap

This routine will input data from the printer channel and test it for:

a. DC1 - XON
   Clear printer off flag

b. DC3 - XOFF
   Set printer off flag

c. Everything else is ignored

4.3.3.75 RSETXY Reset Cursor to Old XY Position

This routine will move the cursor to the positions saved by the SAVE XY routine.

4.3.3.76 SAVEXY Save Current XY Position

This routine will save the current XY position in RAM to be used later by the RSETXY routine.

4.3.3.77 TBLKKY Test for Block Mode + Keyboard Input

This routine will return with the non-zero condition active if Block Mode and Keyboard Input. Else the zero condition will be active.

4.3.3.78 REL

This location contains the ASCII code equal to the resident release level.

4.3.3.79 REV

This location contains the ASCII code equal to the residents revision number.

4.3.3.80 CK1

This location contains the checksum for chip 1.

4.3.3.81 MODESL Mode Select

This routine will display the mode selection menu.

4.3.3.82 RTNBKS

This routine will output the contents stored in (BANKS) to the bank selection register and then return.

4.3.3.83 CLINIT

This routine will light the DSR indicator if DSR is present and output the proper word to the Modem Control Register.

4.3.3.84 KBDINP2

CP/M entry to keyboard input routine. This entry will do the same as KBDINP1 (paragraph 4.3.3.61) except that it will process the code in B instead of getting a code from the keyboard buffer.

4.3.3.85 CDIAL3

This routine will switch banks and call the internal modems routine that will autodial 3.0. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.86 CDIAL4

This routine will switch banks and call the internal modems routine that will autodial 4.0. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.87 CBLDDIR

This routine will switch banks and call the internal modems routine that will build a 60 digit phone number. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.88 CTSTMD

This routine will switch banks and call the internal modems routine that will select internal modem test mode. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.89 CLWRCYB

This routine will switch banks and call the internal modems routine that will force Lower CYBER mode. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.90 HANGUP

This routine will switch banks and call the internal modems routine that will hangup the internal modem. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.91 CUSRDL

This routine will switch banks and call the internal modems routine that will autodial with user controlware. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.92 CUSRSTS

This routine will switch banks and call the internal modems routine that will return modem status. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.93 CUSRMDM

This routine will switch banks and call the internal modems routine that will set modem control parameters. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.94 CANSWR

This routine will switch banks and call the internal modems routine that will auto-answer. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.95 CANSWRB

This routine will switch banks and call the internal modems routine that will auto-answer on two rings. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.96 CADIALZ

This routine will switch banks and call the internal modems routine that will autodial using mode default parameters. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.97 CUTONE

This routine will switch banks and call the internal modems routine that will autodial using tone. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.98 CADIALY

This routine will switch banks and call the internal modems routine that will autodial using 60 digit number. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.99 CATODLX

This routine will switch banks and call the internal modems routine that will autodial. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.100 CATODLY

This routine will switch banks and call the internal modems routine that will autodial. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.101 CANSW70

This routine will switch banks and call the internal modems routine that will go off-hook. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.3.102 THANGUP

This routine will switch banks and call the internal modems routine that will hangup the line if the DCD is not active. A return is made to the caller if the internal modem is not installed. See the internal modem specification for more details on its routine.

4.3.4 Application Notes

4.3.4.1 General Guidelines

1. The listing of the firmware provides added information on entries, exits and operational details. The listing has the same part numbers as the firmware chips and is a controlled document which cannot be distributed outside Roseville Operations without approval of the Roseville General Manager or his/her designate.

2. Never read from or write into NVM directly. Always use Bank 4 parameters.

3. All user callable routines will not enable or disable interrupts (except BFTB will return with interrupts disabled).

4.3.4.1 (Contd)

4. All user callable routines will not change interrupt mask (except interrupt enable and disabled).

5. All user callable routines will return bank selects to equal the value stored in (BANKS).

6. Bank 0 must be selected in Block 0 and Bank 4 must be selected in Block C when using any callable routines.

4.3.4.2 Position the Cursor

There are many ways to position the cursor to a desired position.

1. SETDE - Place the character count in Register D, the line count in Register E and call SETDE.

2. DSTRNG - In a display string of data the X, Y positioning can be used. Example using a system configured to small CYBER, 80 characters per line, bias off. Move cursor to line 4, character 0 and display HELP.

   ASCII - DLE, X, Y, H, E, L, P
   HEX - 10, 03, 48, 45, 4C, 50, FF

   Load (HL) with starting address of hex codes in memory and call DSTRNG.

3. CRDOWN - Call CRDOWN to do DOWN ARROW.

4. CRGRTN - Call CRGRTN to do carriage return.

5. CRLEFT - Call CRLEFT to backspace.

6. CRLNFD - Call CRLNFD to do carriage return and line feed.

7. CRUP - Call CRUP to do up arrow.

4.3.4.3 Displaying One Character

There are two ways to display a character.

1. DISPB - To display the code in B without reacting to control codes call DISPB.
2. BDISPN - To display the code in B while reacting to control codes (see table 3.9.18) call BDISPN.

4.3.4.4 Display a String of Characters

Store the message in memory, terminating it properly. Call DSTRNG.

4.3.4.5 Get One Code From Keyboard

When it has been determined there is something in the keyboard buffer:

1. KINPUT - Call this to get the raw code from the keyboard.
2. KBDAS - Call this to convert the raw code into an ASCII code.

4.3.4.6 Transmit Data

Transmitting data is a two step operation.

1. SENDB - Call this routine to place the code in Register B into the transmit buffer.
2. SEND - If there is something in the transmit buffer call this routine to send the next code if conditions are ready.

4.3.4.7 Receive Data

The initial set up has the host receive interrupt enabled. The interrupt (CMTRPU) will input one code and put it into the receive buffer.

BFTB - This route can be called to take the next code from the buffer and put it into B.

4.3.4.8 Delays

There are two user delays. A timer is run that has a user defined time constant. The user defines the number of times through the timer and the address to be called when finished.

1. The timers time constant is initialized to 8 ms. This can be changed by storing a new time constant variable at (T3TCV). Example for a 5 ms time constant: 5000 000 = 42666 · T3TCV
   117 = T3TCV

2. DLYEN1 or DLYEN2 - Call these routines with the proper register set to number of times through the timer and the proper registers set to address to call when finished.

4.4 Restrictions and Limitations

This firmware does not support the Graphic option. It is intended to have a ROM pack or external loaded controlware to support the Graphic option.

This resident firmware does not support the Graphic or IST PLATO load option. It is intended to have a ROM pack or external loaded controlware to support them.

Certain tables and variables described in paragraph 4.3 are in fixed memory locations and cannot be moved.

4.5 Reliability, Availability, and Maintainability Requirements

- Built in Tests - See paragraph 3.2 Resident Diagnostics
- Performance, Errors, Installation parameters. Aborts and recoveries are covered in each section of this ERS.
- Error/Failure Detection - Test 1 is run when unit is powered on to detect any failures. This includes running of diagnostics that are contained in a present ROM PAK. The hardware has a RAM memory parity checking circuit but it is not used in CYBER mode.
- Function Enble/Disable - All options are selectively enabled or disabled in the Parameter Selection Entry mode. See paragraph 3.3
- See hardware specification, CDC-SPEC 16042886, for the remainder of requirements. This specification is a controlled document which cannot be distributed outside Roseville Operations without the prior approval of the Roseville General Manager or his/her designate.