


**OMEGA Reference Guide  
IBM/Compatibles**

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**OSI**

**REFERENCE  
GUIDE**



ORI-3104B

**OMEGA**

Neural Cybertank  
Design and Simulation

(C) Copyright 1989 By Stuart B. Marks  
Conversion by MicroMagic

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## OSI TERMINAL STARTUP PROCEDURE

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Before you begin, you must follow the instructions below which best describe your machine's configuration.

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### HARD DRIVE OWNERS

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1. Boot your DOS from your hard disk.
  2. Place the Omega PROGRAM disk into Drive A:.
  3. At the C> prompt, type A: <Enter>
  4. At the A> prompt, type INSTALL C: <Enter> [If your hard drive is not designated as Drive C: then replace the C: in the command to your hard drive disk letter).
  5. When prompted, insert the Omega OPERATIONS disk into Drive A: and press a key.
  6. The installation process creates a subdirectory "OMEGA" in the root directory of the hard disk and copies all of the necessary files to that directory.
  7. At the C> prompt, type CD \OMEGA <Enter>
  8. Omega can now be started by typing OMEGA <Enter>
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### TWO DRIVE OWNERS

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1. Boot your DOS disk.
  2. At the A> prompt, type: DISKCOPY B: A: <Enter>
  3. When you see the prompt "Insert Source Diskette into Drive B: Insert Target Diskette into Drive A: Strike a key when ready," remove your DOS disk from Drive A:; insert a blank disk into Drive A: and insert the Omega OPERATIONS disk into Drive B: and press any key.
  4. When the copy is completed, you will be left at the A> prompt.
  5. At the A> prompt, type MAKEUSER <Enter>
  6. After a brief disk access, remove the disk from Drive A: This disk is now your personal User Disk This disk should be used as ~~your personal ID disk~~ while playing
  7. Insert the Omega PROGRAM disk into Drive A: and type: OMEGA <Enter>
  8. When prompted for the OPERATIONS disk, remove the PROGRAM disk from Drive A:; Insert the Omega OPERATIONS disk into Drive A: and insert your personal User Disk into Drive B:
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**ONE DRIVE OWNERS**


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1. Boot your DOS disk.
2. At the A> prompt, type: **DISKCOPY A: A: <Enter>**
3. When prompted for the source diskette, insert the Omega OPERATIONS diskette into Drive A:
4. When prompted for the target diskette, insert a blank disk into Drive A:
5. Repeat steps 3-4 until the disk copy is completed. This will leave you at the A> prompt.
6. At the A> prompt, type ONEDRIVE <Enter>
7. After a brkf disk access, remove the disk from Drive A: This disk is now your personal User disk. This disk should be used as ***your personal ID disk while playing.***
8. Insert the Omega PROGRAM disk into Drive A: and type: OMEGA <Enter>
9. When prompted, insert the Omega OPERATIONS disk into Drive A:
10. When prompted for the User disk, insert your personal User disk into Drive A:

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**3.5" DISK USERS**


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1. Boot your DOS disk.
2. At the A> prompt, type: **Diskcopy A: A: <ENTER>**
3. **When prompted** for source diskette, insert the Omega disk
4. When prompted for the target diskette, insert a blank disk into Drive A:
5. Repeat stages 3 & 4 until the disk copy is completed. This will leave you at the A> prompt.
6. With your COPY of the Omega disk in drive A:, type: **MAKEUSER <ENTER>** at the A> prompt.
7. When the prompt reappears, the installation is finished. This disk is now your Personal UserID and Omega disk. This disk should be used as your play disk for Omega.
8. To start the game, leave your disk in drive A: and type: Omega <ENTER>

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**SECTION 1**


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**OSI/CACD SYSTEM 2 ENVIRONMENT**


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**1.1 Interface Devices**

The OSI/CACD System 2 incorporates the latest in human interface technology. The system is designed to work efficiently when using a mouse, joystick or keyboard interface.

**1.2 The Pointer**

The pointer is a hand-shaped object that is moved about the screen with a mouse, joystick or keyboard. It is used to point at items you wish to select.

**1.3 Clicking**

Selections are often made by moving the pointer to the desired object or option, then pressing and releasing the button. This is referred to as clicking. The same can be done with the keyboard by moving the pointer to the desired object or option and pressing the Enter key.

**1.4 Dragging**

**Another method** of designating choices is by dragging. To drag, place the pointer over the desired object then press and **hold the** button while moving the pointer to another location. Releasing the button completes the drag.

**1.5 Pull-down Menus**

Along the top of the screen is the menu bar. To pull down a menu, place the pointer over the menu title and press and **hold** the button. This reveals a list of menu items. To select an option, drag the pointer down the list. As the pointer passes over each menu item, it is **highlighted**. When the desired item is highlighted, release the button **to select it**.

If you are using the keyboard, press the ESC key to activate the menu bar. The left and right arrows select the previous and next menu item respectively. The up and down arrows select the previous and next menu item respectively. Press the RETURN key to select the highlighted menu item. Dimmed items are not selectable. Press the ESC key to deactivate the menu bar and abort any selection.

**1.6 Dimmed Items**

Occasionally, some menu items will appear less distinct than others. These less distinct items are referred to as dimmed. Dimmed items cannot be selected.

**1.7 Special Control Keys**

To perform various actions, you will often be told to use a special key. For your particular terminal type, the keys are as follows:

<b>MARK</b>	- Ctrl-s
<b>RETURN</b>	- Return
<b>TAB</b>	- Tab
<b>DELETE</b>	- Backspace
<b>CURSOR-LEFT</b>	- Left Arrow
<b>CURSOR-RIGHT</b>	- Right Arrow
<b>CURSOR-UP</b>	- Up Arrow
<b>CURSOR-DOWN</b>	- Down Arrow
<b>CTRL-Q</b>	- Exit Current Module/Exit Omega

**1.8 Using the ESC Key**

Throughout the OSI/CACD System 2, the ESC key is used to move the pointer to various sections of the display. If there are multiple groups of items on the display, then the ESC key should be used to move the pointer to the desired section. Only when the pointer is pointing to a section can other keys be used to select individual items within the section.

**SECTION 2****OSI SECURITY ENTRANCE PROCEDURE****2.1 Console Button Selection Keys**

up Arrow	- Highlights the previous button on console
<b>Down Arrow</b>	- Highlights the next button on console
<b>RETURN</b>	- Selects the highlighted button on console

**2.2 Name and Password**

Backspace	- Delete character left of <b>cursor</b>
<b>TAB</b>	- Toggles between entering name and password
<b>RETURN</b>	- Begins ID Disc Imprinting Process

Note (system revision 33.783.1): Section 1.1.3 of the New Personnel Orientation guide states that you must use the SLOT button to select the location of your Employee ID Disc. Due to a recent update of the OSI/CACD System, this terminal type is equipped with a LOCATE button instead of a SLOT button. Floppy disk users may optionally click the LOCATE button to select an Employee ID File created and saved on a different disk or directory. Hard Disk users will automatically be given the selection panel to locate their Employee ID File.

**SECTION 2  
SYSTEM OPERATIONS****3.1 HOW FILES ARE STORED AND RETRIEVED****3.1.1 Drive Button**

Selecting the **DRIVE** plaque on any of the file access panels will display a list of drive letters. Select the drive letter you want to access. If no drive is designated by the selected letter, the OSI/CACD System 2 will revert to the original drive.

**3.1.2 Directory Selector**

The plaque directly over the file selection area on any of the file access panels allows you to "back-up" to any of the current directories or folders. Using this option lets you to move back to your root directory. Hard disk users should move into the Omega folder instead of the root directory to access the RESOURCE/USER folders.

**3.1.3 Folders**

The OSI/CACD System 2 allows access to subdirectories (or folders). If you select OPEN while a folder is highlighted, that folder will be opened and a list of files within that folder will be displayed.

**S.2 FILE RETRIEVAL PANEL (LOADING FILES)**

The ESC key toggles between the console buttons, the File Selection Area, and the Directory selector.

**3.2.1 Button Selection Keys**

up Arrow	- Highlights the previous button on console
<b>Down Arrow</b>	- Highlights the next button on console
<b>ESC</b>	- Moves to file selection area
<b>RETURN</b>	- Selects the highlighted button on console

**3.2.2 File Selection Keys**

up Arrow	- Highlights the previous file
Down Arrow	- Highlights the next file
ESC	- Moves to the Directory Selector

**3.2.3. Mouse/Joystick**

Click on the buttons to select. A scroll-bar has been provided for file selections. Clicking on a file name highlights the file.

**3.3 FSP: FILE STORAGE PANEL (SAVING FILES)**

The ESC key toggles between the console buttons, the File Viewing Area, and the Directory Selector.

**3.3.1 Button Selection Keys**

- U P - Highlights the previous button on console
- Down Arrow** - Highlights the next button on console
- ESC** - Moves to the File Viewing Area
- RETURN** - Selects the highlighted button on console

**3.3.2 File Viewing Keys**

- Up Arrow - Scrolls file names up
- Down Arrow - Scrolls file names down
- ESC - Moves to the Directory Selector

**3.3.3 Entering File Name**

- Backspace - Delete character left of cursor

**S.2.4 Mouse/Joystick**

Click on the buttons to select. A scroll-bar is provided to scroll through existing files.

**s . 4 FTP: FILE TERMINATION PANEL. (DELETING FILES)**

The ESC key toggles between the console buttons, the File Selection Area, and the Directory Selector.

**3.4.1 Button Selection Keys**

- Up Arrow - Highlights the previous button on console
- Down Arrow** - Highlights the next button on console
- ESC** - Moves to the File Selection Area
- RETURN** - Selects the highlighted button on console

**S.4.2 File Selection Keys**

- Up Arrow - Highlights the previous file
- Down Arrow** - Highlights the next file
- ESC** - Moves to the Directory Selector

**S.4.S Mouse/Joystick**

Click on the buttons to select. A scroll bar is provided for file selections. Clicking on a file name highlights the file.

**SECTION 4****DESIGN CONTROL MODULE (DCM)****4.1 CHASSIS DESIGN MODULE (CDM)****4.1.1 Category Selection Keys**

- Up Arrow - Selects the previous category
- Down Arrow - Selects the following category
- RETURN** - Selects the highlighted category
- Left Arrow - Moves to the Component Selection Area.

**4.1.2 Component Selection Keys**

- U P - Highlights the previous component
- Down Arrow** - Highlights the following component
- RETURN** - Selects the highlighted component
- Right Arrow** - Moves to the Category Selection Area

**4.1.3 Mouse/Joystick**

Clicking on a category or component button selects that particular category or component.

**4.2 THE AI MODULE**

Note: The ESC key acts as the area control key. When the AI Module is entered, the area control key is pointing to the Edit window. Press ESC to activate the menu bar. Press again to activate the CP.

**4.2.1 Insertion Cursor Control Keys**

- Left Arrow - Moves insertion cursor left one character
- Right Arrow** - Moves insertion cursor right one character
- Up Arrow** - Moves insertion cursor up one line
- Down Arrow - Moves insertion cursor down one line
- PgUp - Moves insertion cursor up one page
- PgDn - Moves insertion cursor down one page
- Home - Moves insertion cursor to top of text
- End - Moves insertion cursor to bottom of text

**4.2.2 Text Selection Keys**

Ctrl-S - Toggles selection mode on/off

With selection mode on, the insertion pointer control keys select and deselect text. With selection mode off, all selected text is deselected.

**4.2.3 Text Editing Keys**

Backspace - Deletes either current text selection or one character left of insertion point

Ctrl-X - Deletes (cuts) current text selection and places the selection into temporary storage

Ctrl-C - Copies current text selection into temporary storage without removing it from current text

Ctrl-V - Pastes the text currently in temporary storage (if any) at the insertion pointer.

Ctrl-Z - Undoes the last operation.

**4.2.4 CCL Construction Panel Keys**

When using the keyboard in the AI Module, the Construction Panel (CP) is normally non-functional. Use the ESC key to move the pointer between the Editor and the CP.

ESC - CONNECT key to toggle between the AI Editor, the CP, and the menu bar

Left Arrow - Highlight the plaque left of current selection

Right Arrow - Highlight the plaque right of current selection

Up Arrow - Highlight the plaque above current selection

Down Arrow - Highlight the plaque below current selection

**RETURN** - Selects the currently highlighted plaque

When entering labels or variables in the construction panel, Backspace deletes the character to the left of the insertion cursor.

**4.2.5 Mouse/Joystick**

Clicking anywhere inside the Edit Window moves the insertion cursor to that location. Use the scroll bar to scroll text in the appropriate direction. Drag the mouse or joystick anywhere inside the Edit Window to select text.

When using the mouse or Joystick the Construction Panel (CP) is attached to the AI Editor and both can be used simultaneously. Clicking on the plaques in the CP selects that plaque. Clicking on the partially formed command (at the top of the CP) backs up to the previous plaque selections.

**4.2.6 Search/Replace**

To locate a specific word in your Cybertank's AI, place the Insertion Cursor at the beginning of your AI and select the SEARCH plaque from the CP. Enter the word you wish to locate and select the SEARCH button. If no occurrences of the specified word were found, the IC will remain at the beginning of your AI. If an occurrence was found the word will be highlighted and the following buttons displayed:

REPLACE WITH - Used to replace the highlighted word with text entered after the prompt

NEXT - Locate the next occurrence of the word specified for the search

DONE - Abandon the search and return to AI Editor.

Selecting REPLACE WITH displays the following choices.

D O W - Replaces all occurrences of the specified word with the replacement text

DO ONE - Replaces the current occurrence of the specified word with the replacement text.

SKIP - Locate the next occurrence of the specified word without changing the currently highlighted word

DONE - Abandon the search and return to AI Editor

When you have finished using Search/Replace and are ready to return to the AI Editor, select the DONE button.

**4.3 CYBERTANK AUTHORIZATION MODULE (CAM)****4.3.1 Button Selection Keys**

**Left Arrow** - Highlights the previous button on console

Right Arrow - Highlights the next button on console

**RETURN** - Selects the highlighted button on console

**4.3.2 Mouse/Joystick**

Click on the buttons to select.

**SECTION 5****SIMULATION DESIGN MODULE (SDM)****5.1 SELECT CYBERTANKS****5.1.1 Button Selection Keys**

up Arrow - Highlights the previous button

**Down Arrow** - Highlights the following button

**RETURN** - Selects the currently highlighted button

Left Arrow - Moves to File Selection Area

Right Arrow - Moves to the Other Tanks View Area

**5.1.2 File Selection Keys**

- U P - - Highlights the previous file name
- Down Arrow - Highlights the following file name
- Left Arrow** - Moves to the Directory Selector
- Right Arrow** - Moves to Button Selection Area

**5.1.3 Other Tank View Keys**

- up Arrow - Highlights the previous file name
- Down Arrow - Highlights the following file name

**5.1.4 Mouse/Joystick**

Click on the buttons to select. Click a cybertank name to highlight the cybertank to be selected. The scroll-bar is used to scroll through the cybertank names.

**5.2 SELECTION TEAMS****5.2.1 Button Selection Keys**

- U P - - Highlights the previous button
- Down Arrow - Highlights the following button
- RETURN** - Selects the currently highlighted button
- Left Arrow - Moves to the File Selection Area
- Right Arrow - Moves to the Team 2 area

**5.2.2 Available Cybertank Selection Keys**

- Up Arrow - Highlights the previous file name
- Down Arrow - Highlights the following file name
- RETURN** - Puts selected cybertank into the selected team
- Left Arrow** - Moves to the Team 1 area

**5.2.3 Mouse/Joystick**

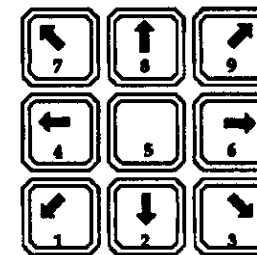
Click on the buttons to select. Click a cybertank name to highlight the cybertank to be selected. The scroll bar is used to scroll through the cybertank names.

**5.3 POSITION HEADQUARTERS****5.3.1 Team selection Keys**

The "+" (plus) and "-" (minus) keys switch to positioning a headquarters building for the other team.

**5.3.2 Headquarters Movement Keys**

The keys on the numeric keypad are used to position the cybertanks as shown at top of following page:

**5.3.3 Mouse/Joystick**

Click on the team name to select its headquarters for movement. Click on the arrow buttons to move the currently selected team's headquarters in the direction indicated.

## SECTION 6

**COMBAT SIMULATION MODULE (CSM)****6.1 GENERAL DESCRIPTIONS****6.1.1 Simulation Action Keys**

- ESC** - Activate the menu bar
- "-" (minus)** - **Cybertank Selection** key used to switch center cybertank to previous cybertank
- "+" (plus)** - **Cybertank Selection key used** to switch center cybertank to next cybertank
- 1-9** - Switches center cybertank to corresponding cybertank number
- 0** - **Switches center cybertank to cybertank number 10**
- Shift 1-5** - Switches center cybertank to cybertank numbers 11-15 respectively
- SPACEBAR** - **PAUSE key** used to toggle pause mode on/off
- CTRL-V** - Turn **SATELLITE VIEW** on/off
- CTRL-S** - Toggle **SOUND** on/off

**6.1.2 Instrument Panel**

Fuel remaining is indicated by the color green in the Fuel Gauge. Damage in the Gauges section is indicated by the color red. The Cybertank **Direction Indicator (CDI)** use the colors blue and red. Red indicates the direction the center cybertank is currently facing, whereas blue indicates the cybertank's scanner direction. Pink indicates that both the cybertank and scanner are facing the same direction.

The Cybertank Vision Indicator (CVI) uses the colors green, pink and white. Green indicates the center cybertank. The pink box indicates the weapon range of the cybertank. White blips indicate where the last scanned enemy is in relation to the cybertank.

## 6.1 SET NUMBER OF BATTLES

### 6.2.1 Button Selection Keys

- Left Arrow** - Highlights the previous button on console
- Right Arrow** - Highlights the next button on console
- RETURN** - Selects the highlighted button on console

### 6.2.2 Number of Rattles Selection Keys

- Up Arrow** - Increases the battle count
- Down Arrow** - Decreases the battle count

Note: The number of battles can only be changed while the pointer is pointing to the number button.

### 6.2.3 Mouse/Joystick

Use the slide bar to vary the number of battles.

## 6.3 POSITION CYBERTANKS

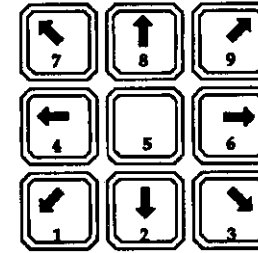
### 6.3.1 Cybertank Selection Keys

- "-" (minus)** - Selects the previous cybertank
- "+" (plus)** - Selects the following cybertank
- 1-9** - Switches center cybertank to corresponding cybertank number
- 0** - Switches center cybertank to cybertank number 10
- Shift 1-5** - Switches center cybertank to cybertank numbers 1-15 respectively

### 6.3.2 Cybertank Movement/Direction Keys

- Enter** - Toggles between selecting the cybertank's location and the direction it is to face
- ESC** - Toggles between the menus, positioning cybertanks, and selecting cybertanks.

The keys on the numeric keypad are used to position the cybertanks as shown at the top of the next page.



### 6.3.3 Mouse/Joystick

Click on the arrow buttons to move the currently selected cybertank in the direction indicated by the arrow. Click on the center dot button to toggle between location and direction selection. If you are selecting a cybertank's direction, the arrow buttons face the cybertank in the direction indicated by the arrow. To select a cybertank for positioning, simply click on its name.

## SECTION 7

# COMBAT TEST MODULE (CTM)

## 7.1 GENERAL DESCRIPTION

### 7.1.1 Simulation Action Keys

- ESC** - Activate the menu bar
- "-" (minus)** - **CYBERTANK SELECTION** key used to switch center cybertank to previous cybertank
- "+" (plus)** - **CYBERTANK SELECTION** key used to switch center cybertank to next cybertank
- 1-9** - Switches center cybertank to corresponding cybertank number
- 0** - Switches center cybertank to cybertank number 10
- Shift 1-5** - Switches center cybertank to cybertank numbers 1-15 respectively
- Ctrl-P** - **PAUSE** key to toggle single step mode on/off
- SPACE BAR** - **STEP - single** steps through the AI commands
- CTRL-V** - Turn **SATELLITE VIEW** on/off
- CTRL-S** - Toggle **SOUND** on/off
- CTRL-T** - Toggle between **TRACE** and **EDIT** modes



## 7.2 EDIT MODE

### 7.2.1 Page Select Keys

- < - View previous status page
- > - View following status page

Note: AI TRACE mode must be off to view the status pages.

### 7.2.2 Edit Register Select Keys

- RETURN** - Toggles edit mode on/off.
- up Arrow - Select the previous field to be edited
- Down Arrow - Select the following field to be edited
- BACKSPACE - Delete the last digit/character in field
- RETURN** - Accept change in field and toggle edit off

### 7.2.3 Mouse/Joystick

Click on any field to select that field and turn the editor on. Enter the new value and press RETURN.

## SECTION 8

# BATTLEFIELD DESIGN MODULE (BDM)

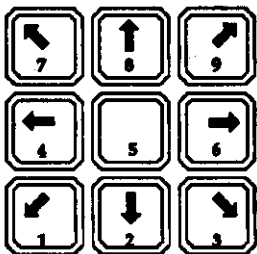
## 8.1 TILE MODE

The ESC key toggles between the Terrain Viewing Area, Menu bar, and Tile/Block Selection Area.

- CTRL-V - Turn SATELLITE VIEW on/off
- CTRL-Z - Undos the last operation.

### 8.1.1 Terrain Movement Keys

The keys on the numeric keypad are used to scroll the battlefield as shown below:



## 8.1.2 Tile Selection Keys

- I - Select the tile above the current selection
- "-" (minus) - Select the tile above the current selection
- J - Select the previous tile
- K - Select the following tile
- M** - Select the tile below the current selection
- "+" (plus) - Select the tile below the current selection

## 8.1.3 Plop Mode

- Enter - Plops the currently selected tile at the currently selected terrain location

## 8.1.4 Mouse/Joystick

Click on the scroll-bars surrounding the Battlefield Display Area to scroll the battlefield. Click on the scroll-bar directly to the right of the tile display area to scroll the tiles up and down. Click on the tile for selection. Click in the battlefield display area to plop the currently selected tile at the pointer. Dragging the pointer plops tiles as the pointer is moved.

## 8.2 BLOCKMODE

### 8.2.1 Terrain Movement Keys

The keys on the numeric keypad are used to scroll the battlefield. See DiagramsecUon8.1.1.

### 8.2.2 Block Selection Keys

- I - Select the previous block
- "-" (minus) - Select the previous block
- M - Select the following block
- "+" (plus) - Select the following block

### 8.2.3 Copy Mode

- RETURN** - Toggles the currently selected tile at the currently selected terrain location for copying
- SPACEBAR - Place the current copy selection into the selected block area.

### 8.2.4 plop Mode

- RETURN** - Plop the current block onto the battlefield

### 8.2.5 Mouse/Joystick

Click on the scroll-bars around the Battlefield Display Area to scroll. Click on the scroll-bar directly to the right of the block display area to scroll blocks up and down. Click on tiles in the battlefield to plop the current block or select tiles to be copied (whichever is selected).

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**SECTION 9****DATA DUPLICATION MODULE (DDM)**

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**9.1 GENERAL DESCRIPTIONS**

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**9.1.1 Button Selection Keys**

- Up Arrow - Highlights the previous button
- Down Arrow - Highlights the next button
- RETURN** - Selects the highlighted button
- Left Arrow - Moves to the Directory Selector
- Right Arrow - Moves to the File Selection Area

**9.1.2 File Selection Keys**

- Up Arrow - Highlights the previous file
- Down Arrow - Highlights the next file

**9.1.3 Mouse/Joystick**

Click on the buttons and file names to select. Click on the category plaques to change categories.

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**SECTION 10****FILENAME RULES**

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**10.1 GENERAL DESCRIPTIONS**

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**10.1.1 Naming Conventions**

All files used with OMEGA must follow certain naming conventions to remain functional with the OSI/CACD System 2 operating environment. In the examples below, the symbol "<name>" represents the name typed in by the user when saving a file through the File Storage Panel (FSP). All **prefixes** are attached to "<name>" by the OSI/CACD System 2 for ease of recognition. When transferring files between employees, these conventions should be adhered to:

- <name>.DSN - Cybertank designs
- <name>.TNK - Authorized cybertanks
- <name>.SIM - Simulation designs
- <name>.FLD - Battlefield designs
- <name>.BLK - Block configurations from Battlefield Design Module
- <name>.SIP - Saved simulations in progress
- <name>.EIP - Saved evaluations in progress
- <name>.CAP - Capsules



# NEW PERSONNEL ORIENTATION GUIDE

CLASSIFIED

## OMEGA

Neural Cybertank  
Design and Simulation



**DOCUMENT BRIEF**

This Orientation Guide provides an overview of security procedures and introduces the computer-aided cybertank development tools utilized by cybertank engineers.

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**INTRODUCTION**

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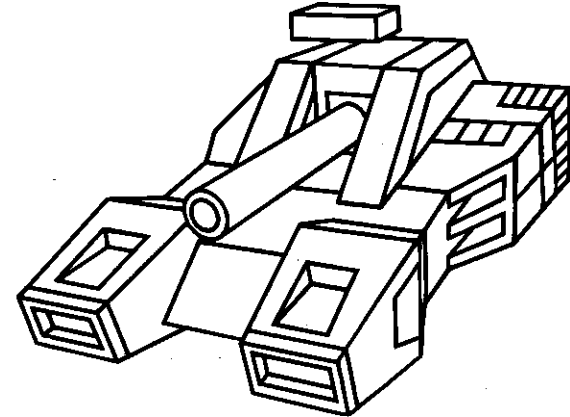


Diagram 0.1 -- Holographic cybertank

Welcome to The Organization of Strategic Intelligence (OSI), the leading developer of military and law enforcement cybernetic applications.

As a qualified cybernetics engineer, you have been assigned to an elite team involved in the critical military contract, OMEGA. This project expands the boundaries of cybernetics technology and development.

Your job is to create the most powerful cybernetic tank (cybertank) possible. You will have access to the most sophisticated computer-aided design tools available. You will design your cybertank's chassis, including its body class, drive system, fuel capacity, primary weapon and electronic instrumentation. Using the specially designed Cybertank Command language, you will design your cybertank's artificial intelligence, giving it the ability to

track down and destroy an enemy. You will then test your cybertank's performance on a simulated field of combat against cybertanks designed by Your Peers.

Your entry-level security clearance designation is STANDARD. There are ten Clearance levels within the OMEGA project. Promotions to higher levels are based on the efficiency of your cybertank designs, demonstrated in successful combat simulations (at least a 70% win ratio). You can request a formal clearance evaluation at any time. Your project director will evaluate the design of your choice, and you will be promoted if the design meets with their criteria.

Engineers with STANDARD Clearance are allocated a budget of 1000 credits. Each successive clearance level increases your budget by 1000 credits. Credits are used to purchase components for your cybertank's chassis. Thus, larger budgets provide access to the components you will need for more sophisticated designs. Employees attaining the highest clearance level will be allotted an unlimited budget, and only their cybertank designs will be considered for military applications.

As a top priority military contract, it is crucial that only the best designers be assigned to OMEGA. You are among the best in your field. Your involvement is expected to ensure that we meet and exceed project goals.

We are proud to have you as a member of our organization.

## SECTION 1 OSI SECURITY ENTRANCE PROCEDURE

### SECTION BRIEF

This section outlines procedures necessary for admittance to The Organization of Strategic Intelligence's high security complex (shown below).

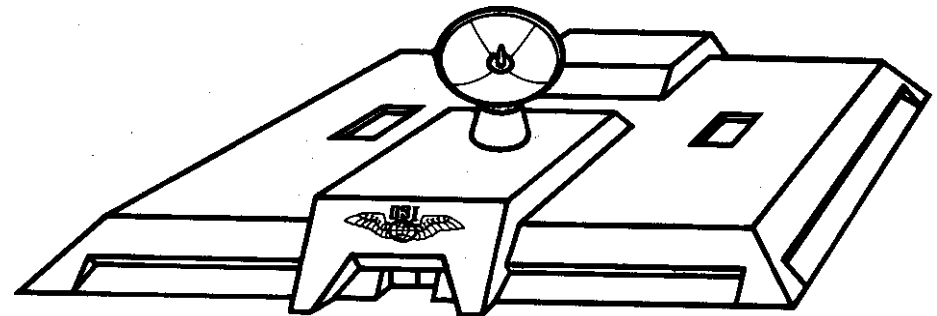


Diagram 0.2 .. OSI complex

## 1.1 NEW PERSONNEL ADMITTANCE

### 1.1.1 SECURITY ENTRANCE CONSOLE

Diagram 1.1.1 illustrates the components of OSI's Security Entrance Console located in the recess to the right, of the complex entryway.

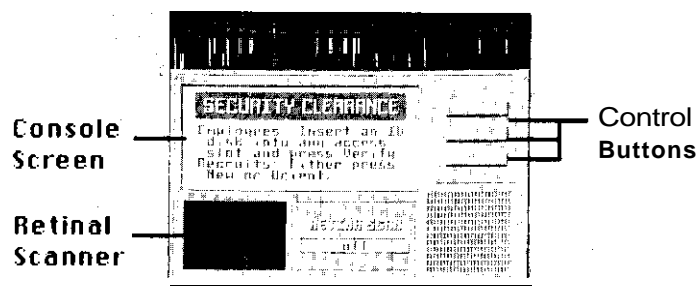


Diagram 1.1.1 -- OSI Security Gate

### 1.1.2 IO DISC

#### NOTE

Refer to subsection 1.2 "STANDARD ADMITTANCE" if you already have an imprinted ID Disc.

New personnel are required to procure a blank ID Disc (also referred to as a diskette) suitable for imprinting personal identification data. Once imprinted, your personal ID Disc is used to gain admittance to the OSI Security Complex. Your ID Disc is also used for electronic storage of all your records and files, including your current clearance level and project data. You are expected to keep your ID Disc on your person at all times.

As a new employee of OSI, the ID Disc imprinting process automatically transfers special orientation information to your ID Disc. This information will be used in conjunction with this orientation guide for demonstration purposes. If you should ever need a new ID Disc, use the NEW option.

**NOTE:** *Throughout this Orientation Guide, any specific instructions which you should follow will be set off by a ">>>" symbol. Any instructions which are preceded by this symbol should be carried out immediately.*

### 1.1.3 IO DISC IMPRINTING

>>>To imprint your personal ID Disc (also called initializing or formatting), click on the control button labeled ORIENT (refer to the OSI/CACD System 2 Reference Card for keyboard control of the security console).

>>>If your terminal is not equipped with a High Capacity Storage Device, (also known as a hard drive), then insert your blank ID Disc into any access slot (also referred to as disk drive.)

>>Click on the SLOT button to select the location of your Employee ID Disc. At this point the File Retrieval Panel (FRP) will appear. Please select the access slot containing the disc to be used for imprinting (refer to your OSI/CACD System 2 Reference Card for keyboard control of the FRP).

>>>If your terminal is equipped with a High Capacity Storage Device, then your ID information can be stored on it by selecting that device.

**NOTE:** The High Capacity Storage Device will not be imprinted (or formatted). The ID information will be placed into a separate folder, thus allowing multiple users to access the same High Capacity Storage Device. Also note that any uses of the term "ID Disc" in the OMEGA manuals refers to your ID FDLDER. All of your personnel files are stored in your ID folder.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

After selecting the ORIENT button,, one of the access slots will activate and attempt to read the disc it contains. The name of the disc (if it has one) will then appear on the console screen.

>>>Click on the SLOT button until the access slot that contains your ID Disc is activated. When the proper access slot is activated. click on the CREATE button to continue the imprinting procedure.

#### 1.1.4 NAME AND PASSWORD

>>>Enter your name and desired password when prompted to do so on the console screen.

Leave the password blank if you do not care to protect against unauthorized access to the data on your, ID Disc.

#### \*\* WARNING \*\*

Once entered, your password is inaccessible. Without your password you will not be able to use your ID Disc to gain admittance to OSI and all data stored on your ID Disc will be lost.

>>>After your name and password are entered, follow the instructions on the console screen to begin imprinting.

#### 1.1.5 RECORDING RETINA PATTERN

After the initial imprinting stage, your retina pattern is recorded for future identity verification. Admittance to OSI requires password and retina pattern verification from your imprinted ID Disc.

>>>To record your retina pattern, look into the retinal scanner (refer to Diagram 1.1.1 for location of retinal scanner on security console) and follow the instructions on the console screen.

#### 1.1.6 SUMMARY

This completes the NEW PERSONNEL ADMITTANCE procedure. Entry to OSI will be approved pending the correct execution of this procedure and the proper cross-referencing of your data with OSI's NEW PERSONNEL files.

You may skip the next subsection (1.2 STANDARD ADMITTANCE). it deals with personnel admittance using existing ID Discs.

### 1.2 STANDARD ADMITTANCE

#### 1.2.1 PERSONNEL IDENTIFICATION

##### NOTE

Refer to subsection 1.1 NEW PERSONNEL ADMITTANCE if you do not have an imprinted personal ID Disc.

Admittance to OSI requires password and retina pattern verification from your personal ID Disc.

>>>To initiate the verification process, press the VERIFY button (refer to the OSI/CACD System 2 Reference Card for keyboard control of the security console).

>>>Use the LOCATE button to select the access slot in which your ID Disc is located. If you are using a High Capacity Storage Device, then you must also select which employee is to be verified.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

After pressing the VERIFY button, the OSI/CACD System 2 will automatically search the available access slots for the presence of an ID Disc. You will be notified if an ID Disc is not found in any of the access slots.

**1.2.2 PASSWORD VERIFICATION**

>>>Enter your password when prompted to do so. Leave the password blank if you did not enter one. When your ID Disc was imprinted. Follow the instructions on the console screen to perform verification.

**1.2.3 RETINA PATTERN VERIFICATION**

Once your password has been verified, you will be prompted for retina pattern verification.

>>>Look into the retinal scanner and follow the instructions on the console screen to initiate verification.

**1.2.4 SUMMARY**

This completes the STANDARD ADMITTANCE procedure. Entry to OSI Will be approved pending the correct execution of this procedure and the verification of your password and retina pattern with that imprinted on your personal ID Disc.

---

**SECTION 2**  
**OSI/CACD SYSTEM 2 ENVIRONMENT**

---

**SECTION BRIEF**

This section briefly describes the modules comprising the OSI/CACD System 2 environment and provides a hands-on demonstration of the systems. Please consult the Engineer's Handbook for a more detailed description of these modules.

---

**2.1 GENERAL DESCRIPTION**

---

**2.1 .1 SYSTEM MODULES**

The OSI/CACD System 2 represents the latest in Computer Bided Cybertank Design. This system consists of the External Control Module, the Chassis Design Module, the Artificial Intelligence (AI) Module, the Cybertank Test Module, the Battlefield Design Module, the Combat Simulation Module, the Simulation Design Module and the Data Duplication Module.

**2.1.2 SYSTEM DEMONSTRATION**

The demonstration in this orientation guide uses a predesigned cybertank to illustrate the development of the cybertank's chassis, the artificial intelligence associated with it, and the actual combat simulation where you will witness the cybertank's performance.

---

**2.2 HUMAN INTERFACE**

---

**2.2.1 INTERFACE DEVICES**

The OSI/CACD System 2 incorporates the latest in human interface technology. The system is designed for optimum efficiency when using a mouse or joystick. The system also supports a keyboard interface.



### 2.2.2 KEYBOARD INTERFACE

The OSI/CACD interface allows Complete Control using a keyboard. Refer to the OSI/CACD System 2 Reference Card for the keyboard commands that pertain to your terminal type.

### 2.2.3 THE POINTER

The pointer is a hand-shaped object moved about the screen with a mouse or joystick. It is used to select specific items (see Oigram 2.2.6).

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

The pointer is a triangular shaped object.

### 2.2.4 CLICKING

Selections are often made by moving the pointer to the desired object or option and pressing and releasing the mouse or joystick button. This is referred to as clicking.

### 2.2.5 DRAGGING

Dragging is used to select objects or text. Place the pointer in a position marking the start or end point of the selection. Press and hold the button, and drag the pointer until you have highlighted the desired selections. Release the button.

### 2.2.6 PULL-DOWN MENUS

At the top of the screen is the menu bar (see Oigram 2.2.6). A menu is pulled down by placing the pointer over the menu title and depressing the button. This reveals a list of menu items. Menu items are selected by dragging the pointer down the list (the button must be held down). As the pointer passes over each menu item, the item is highlighted. When the desired item is highlighted, it is selected by releasing the button (see Diagram 2.2.6).

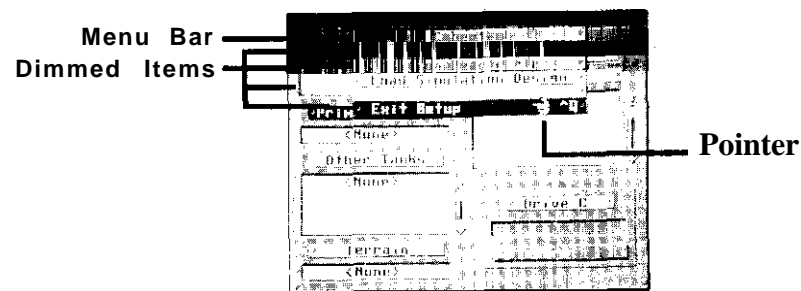


Diagram 2.2.6 – Pull-down menu with dimmed items

### 2.2.7 DIMMED ITEMS

Occasionally, some menu items appear less distinct than others. Less distinct items are referred to as dimmed. Dimmed items cannot be selected (see Diagram 2.2.6).

### 2.2.8 SUMMARY

The OSI/CACD interface is designed for ease of use. The interface is extremely intuitive and requires minimal training time. If you think something can be clicked on or pulled down, try it. You will often find that it can be.

## 2.3 THE DEMONSTRATION

### 2.3.1 EXTERNAL CONTROL MODULE

The External Control Module (ECM) should be displayed on your terminal (see Diagram 2.3.1). The ECM serves two purposes: 1) it is your link to all other OSI/CACD modules, and 2) it is your source for all OSI company announcements and world news broadcasts.

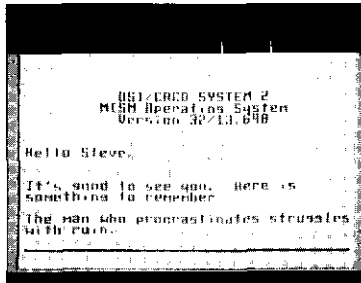


Diagram 2.3.1 -- External Control Module (ECM)

### 2.3.2 EMAIL

Important company announcements and world wide news broadcasts are distributed via electronic mail (EMAIL). The Various news wires connected to the OSI/CACD System 2 network are:

- (ANA) Rmerican News Agency
- (MER) Middle East Report
- (EPI) Eurasian Press International
- (LJS) London Journalistic Society
- (NAPS) North American Press Service
- (SDE) Soviet Data Exchange
- (GJN) Global Journalism Network

It is mandatory that all OSI personnel monitor their electronic mail messages.

### 2.3.3 DESIGN CONTROL MODULE

In this demonstration, we will bypass the creation of a cybertank and use the predesigned cybe'tank design, VIPER; however, we will step through all of the modules used in designing cybertanks.

>>>Select DESIGN CYBERTANK from the DESIGN menu to link to the Design Control Module (DCM).

From the OCM, you can. create new cybertank designs, load existing cybertank designs, delete cybertank designs from your ID Disc, or create/edit AI Capsules (see Oiaqrsm 2.3.3).

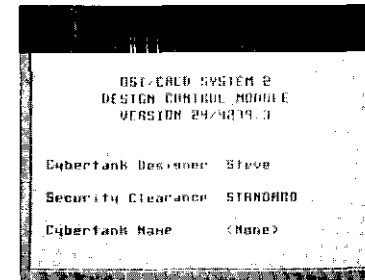


Diagram 2.3.3 -- Design Control Module (DCM)

### 2.3.4 LOAD VIPER

Chassis design is the first step in' the development of a cybertank. In this demonstration we will use the previously created cybertank design, VIPER.

#### SPECIAL NOTE

Most terminals at OSI are equipped with multiple access slots or High Capacity Storage Devices (HCSD). Special Instructtcons will appear on your screen if your terminal is equipped with only one access slot.

>>>To load VIPER, select LOAD from the CYBERTANK menu. When the FILE RETRIEVAL PANEL (FRP) appears (see Diagram 2.3.4), the SELECTION BRR will be on VIPER. Click the OPEN button to load VIPER from your ID Disc (for keyboard control of the FRP, refer to the OSI/CACD System 2 Reference Card).

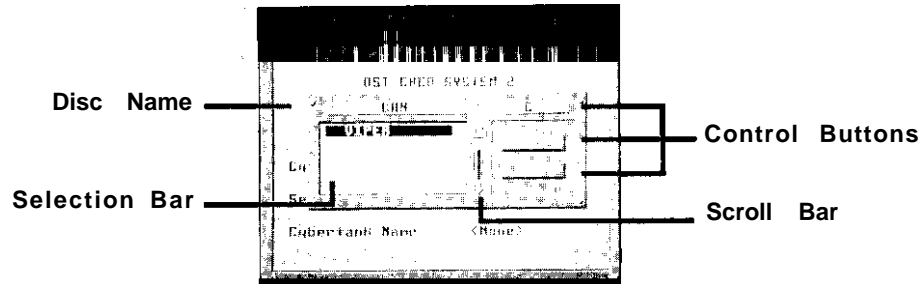


Diagram 2.3.4 -- File Retrieval Panel (FRP)

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

The File Retrieval Panel (FRP) will have a LORD button instead of an OPEN button. The LOAD button is functionally identical to the OPEN button used on other terminal types.

The FRP will also have a SLOT button instead of a DRIVE button. The SLOT button is functionally identical to the DRIVE button used on other terminal types.

### 2.3.5 ARTIFICIAL INTELLIGENCE MODULE

When you load an existing cybertank design from your ID Disc, you are automatically linked to the AI Module (see Diagram 2.3.5). This module is used to create your cybertank's brain, where you impart the analytical logic required to terminate the enemy. Language designers at OSI

have developed a special Cybertank Command Language (CCL) to facilitate the creation of AI.

>>>Displayed in the EDIT window are the opening lines of VIPER's artificial intelligence. Click on the Scroll-Bar at the right of the EDIT window (see Diagram 2.3.5) to scroll through VIPER's AI.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

>>>Instead of the Scroll-Bar, the SCROLL ARROWS at the right of the EDIT window are used to scroll through the lines of AI.

As you can see from scanning VIPER's AI, CCL comprehension is maximized by modelling it after the English language.

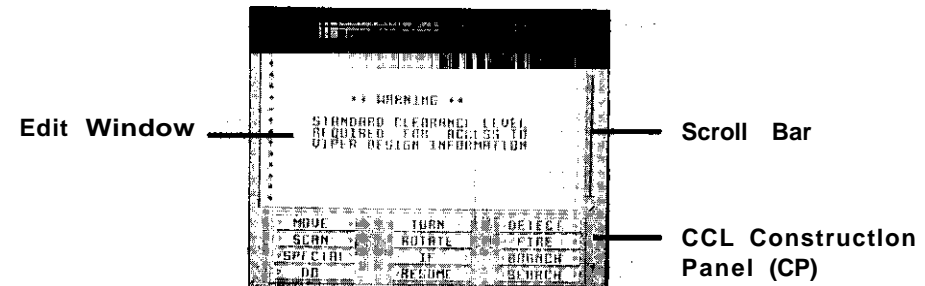


Diagram 2.3.5 -- AI Module

The AI Module contains a full-featured text editor. Commands can be entered directly from the keyboard or with the CCL Construction Panel (CP) (see Diagram 2.3.5). The CP is used to automatically and quickly construct a command line by clicking on the command buttons. Once entered, text can be edited using the cut, copy, paste, insert, or delete options.

AI design can be facilitated using predesigned AI Library

Capsules. library Capsules are self-contained segments of artificial intelligence that perform isolated functions. OSI provides a number of library Capsules that greatly simplify the task of designing your cybertank's AI. For example, instead of designing the AI that instructs your cybertank to move around an indestructible building, you can simply use one of the movement Library Capsules that instructs a cybertank to avoid obstacles.

Experiment with modifying or entering text with the CP and/or keyboard, but be careful not to save the changes to VIPER back to your ID Disc.

### 2.3.6 CHASSIS DESIGN MODULE

When creating a new cybertank, the DCM automatically links to the Chassis Design Module (CDM). In this demonstration, the cybertank design, VIPER, was loaded and the DCM automatically linked to the AI Module. The AI Module can link to the CDM in order to view or modify a cybertank's chassis.

>>>Select CHASSIS from the CYBERTANK menu to link to the Chassis Design Module.

A cybertank's chassis consists of its tank class, fuel Cells, drive system, weapon type, scanner, and assorted special items. The quality and quantity of components that can be added to your cybertank's chassis are dependent upon your budget. Engineers with STANDARD Clearance have a budget of 1000 credits. Your current budget is displayed in the CREDITS Display Area (see Diagram 2.3.6)

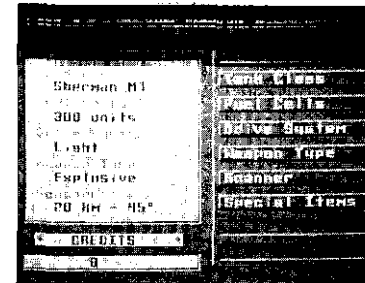


Diagram 2.3.6 -- Chassis Design Module (CDM) with VIPER loaded

VIPER's general specifications are displayed in the Main Display Area (see Diagram 2.3.6). To modify a cybertank's chassis, click the desired Component button on the right side of the screen. A list of options for that component will then be displayed.

>>Click the Weapon Type button.

A complete list of available cybertank weapons, and the cost of each, is displayed. The currently selected weapon is designated by a highlighted circle. Items which are too expensive to select will be dimmed and unselectable. Clicking on the "None" selection deselects the currently selected weapon and its cost is returned to your budget.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

A diamond appears next to the currently selected weapon. Selecting a weapon automatically subtracts that weapon's cost from your budget. Clicking on a selected weapon "deselects" it and its cost is returned to your budget. Also note that items which are too expensive are NOT dimmed.

Feel free to experiment with modifying VIPER's components, but be careful not to save the changes back to your ID Disc.

### 2.3.7 CYBERTANK AUTHORIZATION

A cybertank design must be authorized before it can be approved for combat simulations. For expedient authorization, your project directors designed the Cybertank Authorization Module (CAM). Cybertanks must have all the fundamental chassis components and be free of illegal command structure in their AI to receive authorization. Without proper authorization, cybertanks are denied access to the Combat Simulation Module. You will be informed of any cybertank design flaws during the authorization procedure.

>>>Authorization can be performed from either the CDM or the AI Module. Before authorizing VIPER, reload it to override any changes you may have made to it (for loading instructions, refer to Section 2.3.4 LOAD VIPER). If the OSI/CACD System 2 asks if you want to save the changes to VIPER, select NO. Once VIPER is reloaded, select AUTHORIZE from the CYBERTANK menu.

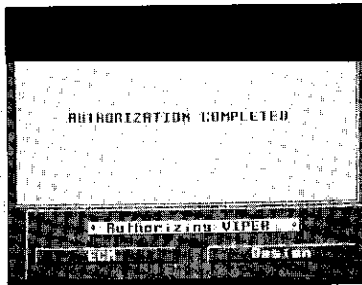


Diagram 2.3.7 -- Cybertank Authorization Module (CAM)

The CRM will be displayed on your terminal (see Diagram 2.3.7). After a brief pause, VIPER will be approved.

After authorization is complete, a cybertank design can be further edited by clicking the DESIGN button at the bottom of the screen; otherwise, as is more often the case, you can link directly back to the External Control Module by clicking the ECM button.

>>>Click the ECM button.

### 2.3.8 COMBRT SIMULATION MODULE

The efficiency of your cybertank design becomes apparent in the Combat Simulation Module (CSM). Melee (free-for-ails) or Team combats can be simulated. Team simulations offer alternate objectives: 1) Absolute Termination - destroy ail cybertanks on the opposing team, or 2) Headquarters Termination - destroy the opposing team's headquarters.

>>>A predesigned Combat simulation has been provided for your orientation. Select START SIMULATION from the SIMULATE menu. When the FRP appears, the SELECTION BRR will be on the ORIENTRT simulation. Click the OPEN button to load ORIENTRT from your ID Disc (refer to the OSI/CACD System 2 Reference Card for keyboard control of the FRP).

NOTE: For users of Commodore 64 and Rppie //+,c,e terminals only:

>>>A predesigned combat simulation has been provided for your orientation. Select START A SIMULATION from the SIMULATE menu. When the FRP appears, the SELECTION BAR will be on the ORIENTATION simulation. Click the LORD button to load ORIENTATION from your ID Disc (for keyboard control of the FRP, refer to the OSI/CACD System 2 Reference Card).

Combat begins automatically once the Preselected battlefield and cybertanks are loaded from your ID Disc. This simulation is a melee combat between VIPER and three clones of itself. The battlefield is called SMALL.

>>>Press the PAUSE key to suspend the simulation (refer to the OSI/CACD System 2 Reference Card for the appropriate key for your terminal type).

While the simulation is suspended, familiarize yourself with the Instrument Panel displayed on the right side of your terminal (see Diagram 2.3.8).

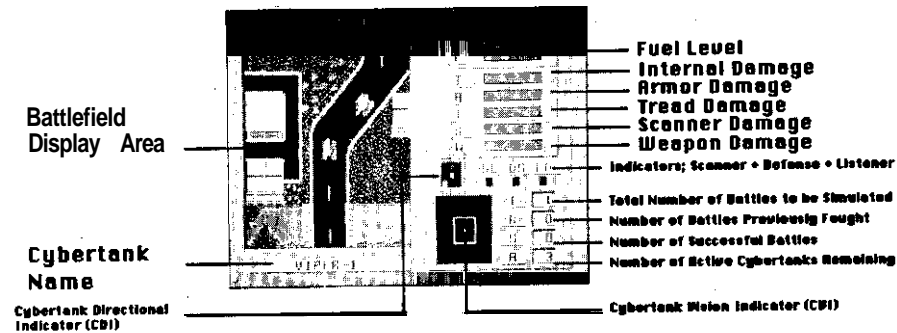


Diagram 2.3.8 - Combat Simulation Module (CSM)

The instrument panel displays your cybertank's fuel level, current damage, status of special components, scanned cybertanks, and simulation results.

The Battlefield Display Area on the left side of your terminal presents an overhead view of a portion of the battlefield. The selected cybertank is centered in the combat viewport with its name displayed below. Other cybertanks can be selected with the simulation either active or suspended. Destroyed cybertanks appear as craters or piles of junk when selected.

>>>Press the Cybertank Selection Keys on your terminal to select another cybertank for viewing (refer to the OSI/CACD System 2 Reference Card for the appropriate keys for your terminal type).

>>>Press the PAUSE key again to continue the simulation (refer to the OSI/CACD System 2 Reference Card for the

appropriate key for your terminal type).

>>>It is often necessary to see the entire battlefield at once. In order to do this, select SATELLITE VIEW from the SIMULATION menu.

A simulated transmission from the orbiting OSICOM I satellite is displayed in the combat window. Active cybertanks are indicated by the flashing blips.

Clicking the mouse button will return you to the normal combat view. This simulation can be viewed in full speed from the satellite view (i.e., the simulation does not have to be paused to view the satellite transmission.)

NOTE: For users of Commodore 64 and Apple //+,c,e terminals only:

The currently selected cybertank is surrounded by a solid box which outlines the area of the battlefield last shown in the Battlefield Display Area.

The simulation cannot be viewed in full speed from the satellite view. When the OSICOM I satellite is activated, all cybertanks will pause in their current positions and remain paused until the normal viewing mode is reactivated.

You must press a key in order to return to normal combat view.

Relax and observe the combat. Simulation times vary depending upon random positions of the cybertanks. This demonstration simulation should take from 30 to 60 seconds. You are notified when the simulation ends and the results are automatically recorded on your ID Disc. If you wish to observe another combat, select RESTART from the SIMULATION menu.

>>>When the simulation is completed and you are finished viewing the CSM, return to the ECM by selecting EXIT SIMULATION from the SIMULATION menu.

---

## 2.4 ORIENTATION SUMMARY

---

### 2.4.1 CONCLUSION

This concludes your introduction to the OSI/CACD System 2 environment. You should now be familiar with the External Control Module, the Design Control Module, the Chassis Module, the Artificial Intelligence (AI) Module, and the Combat Simulation Module.

For complete information concerning the OSI/CACD System 2 environment, refer to the **Cybertank Engineer's Handbook**. The handbook is divided into six sections. The first section is a Training Guide that covers the complete design of a cybertank. Experienced engineers may wish to skip the Training Guide and proceed directly to the reference sections. The second and third sections present detailed descriptions of the modules comprising the OSI/CACD System 2 environment and the complete structure of the Cybertank Command language. Section four explains and details how to use predefined AI library Capsules, which greatly simplify the creation of a cybertank's AI. Section five explores all of the possible combat variations and discusses such features as the communications link and manually controlled cybertanks. Section six is a trouble shooting guide.

Once again, we stress that OMEGR is a top priority military contract that pushes the limits of cybernetics technology. Please do not hesitate to express any questions or comments to your project directors. We are confident of your ability to contribute to this project and look forward to your long and productive career with the Organization of Strategic Intelligence.



Diagram 0.3 – OSI corporate logo

## The Making of OMEGA...

By the time a computer game appears on retail shelves, it shares only a few of the characteristics originally visualized by the author. OMEGA is a case in point.

OMEGA has evolved from an idea that first came to Stuart Marks in 1984. It was an idea for a game that would allow players to engineer the mobile tactics of a piece of military robotic hardware - a boat, plane or ground vehicle - and compete in simulated battle against others. "I was so fascinated by the idea," Stuart said, "that I continued refining the design and by late 1986 was calling it "Tank Battle."

By early 1987, the initial design specs included many of the features which appear in OMEGA today. Stuart had expanded the scope of the project to include battlefield, chassis and artificial intelligence design modules. But it wasn't until the Summer of 1987, after ORIGIN had agreed to publish the game, that cybernetics entered the picture.

"I can't recall the specific incident," Stuart said, "but I remember bouncing ideas back and forth with Dallas Snell, ORIGIN's Executive Producer, when the term was mentioned. We both liked the futuristic feel of "cybernetics", and "cybertank" seemed a natural fit with the direction the game was taking."

The dramatic evolution continued. "The idea of making the player an employee of the Organization for Strategic Intelligence, grew from a conversation with friends during a round of beers at a local tavern," Stuart said. "Later, Richard Garriott, the author of the Ultima series, contributed a workable method of including manual control of the cybertanks, and Paul Neurath, the author of Space Rogue, came up with the idea for team play."

The most difficult corners to turn in the development of OMEGA focused on organizing the documentation, and implementing an easy-to-use design system for novices. The manuals and tutorials were the objects of intense quality testing at ORIGIN. An Artificial Intelligence Construction Panel and pre-defined **Capsule** Routines provided an effective way of allowing non-technical players to enjoy this simulation.

Stuart Marks and the team of graphic artists, programmers, sound engineers and producers at ORIGIN, have not only turned the corners - they've been able to straighten quite a few. The result is a truly unique gaming experience -

The OMEGA Experience!

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**PART 1**  
**TRAINING GUIDE**

---

**SYNOPSIS**

This section is designed for the new employee. All new employees must read the Training Guide to develop an understanding Of design and implementation. The Training Guide covers many important topics, including the Employee Identification Disc, designing a cybertank, testing a cybertank, and the Clearance Evaluation procedure.

---

## SECTION 1 GENERAL INFORMATION

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### SECTION BRIEF

This section describes how to use the Training Guide, explains how to get started, and provides important background information.

---

### 1.1 EMPLOYEE IDENTIFICATION DISC

---

If you have not yet obtained an Employee Identification Disc (ID Disc), do so now. The procedure for creating an ID Disc is detailed in the Orientation Guide. *The remainder of this Training Guide assumes that you have read the Orientation Guide and followed its instructions.*

---

### 1.2 GETTING STARTED

---

The Training Guide is organized so that you can read it while operating your OSI/CACD terminal. For maximum training benefit, it is recommended that you work through this Training Guide while operating an OSI/CACD terminal. Follow the instructions in this guide carefully to ensure that your terminal session stays in sequence. To begin, make sure that the OSI Security Gate is showing. If not, select CALL IT A DAY from the EMPLOYEE menu, and restart OMEGA. Restarting OMEGA guarantees that your terminal is in sequence with this Training Guide.

After arriving at the OSI Security Gate, select the VERIFY button and follow the directions on the screen to gain access to OSI. After your password and retina pattern have been verified, you are transferred to the External Control Module (ECM).

---

## 1.3 SPECIAL KEYS

---

Throughout the Training Guide you will find these names used to identify special keys:

RETURN  
DELETE  
TAB  
MARK  
CURSOR-LEFT  
CURSOR-RIGHT  
CURSOR-UP  
CURSOR-DOWN

These names are always typed in UPPER CASE, as they appear above. Some terminals do not have all of these keys. Consult the OSI/CACD System 2 Reference Card to determine which keys are available for your terminal type.

## SECTION 2 DESIGNING A CYBERTANK

### SECTION BRIEF

Designing a cybertank consists of two steps: designing the chassis and designing the Artificial intelligence (AI). The term chassis refers to the cybertank's mechanical components. AI refers to commands which control the cybertank's actions via an on-board computer. This section details both aspects of cybertank design.

### 2.1 CHASSIS DESIGN AND AI DESIGN

Designing a cybertank chassis requires the selection of mechanical components from various equipment categories. These choices define the specifications for your cybertank.

Designing cybertank AI involves creating a sequence of commands for the cybertank's on-board computer. AI can be created rapidly using semicustom or full custom design techniques. Full custom design fully exploits the capabilities of the on-board computer.

### 2.2 BEGINNING THE CYBERTANK DESIGN PROCESS

To begin, select DESIGN CYBERTANK from the DESIGN menu. The OSI/CACD transfers you to the Design Control Module (DCM). Your name, your clearance level, and the name of your cybertank (currently <NONE>) are displayed on the screen (see Diagram 2.2).

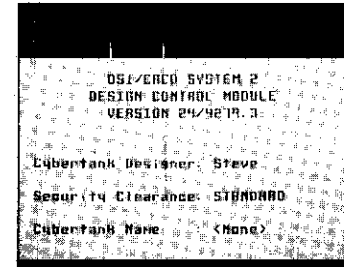


Diagram 2.2 – Design Control Module (DCM)

#### 2.2.1 The Design Control Module

The DCM is the heart of OSI/CACD System 2. As a Cybertank Engineer, you must become very familiar with this module. The DCM includes the chassis and AI design facilities.

#### 2.2.2 Creating a New Cybertank

To create a new cybertank, select NEW from the CYBERTANK menu. This allows you to name your new cybertank, and initiate its design. Every cybertank is given a code name of the designer's choosing. To maintain consistency with the Training Guide, name your initial cybertank design "ALPHA."

Your cybertank's name is entered using the File Storage Panel (FSP) now displayed on your screen (see Diagram 2.2.2). Type 'in "ALPHA", and click on the Save button (for keyboard control of the FSP, please refer to the OSI/CACD System 2 Reference Card). A place on your ID Disc is now reserved for a new cybertank design named "ALPHA."

*Note: the FSP is described in detail in Part 2, Section 9.1*

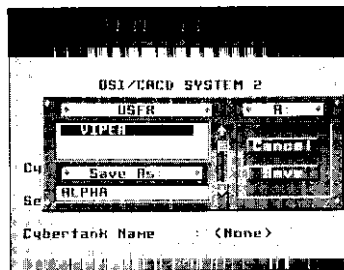


Diagram 2.2.2 -- File Storage Panel (FSP)

## 2.3 DESIGNING THE CYBERTANK'S CHASSIS

After reserving a place for ALPHA, the OSI/CACD transfers you to the Chassis Design Module (CDM). Here, you will design the chassis of your cybertank.

### 2.3.1 The Chassis Design Module Display Panel

The COM display panel is divided into three parts (see Diagram 2.3.1): the main display area, the component buttons, and the credits display area.

The main display area, located below the cybertank name plaque, displays information selected by using the component buttons at the right. Currently, ALPHA's Specifications are displayed.

To get a feel for using the COM panel, try selecting each of the component buttons. Note each button's effect as it appears on the main display area.

The Specifications button shows a summary of equipment selected for the cybertank. The other component buttons display lists of equipment for each specific component.

Each piece of equipment has an associated cost. As an engineer with STANDARD Clearance, you are allotted an initial budget of 1,000 credits. The credits display area shows the remaining balance as you choose equipment.

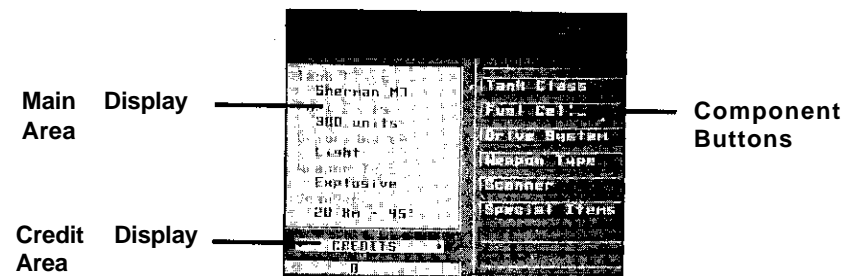


Diagram 2.3.1 -- Chassis Design Module (CDM)

### 2.3.2 Selecting Equipment

To see how equipment is chosen, select the Drive System button. The various drive systems appear in the main display area. Now, select Light as if it were a button. The small, circular button directly to the left of Light becomes highlighted and the credits area is updated accordingly.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

Instead of a small, circular indicator, a diamond appears indicating that Light has been selected. The credits display area is updated accordingly.



Now select Heavy. Notice that selecting Heavy “deselects” Light. This occurs because your cybertank can have only one drive system. Try choosing other drive systems.

The five primary equipment components are Tank Class, Fuel Cells, Drive System, Weapon Type, and Scanner. To authorize a cybertank, the cybertank must include one (and only one) choice for each component. In Special Items, you may include as many items as your budget allows (or none). Special items are optional.

### 2.3.3 Choosing ALPHA's Equipment

You are now ready to choose ALPHA's equipment. Display the various equipment by selecting the appropriate component (specified below in bold print). Then choose the item, specified in outline print, by selecting it in the main display area as if it were a button.

**Tank Class** determines the weight of the cybertank, the thickness of its armor, and other attributes (see Part 2, Section 2.3.3 for details). For ALPHA, choose the Sherman M7 Tank Class.

**Fuel Cells** provide energy for the drive system, weapon system, and scanner system. If a cybertank runs out of fuel, its mechanical functions cease operation. For ALPHA, choose 300 units of fuel.

**The Drive System** is the power plant of the cybertank. The cost (in credits) of a drive system indicates the amount of energy it can produce. For more information regarding drive systems, see Part 2, Section 2.3.5. For ALPHA, choose the Light Drive System.

**Weapon Type** determines the weapon type to be installed on the cybertank. For a discussion of Weapon Types, see Part 2, Section 2.3.6. For ALPHA, choose Explosive.

**The Scanner** is the eyes and ears of the cybertank. It detects enemy cybertanks and other objects in a wedge-

shaped area emanating from the cybertank (see Diagram 2.3.3). The length of the wedge is called the range of the scanner and is measured in hectometers (hm). The width of the wedge is called the *sweep angle* and is measured in degrees ( $^{\circ}$ ). For ALPHA, choose the 20 hm -  $45^{\circ}$  scanner.

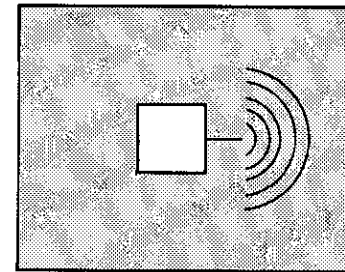


Diagram 2.3.3 - Shape of the scanner

**Special Items** provide advanced battle capabilities. They will be discussed later when you have a large enough budget to use them.

### 2.3.4 Viewing ALPHA's Specifications

Select the Specifications button to view ALPHA's specifications. The main display area should look like Diagram 2.3.4. Notice that the items you have chosen exhaust your budget of 1,000 credits.

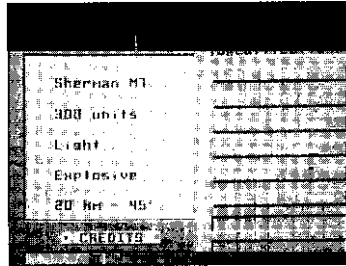


Diagram 2.3.4 – ALPHA specifications in the CDM

## 2.4 DESIGNING THE CYBERTANK'S AI

With the chassis complete, you can now design the cybertank's AI. Select AI from the CYBERTANK menu. The OSI/CACD transfers you to the Artificial Intelligence Module (AI Module). Your screen should now look like Diagram 2.4.

*Note: The CDM and AI Module are both parts of the Design Control Module (DCM). You can transfer back and forth between the two by selecting CHASSIS or AI from the CYBERTANK menu.*

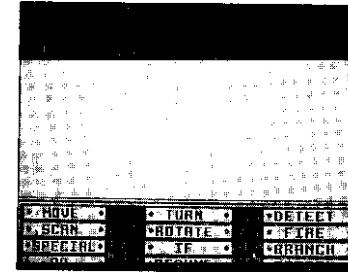


Diagram 2.4 – AI Module

The main viewing area of the screen is called the edit window. The Scroll-Bar directly to the right of the edit window is used to scroll through the lines of AI.

**NOTE:** For users of Commodore 64 and t1pple //+,c.e terminals only:

Your terminal is equipped with Multi-speed Scroll Arrows located at the right edge of the edit window. These Scroll Arrows allow you to scroll through the lines of AI at varying rates of speed.

Below the edit window is the CCL Construction Panel (C?). The CP is comprised of various plaques.

### 2.4.1 Cybertank Command language (CCL)

Cybertank AI is comprised of commands written in the Cybertank Command language (CCL), a special language developed by OSI Engineers. CCL is easily understood because it resembles the English language.

### 2.4.2 Semicustom versus Full Custom Design

There are two basic methods available for designing AI, Semicustom Design and Full Custom Design.

When using semicustom design, the designer forms the AI by piecing together predefined sequences of commands, called AI library Capsules. In full custom design, the designer enters each CCL command individually.

You will be using semicustom design for your first cybertank (ALPHA). Full custom design is discussed later in this Training Guide.

#### 2.4.3 The AI Module

The AI Module is used to enter and change AI commands. Commands can be entered by typing, or by selecting the CCL Construction Panel (CP) plaques below the edit window.

Notice the thin vertical bar in the upper left-hand corner of the edit window. It is called the Insertion Cursor (IC). It indicates where text will be inserted when you start typing.

#### 2.4.4 Entering ALPHA's AI

Type in the following lines, ending each with a RETURN:

```
Start
  Do Seek
  Do Destroy
  Branch to Start
```

Note: AI commands can be in UPPER CASE (CAPITAL) letters, lower case letters, or both.

Note: The AI Module has a built-in feature which automatically indents the next line when you press RETURN. DELETE returns-the cursor to the left margin.

#### 2.4.5 Examining ALPHA's AI

The four lines entered for ALPHA's AI embody the logic of a simple but effective AI. When ALPHA is battle activated, its on-board computer processes the AI, beginning with Start.

The first line, Start, is called a Label. A Label simply names a segment of AI. *Labels always appear on a line by*

*themselves, and always begin in the leftmost column of the edit window.*

The second line, Do Seek, instructs the on-board computer to perform a routine called Seek.

Similarly, the third line, Do Destroy, instructs the on-board computer to perform a routine called Destroy.

The last line, Branch to Start, instructs the on-board computer to branch back to the label Start before processing additional commands.

These four lines make up a common structure called a "loop." The on-board computer will "loop back" to Start after it performs Destroy, such that the on-board computer alternately performs the Seek and Destroy routines.

#### 2.4.6 Routines

A routine is a sequence of CCL commands which instruct the cybertank to Perform a particular task.

ALPHA's AI incorporates two routines: Seek and Destroy. Seek causes the cybertank to seek out an enemy. Destroy causes the cybertank to fire at the enemy until it either runs away or is destroyed.

The routines Seek and Destroy are not yet defined in your AI. Fortunately, they are both available as Library Capsules. To use these library Capsules, press RETURN and type the following two lines:

```
Include Seek
Include Destroy
```

Note: Press RETURN at the end of each line.

#### 2.4.7 Library Capsules

Library Capsules are prewritten segments of AI. A library Capsule can contain one or more routines composed of CCL

commands and are often named after the first routine they contain. This is the case with both Seek and Destroy.

The line Include Seek represents the contents of the library Capsule named Seek. You could replace Include Seek with the CCL commands from the Library Capsule "Seek" without changing the meaning of the AI.

Later in this Training Guide you are shown how to view, edit, and create Library Capsules. Part 4, "Capsule Reference," describes the Capsules available in the OSI Library.

#### 2.4.8 Saving the Cybertank Design

Your cybertank design is now ready to be saved onto your ID Disc. Before proceeding, make sure that your AI is identical to the following (no distinction is made between upper and lower case letters):

start

Do Seek  
Do Destroy  
Branch to Start

Include Seek  
Include Destroy

To save your cybertank design, select SAVE from the CYBERTANK menu. ALPHA's chassis and AI designs are now stored on your ID Disc.

## 2.5 AUTHORIZING A CYBERTANK

Your cybertank design must be authorized before it can be submitted to the Combat Simulation Module (CSM). Your design will be checked by the Cybertank Authorization Module (CAM) for any flaws; such as missing chassis components and incorrect CCL commands, as well as missing Library Capsules.

**2.5.1 Activating the Cybertank Authorization Module**  
By selecting AUTHORIZE from the CYBERTANK menu, the OS/CACD transfers you to the CRM and automatically begins the authorization Process. If there are no problems with your design, the CRM will display the message "AUTHORIZATION COMPLETE."

At this point, Select AUTHORIZE from the CYBERTANK menu to Authorize ALPHA.

**NOTE: For users of Commodore 64 and Apple //+,c,e terminals only:**

The Capsule Routines are found on the RESOURCE disc.

#### 2.5.2 Successful Authorization

After the CRM has successfully authorized your cybertank, the ECM and Design buttons appear at the bottom of your screen. The ECM button transfers you to the External Command Module (ECM). The Design button transfers you to the Design Control Module (DCM). For now, select the ECM button. When the OS/CACD System 2 asks if you want to save the changes made to ALPHA, select "YES".

#### 2.5.3 Unsuccessful Ruthorlization

If the CAM identifies a problem with your design, a message is displayed explaining the problem. If the problem is in Your chassis design, press any key. You will be transferred to the Chassis Design Module (CDM) where you can fix the cybertank's chassis.

If the Problem is in your AI design, the buttons Continue end Cancel appear at the bottom of the screen. Select the Cancel button to return to the AI Module, or select the Continue button to allow the CRM to continue searching for problems. When the CRM is finished, the OS/CACD transfers you to the AI Module where you can fix your cybertank's AI.

Some problems with AI designs discontinue the authorization of your design. If this happens, press any key and you will be transferred back to the AI Module.

---

## SECTION 3 BATTLE SIMULATION

---

### SECTION BRIEF

The combat Simulation Module (CSM) is a powerful and flexible tool used by engineers to observe cybertanks under a variety of battle conditions. This section describes how to design and conduct a battle simulation.

---

### 3.1 THE COMBAT SIMULATION MODULE

---

A maximum of 15 cybertanks can be included in a simulation. At least two cybertanks must be chosen for a simulation. One of these must be designated as the Primary Cybertank:

At the beginning of a simulation, the battle is viewed from the vantage point of the Primary Cybertank. During the simulation, the view can be changed to the vantage point of any of the other cybertanks.

The objective of every cybertank is to destroy its enemies. Its enemies usually include all of the other cybertanks in the simulation; however, the CSM has provisions for organizing cybertanks into teams. Cybertank teams are discussed in Part 2, Section 3.2.

Combat can be waged on a variety of battlefields. OSI includes three pre-designed battlefields and you can design Your own (see Part 2, Section 7). The three OSI battlefields are copied onto every ID Disc.

## 3.2 DESIGNING A BATTLE SIMULATION

Battle Simulation Design consists of the following steps:

1. Selecting a **Primary Tank**
2. Selecting the **Other Tanks**
3. Selecting a **BattleField**
4. Choosing Team8 (optional)
5. Placing Team Headquarter8 (optional)

To begin the design process, select **DESIGN A SIMULATION** from the **SIMULATE** menu. You will be transferred to the **Simulation Design Module (SDM)**.

### 3.2.1 The Simulation Design Module Display Panel

Diagram 3.2.1 illustrates the SDM display panel. The left side of the panel is comprised of four display areas. The **EMPLOYEE** display area displays your name and clearance level. The **PRIMARY TANK**, **OTHER TANKS**, and **BATTLEFIELD** display areas show your simulation specifications.

The right side of the panel is used to make selections. It is composed of a three-part display area called the **File Selection Area**, and three buttons called **Select**, **Category**, and **Drive**.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

These terminal types are equipped with a **Slot** button instead of a **Drive** button. This button allows you to use other access slots.

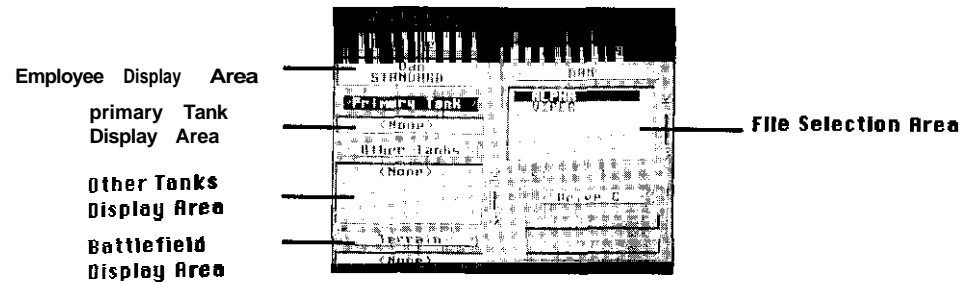


Diagram 3.2.1 Simulation Design Module (SDM)

### 3.2.2 Cybertank and Battlefield Files

The **cybertanks** and **battlefield** are selected from the current disc using the **File Selection Area** and the **Select** button as described below. You can change the current disc, which is usually your **ID Disc**, by inserting another disc into any access slot and selecting the **Slot** button until that disc is selected. The current disc's name is always displayed in the center part of the **File Selection Area**.

When selecting **Primary Tank** or **Other Tanks**, the lower part of the **File Selection Area** displays the names of the **cybertanks** on the current disc. When selecting the **Battlefield**, the names of the **battlefields** are displayed. The upper part of the **File Selection Area** displays the category: **cybertanks** or **battlefields**.

### 3.2.3 Selecting the Primary Cybertank

Examine the **File Selection Area**. Notice that the first **cybertank** is displayed in *reverse type* – it is *highlighted*.

There are two ways to change the highlighted file name. (1) If You are using a mouse or a joystick, you can select a file name by simply moving the pointer over it and pressing the

button. (2) If you are using a keyboard, use the CURSOR-UP and CURSOR-DOWN keys on your terminal. *Note: For additional information on CURSOR keys, consult the OSI/CACD System 2 Reference Card under Simulation Design Module -- File Selection Keys.*

To make a selection, simply highlight the desired cybertank or battlefield and click on the Select button. Try this now. Make ALPHA the Primary Cybertank by highlighting "ALPHA" and selecting the Select button. Notice that the PRIMARY TANK display area on the left now displays ALPHA.

### 3.2.4 Selecting Other Cybertank

Notice that the PRIMARY TANK plaque looks different than the other plaques. The color of the plaque is reversed indicating that the PRIMARY TANK category is active. Select the Category button. The OTHER TANKS plaque is now reversed indicating that OTHER TANKS is the active category. Other Cybertanks can now be selected.

Other Cybertanks are selected the same way as the Primary Cybertank. Select VIPER by highlighting "VIPER" and choosing the Select button. The OTHER TANKS display area now shows "VIPER." Select the Select button two more times. Notice that each time the button is selected, another VIPER is added to the OTHER TANKS display area. Now highlight "ALPHA" again and select the Select button.

As you can see, this simulation will include five cybertanks. The Primary Cybertank is ALPHA, and the Other Cybertanks consist of three VIPERS and one ALPHA.

*Note: Duplicate cybertanks are allowed in simulations.*

### 3.2.5 Selecting a Battlefield

Select the Category button to activate the BATTLEFIELD category. Notice that the File Selection Area now displays battlefields instead of cybertank files. Highlight HOUSTON and select the Select button. The BATTLEFIELD display area now displays HOUSTON.

### 3.2.6 Cybertank Teams

As previously mentioned, simulations can optionally involve teams of cybertanks. This is an advanced topic beyond the scope of this Training Guide. After you become familiar with standard combat, you may wish to pursue team scenarios. Cybertank Teams are discussed in Part 5, Section 2 of the Engineer's Handbook.

### 3.2.7 Saving the Simulation Design

Like cybertank designs, simulation designs have code names. For the Purposes of this Training Guide, name the simulation RLPHSIM.

Select SAVE SIMULATIONDESIGN from the DESIGN menu. The File Storage Panel (FSP) appears. Type ALPHASIM and select the Save button to save the simulation design onto your disc. You are then transferred to the ECM.

*Note: In order for the CSM to execute the simulation, the Primary Cybertank, Other Cybertanks, and the Battlefield all must be located on the same disc as that of the simulation design.*

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## 3.3 CONDUCTING A SIMULATION

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Select START A SIMULATION from the SIMULATE menu. The File Retrieval Panel (FRP) appears. Select the ALPHASIM simulation. The OSI/CACD loads the cybertanks (ALPHA and VIPER), the battlefield (HOUSTON), as specified by the simulation design, and transfers you to the CSM.

### 3.3.1 Starting a Simulation

Once transferred to the CSM, combat commences automatically. Press the PAUSE key to temporarily stop the simulation (refer to the OSI/CACD System 2 Reference Card to determine the appropriate key for your terminal type). Your screen should resemble Diagram 3.3.1.

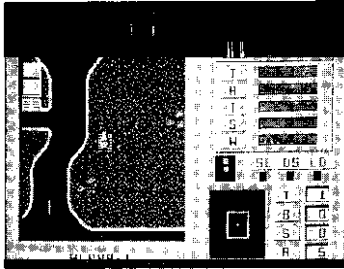


Diagram 33.1 -Combat Simulation Module (CSM)

### 3.3.2 Status Bars

A great deal of information is displayed in the CSM. The large area to the left, called the Battlefield Display Area, shows a relatively small portion of the battlefield with the Primary Cybertank, ALPHA, in the center. The instrument panel on the right contains several status displays.

There are six status bars on top of the instrument panel (status bars are summarized in Table 3.3.2). The first is the fuel gauge. The shaded section represents the fuel remaining. As fuel is consumed, this area decreases, in size. When out of fuel, the status bar is completely empty.

The other five status bars are damage indicators. Initially, each bar is empty, indicating no damage. If damage is incurred, the bar begins to fill, moving left to right. A solid bar indicates 100% damage.

### Table 3.3.2

- F - Fuel Remaining. Decreases as fuel is consumed. When the cybertank runs out of fuel, all mechanical functions cease.
- I - Internal Damage. If internal damage reaches 100%, the cybertank is totally destroyed.
- A - Armor Damage. If armor damage reaches 100%, the cybertank is totally destroyed.
- T - Tread Damage. If tread damage reaches 100%, the cybertank is immobilized.
- S - Scanner Damage. If scanner damage reaches 100%, the Cybertank Scanner System (CSS) fails and the cybertank is unable to detect cybertanks.
- W - Weapon Damage. If weapon damage reaches 100%, the Cybertank Weapon System (CWS) fails, and the cybertank is unable to fire.

### 3.3.3 Other Status Indicators

Below the six status bars, are several other indicators. These will be discussed later.

### 3.3.4 Changing the Vantage Point

*Note: This subsection contains references to the Cybertank Selection Keys. To determine which keys should be used on your terminal, refer to the OSI/CACD System 2 Reference Card under Simulation Action Keys.*

Look again at the Battlefield Display Area. The Primary Cybertank, ALPHA, is displayed in the center. Press the CYBERTANK SELECTION KEYS to change the vantage point. The vantage point shifts to the cybertank number designated by the selection key.



Our simulation includes three VIPERs and two ALPHAs. Press the CYBERTANK SELECTION KEYS and observe the battlefield from the vantage point of each of the five cybertanks. The plaque below the Battlefield Display Area shows the name of the current cybertank.

### 3.3.5 The Satellite View

The CSM can simulate a view from the OSICOM I satellite. Select SATELLITE VIEW from the SIMULATION menu to see a satellite view of the entire battlefield. The flashing blips indicate active cybertanks in the simulation. When viewing the Satellite transmission, you can observe all the cybertanks' actions. To do so, press the PRUSE key to continue the action. After watching the simulation for a while, press the PAUSE key again to pause the simulation. To exit the satellite view, simply press any key or click the mouse or joystick button.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

The square box surrounding a small portion of the battlefield represents the region currently selected in the Battlefield Display Area. Note that the cybertanks are automatically paused during the Satellite viewing mode. Simulations cannot operate while viewing the satellite transmission. Press any key to return to the close-up view.

### 3.3.6 Pausing and Resuming the Simulation

The simulator should now be paused (idle). You can resume operation by pressing the PAUSE key. The PRUSE key toggles between idle and active. Press the PRUSE key now and watch the simulation.

Experiment with the controls as you watch the simulation. Change your vantage point with the cybertank selection keys. Examine the satellite view by selecting SATELLITE VIEW from the SIMULATION menu.

### 3.3.7 End of the Simulation

The battle simulation usually continues until only one cybertank remains alive with fuel; however, if none of the cybertanks move for an extended period of time, the simulator will abort the battle, and declare it a draw. This time-out feature prevents battles from continuing even though the cybertanks cannot find and destroy each other.

When the simulation ends, a panel appears in the center of the screen displaying the message, "SIMULATION COMPLETED - PRESS ANY KEY TO CONTINUE." Press any key.

### 3.3.8 Restarting the Simulation

select RESTART THE SIMULATION from the SIMULATION menu. The cybertanks are placed at new random locations on the battlefield and the simulation begins again. To illustrate the random placement of cybertanks, select RESTBRT THE SIMULATION again and notice that ALPHA is in a different place. As you can see, a simulation can be restarted before it has ended.

### 3.3.9 Coffee Break

Congratulations. You have successfully designed and authorized a cybertank (both chassis and AI), and designed and conducted a simulation. You have completed a great deal of training in a short time, and your accomplishments have been noted. Your Supervisor says you can take a fifteen minute coffee break. At this time, select EXIT SIMULATION from the SIMULATION menu to be transferred back to the ECM.

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SECTION 4  
**BACK TO THE DRAWING BOARD**

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**SECTION BRIEF**

In this section you will return to the Design Control Module (DCM) to improve your cybertank's Artificial Intelligence (AI) through the Use of the AI Module.

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**4.1 ENTERING THE AI MODULE**

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From the ECM, select DESIGN CYBERTANK from the DESIGN menu, as you did in Section 2.0, "DESIGNING A CYBERTANK." The OSI/CACD remembers the last cybertank design worked on in the DCM, ALPHA. ALPHA's AI is automatically loaded, and you are transferred to the AI Module.

*Note: There are several instances in which the OSI/CACD will not load the cybertank design you last worked on. This usually occurs when the OSI/CACD is not able to locate the cybertank design in any of the available access slots. If ALPHA does not load automatically, you must load it manually by selecting LOAD from the CYBERTANK menu.*

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**4.2 THE AI MODULE**

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The AI Module is used to enter and modify AI designs. You can add new instructions, remove old ones, change their order, etc. The AI Module provides great flexibility for the cybertank engineer.

**4.2.1 AI Module Terminology**

The material in this section uses terminology which may or may not be familiar to you. The following definitions will aid in your understanding.

The edit window is the large area that displays the AI. Characters are letters, digits, punctuation, or spaces. Text refers to the characters within the edit window. To insert is to add characters to the text; to delete is to remove characters from the text. Editing is the process of altering the text. The Insertion Cursor (**IC**) is the thin vertical bar in the edit window.

**4.2.2 Moving the Insertion Cursor**

*you are currently in the AI Module, and ALPHA's AI is visible in the edit window.* The IC is currently in the upper left-hand corner of the edit window, next to the word "Start." The IC can be moved using either a mouse/joystick or the keyboard as discussed below.

**Using a Mouse/Joystick:** Using a mouse/joystick, move the pointer, the small triangular arrow, to a position just after the word "Start," and click. Notice that the IC has moved to the pointer's position. Move the pointer and click to move the IC anywhere in the edit window.

**Using the Keyboard:** You can move the IC with the following CURSOR keys:

The CURSOR-LEFT key normally moves the IC one character to the left. If the IC is already at the beginning of a line, CURSOR-LEFT moves it to the end of the previous line.

The CURSOR-RIGHT key normally moves the IC one character to the right. If the IC is already at the end of a line, CURSOR-RIGHT moves it to the beginning of the next line.

The CURSOR-UP key normally moves the IC to the beginning of the current line. If the IC is already at the beginning of the line, CURSOR-UP moves it to the beginning of the previous line.

The CURSOR-DOWN key normally moves the IC to the end of the current line. If the IC is already at the end of the line, CURSOR-DOWN will move it to the end of the following line.

#### 4.2.3 Inserting Text

The IC indicates the point in the text at which characters can be inserted or deleted.

Move the IC just to the right of the words "Do Seek." Now type the letters "i", "n" and "g". "Seek" becomes "Seeking." You have just inserted the three characters... i, n, and g. Type several spaces and notice how the IC moves.

Text can be inserted between any two characters. Move the IC between the letters "t" and "a" of the label "Start." Type "u" and "Start" becomes "Stuart."

#### 4.2.4 Deleting Text

Text can be removed (deleted) one character at a time using the DELETE key. Move the IC between the letters "s" and "t" of the word "Destroy" in the line "00 Destroy". Press DELETE three times. "Destroy" becomes "troy." Notice that each time you press DELETE, the character to the left of the IC is removed. The IC, and each of the characters to right of it, move left to fill in the space.

#### 4.2.5 Adding New Lines

Move the IC to the end of the text (just after the word "Destroy") and press RETURN. The IC moves to the next line. Type "New Line" and press RETURN, New lines can be added anywhere in the text.

Labels, such as "Start" (now "Stuart"), always begin in the far left column. Other lines, however, are indented. Since labels are less common than other lines, the AI Module automatically indents each new line for you when you press RETURN. Type "Other Line" and press RETURN.

To move the IC from the indentation column to the far left column (i.e., remove the indentation), press DELETE. To move

the IC from the far left column to the indentation column (i.e., indent), press TAB.

Press RETURN to skip a line. Press DELETE to move the IC to the left column. Type "Label" and press RETURN. It is a good practice to add blank lines above labels – it makes the AI easier to read.

#### 4.2.6 Double Lines

Some AI commands will not fit on a single line. *Without* pressing RETURN, type this sentence: "This is an example of a line which is too long." The AI Module automatically wraps your sentence to the next line. Notice that the continuation line is indented further than the original line. This feature also helps to make AI easier to read.

#### 4.2.7 Outgrowing the Edit Window

At present, the text you are editing fits entirely within the edit window. As you add more commands, the text will eventually outgrow the size of the edit window.

Press RETURN. Notice that the label "Stuart" is no longer on the screen. Type three or four more lines, ending each one with a RETURN. One line disappears from the top of the edit window each time a new line is added at the bottom.

Although some of your lines of AI are no longer visible, the AI Module is still keeping track of them. You can see any Part of the AI using scrolling.

#### 4.2.8 Scrolling

Scrolling can be thought of as moving the edit window up and down to examine different parts of the text. You can scroll with either a mouse/joystick or the keyboard. The two methods are discussed below.

Using a Mouse/Joystick: You can scroll the text by clicking anywhere on the scroll-bar located directly to the right of the edit window. Clicking directly on the scroll-bar will scroll the text several lines. Clicking on the small

arrows directly above and below the scroll-bar will scroll one line. By clicking on the small plaque (or "thumbprint" as it is often called), you can drag the plaque to any location in the scroll-bar. This thumbprint represents the location of the text currently visible in the edit window. For example, if the edit window is displaying the first few lines of text, then the thumbprint will be at the very top of the scroll-bar. On the other hand, if the edit window is currently displaying the last few lines of text, then the thumbprint will be at the very bottom of the scroll-bar.

NOTE: For users of Commodore **64** and Apple //+,c,e terminals only:

You can scroll the text by clicking on any of the six arrow buttons at the right side of the edit window. The upward-pointing arrows move the window toward the beginning of the text, and the downward-pointing arrows move the window toward the end. There are three sizes of arrows. The smallest arrows scroll one line. The medium arrows scroll several lines. The longest arrows scroll to the beginning (or end) of the text.

Using the Keyboard: You can always scroll text using the SCROLL keys. See the OSI/CACD System 2 Reference Card to determine which keys to use on your terminal.

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### 4.3 WORKING WITH SECTIONS OF TEXT

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The AI Module lets you modify sections of text, such as a words, lines, or paragraphs. You must first select the text. When selected, a section of text appears highlighted.

#### 4.3.1 Selecting Text

Text can be selected using either a mouse/joystick or the keyboard. The two methods are discussed below.

Using a mouse/Joystick: To select text, move the pointer to the beginning of the text you wish to select, press and hold the button down, and move the pointer to the end of the text section you wish to select. Once selected, release the button.

Using the keyboard: To select, move the IC to the beginning of the text you wish to select, press the MRRK key, then move the IC to the end of the section of text (see the OSI/CACD System 2 Reference Card to determine the MARK key for your particular terminal type).

In either case, the text is highlighted as it is selected. Try Selecting "Branch To" now.

selected text is deselected when the IC is moved. If using the keyboard, the text is not deselected until the MARK key is pressed a second time.

Experiment with selecting and deselecting words, lines, and paragraphs. Notice that you can also select text "backwards." In other words, you can begin selecting from either end of the text section.

#### 4.3.2 Deleting a Section of Text

When editing AI, you will occasionally want to delete a section of text. You could move the IC to the end of the section and press DELETE many times to remove the section, but there is an easier method.

To delete a section of text, simply select the text in the manner previously described, then press DELETE. To demonstrate, select "an example of" and press DELETE. The sentence "**This** is an **example** of a line which is too long" now reads "**This is a line which is too long.**"

#### 4.3.3 Replacing a Section of Text

It is often desirable to replace a section of text (typically a word) with something else. You could delete the old text and begin inserting new text, but, once again, there is a better method.

To replace a section of text, select it and type the replacement text. There is no need to press DELETE. For example, select "too long" and then type "short" to replace it. The sentence now reads: "This is a line which is short."

#### 4.3.4 Cutting and Pasting Text

There will also be times when you need to rearrange text. The AI Module allows a section of text to be removed (Cut) from one location and placed (Pasted) in another.

To cut, select and highlight the text. Next, select CUT from the EDIT menu. The selected text is removed from the edit window and temporarily stored internally by the AI Module.

*Note: Only the last cut or copied section of text is stored.*

To paste, move the IC to the beginning of the new location for the stored text. Select PASTE from the EDIT menu. Paste inserts the stored text at the current location of the IC.

#### 4.3.5 Copying and Pasting Text

Sometimes it is desirable to duplicate, or copy, a section of text. The AI Module allows a section of text to be Copied (without removing it) and Pasted to another place.

To Copy, select the text to be copied. Select COPY from the EDIT menu. The AI Module internally stores a copy of the selected text, *without removing the selected text* from the edit window.

To paste, move the IC to the beginning of the new location for the stored text. Select PASTE from the EDIT menu. A copy of the internally stored text is inserted at the current location of the IC. Each time you select PASTE, stored text is inserted. As you can see, it is easy to make multiple copies of a section of text.

#### 4.3.5 Undo

*Special Note: The UNDO feature is not supported on Commodore 64 and Apple //+,c,e terminals,*

There will be times when you mistakenly delete Portions of AI and your suddenly realize the error of doing so. If you immediately select the UNDO option from the EDIT menu, then your isst action will be undone. Please note that this **only works** if you immediately select UNDO.

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## 4 . 4 E D I T I N G A L P H A

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Congratulations! You now know almost everything there is to know about the AI Module and are probably curious about the plaques below the edit window. Relax. Those will be covered soon. For now, let's get on with editing ALPHA.

#### 4.4.1 Reloading ALPHA

The editing exercises you completed in previous sections left ALPHA's AI in an unusable state. Reload ALPHA's AI by selecting LOAD from the CYBERTANK menu. The File Modification Panel (FMP) appears and tells you that unsaved changes have been made to the current cybertank design. It will ask if you want to "SAVE CHANGES TO ALPHA?"

Select the No button if you select Yes, your good copy of ALPHA will be overwritten (replaced) by the edited one.

The OS/CACD always informs you of current work that has not been saved to disc. When another cybertank is loaded, it will replace whatever is currently being edited. At present, this is desired since the current design is unusable.

After selecting the Yes button, the File Retrieval Panel (FRP) appears and you can reload ALPHA.

#### 4.4.2 Replacing a Capsule

One of the advantages of semicustom design is that significant changes in the cybertank's behavior can be easily incorporated using different Library Capsules.

You may have noticed that one problem in ALPHA's behavior is that it spends so much time moving that it does not have much time to scan. The result is that ALPHA often misses "seeing" things.

The Seek routine currently used was designed to move a cybertank fairly quickly. Search, another routine available as a Library Capsule, puts more emphasis on scanning.

Modify ALPHA's AI by replacing Do Seek with Do Search. You can do this by replacing a section of tent ("Seek") as discussed in Section 4.3.3.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

Capsule Routines are found on the RESOURCE disc.

#### 4.4.3 Authorizing the new ALPHA

Each time a cybertank undergoes design modification, the changes must be authorized. Re-authorize ALPHA by selecting AUTHORIZE from the CYBERTANK menu. Oops, an error. The Cybertank Authorization Module (CAM) reports a problem: "The label SEARCH was not found in the following line: Do Search."

Select the Continue button to look for additional errors. After the CRM examines the rest of the AI, you are then transferred to the AI Module where you can make corrections to the problem.

What happened? There is nothing wrong with the command "DO Search", but the routine Search is nowhere to be found. It is only available in the Library Capsule named Search and that has not been included in ALPHA's AI. To solve the problem, replace the line "Include Seek" with the line "Include Search".

#### 4.4.4 Saving the Design As Beta

At this point, verify that ALPHA's AI is identical to the

*following.* if necessary, edit the AI to make it match. It should be pointed out that the case of the letters does not matter (i.e., START is equivalent to Start).

start

Do Search

Do Destroy

Branch to Start

Include Search

include Destroy

Before authorizing your cybertank, save it to disc. This time, select SAVE AS instead of SAVE from the CYBERTANK menu. By selecting SAVE AS, you are able to choose a new name for your cybertank design. Choose the name BETA by typing BETA and pressing RETURN. You have now created an entirely new cybertank design named BETA. Notice that the name plaque at the top of the edit window displays BETA. ALPHA has not been replaced; it is still on the disc and can be recalled at any time.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

Capsule Routines are found on the RESOURCE disc.

#### 4.4.5 Authorizing BETA

Authorize your new cybertank, BETA, by selecting AUTHORIZE from the CYBERTRNK menu. If the authorization is successful, as it should be, return to the External Control Module (ECM) by selecting the ECM button. If the authorization is unsuccessful, please refer back to Section 4.4.4 to verify your cybertank's AI.

You have now designed your first two cybertanks, ALPHA and BETA.

## SECTION 5 REVISITING THE SIMULATION

### SECTION BRIEF

This section revisits the Simulation Design Module (SDM) and discusses additional features of the Combat Simulation Module (CSM)

### 5.1 MORE ABOUT THE CYBERTANK SIMULATION

Now that you have a new cybertank, BETA, you need to design a new simulation that includes it.

#### 5.1.1 Deleting the Old Simulation Design

Simulation designs which are no longer needed can be removed from a disc to conserve space. You will not be using ALPHASIM anymore, so remove it by selecting **DELETE A SIMULATION DESIGN** from the **SIMULATE** menu. The File Termination Panel (FTP) appears. It is very similar to the File Retrieval Panel. Select ALPHASIM in the usual way and select the **Delete** button.

#### 5.1.2 Designing the New Simulation

To begin your new simulation design, select **DESIGN A SIMULATION** from the **SIMULATION** menu. Make the following selections. (If you need a review, refer back to Section 3.2).

#### PRIMARY TANK

BETA

#### OTHER TANKS

ALPHA

VIPER

#### BATTLEFIELD

HOUSTON

Select **SAVE SIMULATION DESIGN** from the **DESIGN** menu. Save the simulation under the name **BETASIM**. You are automatically transferred to the **ECM**.

### 5.2 RUNNING THE SIMULATOR

To begin the simulation, select **START R SIMULATION** from the **SIMULATE** menu. The File Retrieval Panel (FRP) appears. Select the **BETASIM** simulation to be processed. Once the cybertanks (**BETA**, **ALPHA**, and **VIPER**), and battlefield are loaded, you are transferred to the **CSM** and the simulation begins.

#### 5.2.1 The Instrument Panel

The fuel and damage indicators have already been discussed. Several other instruments and lights also appear on the instrument panel.

**SL** -Scanner Lock. This LED turns on when the cybertank locks its scanner onto an object or enemy cybertank.

**DS** -Defense Shield. This LED turns on when the cybertank raises its shield. It is off when the cybertank has its shield lowered.

**LD** -Listener Device. This LED turns on when an enemy cybertank has locked its scanner onto the cybertank.

The three lights above are used only when the cybertank is equipped with specific special items. If the cybertank is not equipped with the items, the lights are inactive.

Also on the instrument panel is the Cybertank Directional Indicator (**CDI**). This indicator is directly left of the three lights. It indicates which direction the cybertank is currently facing, and in which direction the scanner is currently facing. (For specific details on the directional indicator, see the **OSI/CACD System 2 Reference Card**).

Directly below the directional indicator is the **Cybertank Vision Indicator (CVI)** which depicts what the **scanner** is "seeing." Objects and enemy cybertanks which are scanned by the cybertank show up as blips on this indicator. (For specific details on the Cybertank Vision Indicator, see the **OSI/CACD System 2 Reference Card**.)

**Battle results** are located at the lower right side of the instrument panel. The numbers displayed are as follows:

- T - Total number of battles to be simulated
- B - Number of battles previously fought
- S - Number of successful battles
- A - Number of active cybertanks remaining

### 5.2.2 Watching the Simulation

At this Point. you Can Sit back, relax, and, watch the simulation. When YOU are finished watching the simulation, select **EXIT SIMULATION** from the **SIMULATION** menu to return to the **ECM**.

## 5.3 TIME FOR SOME R & R

**Congratulations.** You are now fully qualified to design semicustom cybertanks and simulations and your accomplishments have been noted. YOU have completed this portion of your training ahead of schedule. The Departmental Manager has granted you a two day furlough. When YOU return, YOU Will begin the final phase of your training.

## SECTION 6 FULL CUSTOM DESIGN

### SECTION BRIEF

This section describes the development of AI from the ground up. It provides information on how cybertanks operate, and are simulated. In addition, the **Cybertank Command Language (CCL)** is presented in more detail.

### 6.1 GENERAL INFORMATION

In the previous sections, cybertank AI was developed Using semicustom design techniques. Predefined sequences of CCL commands, called **Library Capsules**, were Used as building blocks in the AI construction. In this section, cybertank AI will be developed using **Full Custom Design** techniques. The AI is created entirely using individual CCL commands.

### 6.2 THE SIMULATED WORLD OF THE CSM

The CSM, like all simulators, attempts to approximate a real-world system by using an artificial model. As a cybertank engineer, it is important for YOU to Understand the specific details of that model.

#### 6.2.1 Battlefield Coordinate System

A battlefield is divided into a 64 x 64 grid of cells, each representing an area equal to one square hectometer (hm). Each cell contains one of several types of terrain, such as grass, water, trees, buildings, etc. The cells surrounding the battlefield form an impenetrable wall which mark the battlefield boundaries.

Each cell is identified by two numbers which are called its 'H' and 'Y' coordinates (see Diagram 6.2.1). The H-coordinate



specifies the cell's east-west position and ranges in value from zero (west wall) to sixty-three (east wall). Similarly, the Y-coordinate specifies the cell's north-south position and ranges in value from zero (north wall) to sixty-three (south wall). Many CCL commands use these coordinates. It should be noted that since the battlefield wall occupies the outer edges of the battlefield, employees should only be concerned with coordinate values from 1-62.

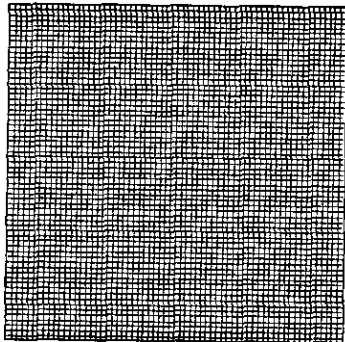


Diagram 6.2.1 -- 64 x 64 battlefield grid

### 6.2.2 The Eight Standard Directions

Diagram 6.2.2 illustrates the eight standard directions. A cybertank can move, detect obstacles, and scan in any of these eight directions. These eight directions represent the 45' angles of a circle.

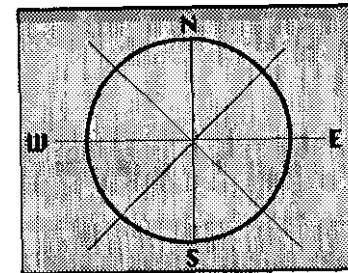


Diagram 6.2.2 -- The eight possible facing directions

### 6.2.3 Distance

Each cell is adjacent to eight other cells, one in each of the standard directions. When calculating distance, any two adjacent cells are considered to be one hectometer apart.

---

## 6.3 THE SIMULATED CYBERTANK

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As you have learned in your previous design experience, all cybertanks have standard equipment. The following Provides insight into how these devices are simulated.

### 6.3.1 Movement

Movement is simulated by changing the X- and Y-Coordinates of the cybertank. A cybertank's movement is limited to the eight standard directions. Each move of one hectometer consumes a certain amount of time, which is based on the weight of the cybertank and the speed of the drive system.

### 6.3.2 The Movement Sensor and the Scanner

The cybertank has a built-in movement sensor and scanner. Both devices constitute parts of the Cybertank Scanner System (CSS), but they are independent mechanisms and operate differently.

The movement sensor, referred to as the Movement Obstruction Sensor (MOS), which can be aimed in any of the eight standard directions, detects obstacles which can impede the cybertank's movement. It is limited to a range of three hectometers and covers a one degree area (a straight line) in the direction aimed. It covers a very small area. If more than one obstacle exists along the line, the MOS always detects the one nearest the cybertank.

The scanner can be instructed to find one of three things: 1) an enemy cybertank, 2) the enemy headquarters, or 3) the nearest object. Mounted on a rotating base, the scanner can face any of the eight standard directions. It continues to face that direction until it is instructed to rotate. Scanners are available in 20, 35, and 50 hectometer ranges, with sweep angles from 30 to 90 degrees. The scanner cannot "see through" all objects. Some objects block scanner signals.

### 6.3.3 The Weapon System

Cybertanks can be equipped with various weapons. Each weapon type has its own characteristics. All weapons have a maximum firing range of four (4) hectometers. They can be fired at enemy cybertanks, enemy headquarters, obstructions, at the closest object, or at any specific location within range. For ease of design, they can also be fired in the direction the scanner is facing, or the direction the cybertank is currently facing.

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## 64 ELEMENTS OF THE CYBERTANK COMMAND LANGUAGE

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As described previously, the Cybertank Command language (CCL) is the language used to develop cybertank AI. Full Custom Design incorporates the various CCL commands individually to create the cybertank's AI. This subsection reviews and defines some basic elements of the CCL.

The following are brief descriptions of the basic elements. Do not be alarmed as they will be fully explained, with examples, later in this section.

### 6.4.1 Labels

Labels are used to designate the beginning of an AI segment (or routine) that can be executed using either the Do or Branch commands. The label provides a way to reference the segment of AI it names. In ALPHA and BETA, the label Start names the entire AI for the cybertank.

Some of the characteristics of labels follow:

- A label always begins flush with the left margin of the edit window
- A label is always on a line by itself
- A label names the segment of AI that follows (up until the next Label)
- A label is usually referenced at least once by a **Branch** or Do command
- A label is a maximum of ten characters long
- A label is defined by the designer, and can be almost anything.

### 6.4.2 Reserved Words

The CCL commands, operators, and system variables are "reserved" for specific purposes and cannot be utilized as User Variables (see Section 6.4.4). See Appendix 1 for a list of Reserved Words.

### 6.4.3 System Variables

System Variables are used by the CCL for internal operations and represent the state of the cybertank. They may be used in computations, but cannot be altered. System variables are very useful, and often necessary, in designing cybertank AI. Examples include: TankX and TankY, which specify the cybertanks coordinates; FuelLevel, the amount of fuel remaining; and EnemyDist, the distance to the enemy. See Appendix 2 for a list of the System Variables.

### 6.4.4 User Variables

User Variables are defined by the AI designer. Unlike System Variables, User Variables can be altered. For example, you might make up a user variable called FuelStart. At the beginning of the AI you could store the value of FuelLevel in FuelStart. Later, you could subtract the current value of FuelLevel from FuelStart to calculate how much fuel your cybertank had consumed.

### 6.4.3 Action Commands

Action Commands cause the cybertank to perform a mechanical action, such as firing the weapon or rotating the scanner. These are, for the most part, self-explanatory.

### 6.4.6 Computation Commands

Computation commands, or logic commands, cause the on-board computer to perform computations such as arithmetic calculations. These commands are processed quickly since they do not involve mechanical activity.

### 6.4.7 Sequence Commands

Sequence Commands change the order in which commands are processed. When a simulation begins, the on-board computer begins processing commands starting with the first line in the cybertank's AI. Commands are normally processed in order, beginning to end.

Sequence Commands can be used to alter the order, usually to repeat a segment of AI. For example, the command Branch to Start in BETA forces the on-board computer to

"loop pack" to the beginning of the AI. As another example, Do Search causes the on-board computer to begin processing commands in the routine labeled *Search*. At the end of *Search*, another Sequence Command, Resume, causes the on-board computer to resume processing instructions from where it left off, the line immediately following the Do Search line.

### 6.4.8 Decision Commands

Decision Commands allow the cybertank's on-board computer to make decisions. These commands always begin with the word If. The last part of a Decision Command is actually a Sequence Command, only processed if a specified condition is met.

---

## 6.5 THE CCL CONSTRUCTION PANEL

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The CCL Construction Panel (CP) is helpful in Full Custom Design. CCL commands can be constructed by simply selecting the plaques on the CP. To get to the AI Module and the CP, select DESIGN A CYBERTANK from the DESIGN selection menu. If the File Retrieval Panel (FRP) appears, select ALPHA. At this point, you should be transferred to the AI Module.

### 6.5.1 Experimenting with the CCL

If you are using a mouse or joystick, you can select the CP Plaques in the usual way --by clicking on them.

If you are using the keyboard, you can use the CP as follows: 1) Press the CONNECT key to connect to the CP. 2) Use the CURSOR keys to highlight the desired plaque. 3) Press RETURN. 4) When you are through using the CP, press the CONNECT key to disconnect from the CP. *Check the OSI/CACD System 2 Reference Card to determine the CONNECT key for your particular terminal type.*

Try the following example. Move the Insertion Cursor (IC) to the end of the text. Select the following plaques from the CP located at the bottom of the screen:

```
MOVE
FORWARD
3
```

Notice that the command MOVE TANK FORWARD 3 has been entered into the text. Now select these plaques:

```
ROTATE
TO ENEMY TANK
```

Notice that the command ROTATE SCANNER TO FACE ENEMY TANK has been entered. Now try one more example:

```
I F
WEAPON
WEAPON RANGE
ENEMY WITHIN
DO
```

At this point, the CP is prompting you to enter a label name. Type in BLASTEM and press RETURN. Notice that the command IF ENEMY TANK IS WITHIN RANGE THEN DO BLASTEM has been entered. The CP prompts you to enter label names, variable names, or X-Y coordinates when needed to complete a particular command.

*No te: In all of the subsections below, User Variable names are being referenced in the commands. They are being used Only as examples and have no material relevance in the CCL. System Variables can also be used in place Of the User Variables lo all of the below commands.*

*All User Variables are printed In upper and lower case so they will stand out from the CCL commands.*

## 6.5.2 MOVE Commands

Cybertank movement is accomplished by turning the cybertank to face one of the eight standard directions and then moving it forward or back. It is advisable to use the Movement Obstruction Sensor (MOS) before moving to avoid collision damage.

MOVE commands can specify either a fixed or variable distance for the cybertank to move. A fixed distance is indicated by a number in the 1 to 62 hectometer range. A variable distance is specified by using a variable name. When a variable is used, the value of the variable determines the distance the cybertank will move.

The CP can construct four different types of MOVE commands. Try building each of these:

```
MOVE TANK FORWARD 3
MOVE TANK FORWARD AdvanceAmount
MOVE TANK BACKWARD 2
MOVE TANK BACKWARD RetreatAmount
```

## 6.5.3 TURN Commands

TURN commands change the direction the cybertank is facing. There are several ways to turn the cybertank. Each is discussed below. Try to construct each of the commands with the CP.

The following two commands will face the cybertank in one of the eight standard directions. For example, TURN TANK TO 5 will turn the cybertank to face direction 5 (southwest). If a variable is used, the value of that variable determines the direction the tank will turn.

```
TURN TANK TO 7
TURN TANK TO NewBearing
```

The following group of commands turn the cybertank a specified amount *relative to its current heading*. For example, suppose the cybertank is facing direction 6 (west).

If the command **TURN TANK RIGHT 1** is processed, the cybertank will be turned to face direction 7 (northwest).

```
TURN TANK LEFT 1
TURN TANK LEFT ThisMuch
TURN TANK RIGHT 2
TURN TANK RIGHT ThatMuch
```

The following commands turn the cybertank to face a particular object or battlefield location. The on-board computer calculates the direction that best approximates the actual direction to the object or location.

```
TURN TANK TO FACE ENEMY TANK
TURN TANK TO FACE ENEMY HQ
TURN TANK TO Xcoordinate Ycoordinate
```

Finally, the cybertank can be turned to face the same direction as its scanner.

```
ALIGN TANK WITH SCANNER
```

#### 6.5.4 DETECT OBSTRUCTIONS Commands

The **DETECT OBSTRUCTION** commands tell the MOS to probe in a specified direction the nearby cells on the battlefield. The effect is to set System Variables which can then be tested. The System Variables affected are **ObstacleX**, **ObstacleY**, **ObstacleType**, and **ObstacleDist**. These variables provide the obstacle's location, type, and distance from the cybertank. The cybertank can make decisions by testing these variables with **If** statements.

There are four types of **DETECT OBSTRUCTION** commands. Each is listed below. Try constructing each with the CP.

```
DETECT OBSTRUCTION AT 4
DETECT OBSTRUCTION AT ThataWay
DETECT OBSTRUCTION AT TANK DIRECTION
DETECT OBSTRUCTION AT SCANNER DIRECTION
```

#### 6.5.5 SCAN Commands

The **SCAN** commands cause the scanner to scan an area around the cybertank for a specified type of object. The scanner can scan for enemy cybertanks, enemy headquarters, or the closest object to the cybertank. The area scanned is dependent upon the scanner's maximum range, sweep angle, and current direction.

The scanner cannot "see" through certain types of objects such as buildings, and it is possible for an enemy cybertank or headquarters to be hidden from view. The scanner's visibility may be improved by destroying intervening objects. For a complete list of objects and obstructions and their impact on the scanner, see Appendix 3.

The effect of scanning is to set System Variables which can then be tested. This process is similar to that of the movement sensor. The System Variables affected depend on the type of scan performed.

When scanning for enemy cybertanks, **EnemyX**, **EnemyY**, and **EnemyDist** are affected. These System Variables provide the enemy's location and its distance from the cybertank.

When scanning for enemy headquarters, **EnemyHQX**, **EnemyHQY**, and **EnemyHQDist** are affected. These System Variables provide the headquarter's location and its distance from the cybertank.

When scanning for the closest object to the cybertank, **ObjX**, **ObjY**, **ObjType**, and **ObjDist** are affected. These System Variables provide the object's location, type, and distance from the cybertank.

The three **SCAN** commands are listed below. Try constructing each with the CP.

```
SCAN FOR ENEMY TANK
SCAN FOR ENEMY HEADQUARTERS
SCAN FOR CLOSEST OBJECT
```

### 6.5.6 ROTATE Commands

ROTRTE commands change the direction the scanner is facing. There are several ways to rotate the scanner. Each is discussed below. Try to construct each of the commands with the CP.

The following two commands face the scanner in one of the eight standard directions. For example, ROTATE SCANNER TO 3 will rotate the scanner to face direction 3 (southeast). If a variable is used, the value of the variable will determine the direction.

```
ROTATE SCANNER TO 7
ROTATE SCANNER TO OldBearing
```

The following commands rotate the scanner a specified amount *relative to its current heading*. For example, suppose the scanner is facing direction 4 (south). If the command ROTRTE SCANNER LEFT 3 is processed, the cybertank will be turned to direction 1 (northeast).

```
ROTATE SCANNER LEFT 1
ROTATE SCANNER LEFT ThisMuch
ROTATE SCANNER RIGHT 2
ROTATE SCANNER RIGHT ThatMuch
```

The following commands rotate the scanner to face a particular object or battlefield location. The on-board computer calculates the standard direction which best approximates the actual direction to the object or location.

```
ROTATE SCANNER TO FACE ENEMY TANK
ROTATE SCANNER TO FACE ENEMY HQ
ROTATE SCANNER TO 52 13
ROTATE SCANNER TO Xcoordinate Ycoordinate
```

Finally, the scanner can be rotated to face in the same direction as the cybertank.

```
ALIGN SCANNER WITH TANK
```

### 6.5.7 FIRE Commands

Cybertanks can fire their weapon at specific objects, battlefield locations, or in a specified direction. When firing at either an object or a location, the direction of fire is not limited to the eight standard directions; however, the weapon has a maximum range of four hectometers. Although the cybertank has an unlimited supply of ammunition, the Cybertank Weapon System (CWS) must be operational to use it.

The various FIRE commands are listed below. Try to construct each with the CP.

This command instructs the cybertank to fire its weapon at an obstruction previously detected by the Movement Obstruction Sensor (MOS).

```
FIRE WEAPON AT OBSTRUCTION
```

These commands fire at specific targets previously scanned by the scanner. *Important: When firing at an enemy cybertank, it is possible to miss since it may move out of the way.*

```
FIRE WEAPON AT ENEMY TANK
FIRE WEAPON AT ENEMY HQ
FIRE WEAPON AT CLOSEST OBJECT
```

These following commands fire at a battlefield location specified by X- and Y-coordinates.

```
FIRE WEAPON AT 23 46
FIRE WEAPON AT Xcoordinate Ycoordinate
```

The last two commands cause the weapon to fire in a specified direction.

```
FIRE WEAPON AT TANK DIRECTION
FIRE WEAPON AT SCANNER DIRECTION
```

### 6.5.8 Special Commands

The majority of special commands involve special equipment which is not covered in this Training Guide. For detailed information about their function, refer to CCL Reference Guide in the Engineer's Handbook.

The special commands are listed below.

SELF DESTRUCT

LAUNCH REMOTE SCANNER  
(requires the Remote Launcher)

RAISE SHIELD  
LOWER SHIELD  
(requires the Defense Shield)

JAM SCANNER SIGNAL  
(requires the Jamming Device)

LOCK SCANNER  
UNLOCK SCANNER  
(requires the Scanner Lock)

REPAIR INTERNAL  
REPAIR TREADS  
REPAIR WEAPON  
REPAIR ARMOR  
REPAIR SCANNER  
(requires the Repair Kit)

### 6.5.9 Decision Commands

**Decision Commands, also known as IF commands, are too numerous to discuss individually. All IF commands have the following form:**

IF <decision condition> THEN <sequence command>

When an IF command is processed, the decision condition is tested. If the decision condition is met, then the sequence command is processed.

A few of the decision conditions are listed below. The sequence command is either a BRANCH TO "Label" command or a DO "label" command. Both are discussed in the following subsection.

TANK TREADS ARE NOT FUNCTIONAL  
MOVEMENT IS OBSTRUCTED  
TANK IS NOT FACING ENEMY TANK  
TANK IS FACING ENEMY HQ  
TANK IS ALIGNED WITH SCANNER  
FUEL IS EMPTY  
SCANNER IS NOT FUNCTIONAL  
SCANNER IS LOCKED  
ENEMY TANK WAS FOUND  
ENEMY HQ WAS FOUND  
CLOSEST OBJECT WAS NOT FOUND  
TANK IS NOT ALIGNED WITH SCANNER  
WEAPON IS NOT FUNCTIONAL  
ENEMY TANK IS WITHIN RANGE  
ENEMY HQ IS BEYOND RANGE  
CLOSEST OBJECT IS WITHIN RANGE  
REMOTE SCANNER IS AVAILABLE  
SHIELD IS UP  
REPAIR KIT IS UNAVAILABLE

**Several examples of the above decision commands follow:**

IF TANK TREADS ARE NOT FUNCTION THEN BRANCH TO CantMove  
IF ENEMY TANK IS WITHIN RANGE THEN DO KillIt

**In addition to the IF commands discussed above, there are three other forms:**

IF <var> <op> <value> THEN <sequence command>  
IF <var> <op> <var> + <value> THEN <sequence command>  
IF <var> <op> <var> - <value> THEN <sequence command>

<var> represents a variable. It can either be a System or User Variable

<op> represents a relational operator. It can be any of the following:

- < (less than)
- > (greater than)
- = (equal to)
- ≤ (less than or equal to)
- ≥ (greater than or equal to)
- ≠ (not equal to)

<value> represents a value. It can be either a number, a System Variable, or a User Variable

<sequence command> can either be a **BRANCH TO** "Label" command or a **DO** "Label" command

**Some examples of these types of IF commands follow:**

```
IF TankY = 1 THEN BRANCH TO FoundTop
IF NewDamage > OldDamage THEN DO BeenHit
IF ScanDir = TankDir + 4 THEN BRANCH TO WatchRear
IF EnemyDist ≤ 4 THEN BRANCH TO FireAway
IF Delta <> NewVal - OldVal THEN BRANCH TO Error
```

#### 6.5.10 Sequence Commands

**AI Commands are normally processed in the order in which they appear: however, Sequence Commands can change the processing order. There are three Sequence Commands: BRANCH TO, OO, and RESUME.**

The **BRANCH TO** command changes the processing order by redirecting the on-board computer to a specified Label. After encountering a **BRANCH TO** Label, the on-board computer processes the first command following the specified Label. It will continue to process commands in order from that point on. This can be used to form a loop, as

in **BRANCH TO START**, or to skip past a segment of **AI**. **BRANCH TO** can also be written as **GOTO**.

The **DO** and **RESUME** commands work together. They are used primarily with routines. In Section 2, a routine was defined as "a sequence of CCL commands which causes the cybertank to perform a particular task." To be more precise, a routine is a sequence of CCL commands beginning with a Label and ending with a **RESUME** command.

When the On-board computer encounters a **DO** "Label" command, it remembers the command's location within the AI and then begins processing the commands following the specified Label.

when the on-board computer encounters a **RESUME** command, it recalls the location of the **DO** "Label" command which called the routine and branches back to the command immediately following the **Do** "Label".

In summary, the **DO** command causes a routine to be processed, and the **RESUME** command marks the end of the processed routine.

#### 6.5.1 I Assignment Commands

**Assignment Commands alter the values of User Variables. These commands are used in the following three forms:**

```
<user var> = <value>
<user var> = <var> + <value>
<user var> = <var> - <value>
```

<user var> represents any User Variable.

<var> represents a variable. It can either be a System or User Variable.

<value> represents a value. It can be either a number, a System Variable, or a User Variable.



When an **Bssignment Command** is processed, the **User Variable** on the left side of the equals sign is assigned the value of the right side.

Some examples of **Rssignment Commands** are as follows:

```
MyVariable = 100
NewCount = OldCount + 5
CountDown = CountDown - 1
DirTemp = TankDir
DeltaVal = NewVal - OldVal
```

**AU variables** have values from 0 to 100. Any operation that results in a number greater than 100 is automatically assigned a value of 100. Any operation that results in a number less than 0 is automatically assigned a value of 0.

---

## 6.6 DESIGNING A CYBERTANK FROM THE GROUND UP

---

In previous sections, predefined sequences of **CCL commands**, called library **Capsules**, were used as building blocks in AI construction. In this section, cybertank AI is developed entirely from individual **CCL commands**.

So far, you have designed two cybertanks. You have also designed and executed simulations. Hopefully, you are fairly comfortable with the operation of the AI Module, the Simulation Design Module (SDM), and the Combat Simulation Module (CSM). If you need further help with any of these review the appropriate section of this Training Guide.

### 6.6.1 Designing a Chassis

At this time, select **NEW** from the **CYBERTANK** selection menu. When the **OSI/CACD System 2** asks if you want to save the changes to Alpha, select **NO**.

When the **File Storage Panel (FSP)** appears, name your new

cybertank **GAMMA**. Once in the AI Module, select **CHASSIS** from the **CYBERTANK** selection menu to proceed to the Chassis Design Module (CDM).

While in the CDM, select whichever cybertank components you like. Keep an eye on the credits remaining. Try not to spend too much on any single item. Remember - you have a lot to choose.

After selecting **GAMMA's Tank Class, Fuel Cells, Drive System, Weapon Type, and Scanner**, you should proceed to the AI Module.

### 6.6.2 A Cybertank's Perspective

To successfully design a cybertank's AI, you must begin thinking about all of the tasks a cybertank must perform. You must begin asking yourself, "If I were a cybertank, what would I do?" To answer this question, you should ascertain exactly what it is that makes a cybertank function and then decide how to implement that function. During most battle simulations, a cybertank must accomplish three basic tasks to be effective; moving around the battlefield, searching for an enemy, and eliminating the enemy. Each of these tasks is covered in detail in the following sections.

### 6.6.3 Moving Around the Battlefield

Like a baby, a cybertank must learn to walk before life becomes very interesting. **Movement** is THE most basic function used in cybertank operation.

Before tackling cybertank movement, try a simple experiment. Close your eyes and put your hands in your Pockets. Now try to walk around the room. If you are like most people, you probably ran into a few walls, chairs, or other obstructions. What you just did is visually represented in Diagram 6.6.3.1.

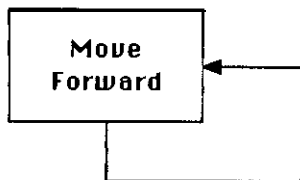


Diagram 6.6.3.1 – Process flow of simple movement

As you can see, the above process does not require any thinking other than that used to move forward. From the experiment, you can also tell that the process is not very effective. To move more effectively, you should leave your eyes open and your hands out of your pockets. If that were the case, then the thought process could be depicted like that shown in Diagram 6.6.3.2.

Begin Here

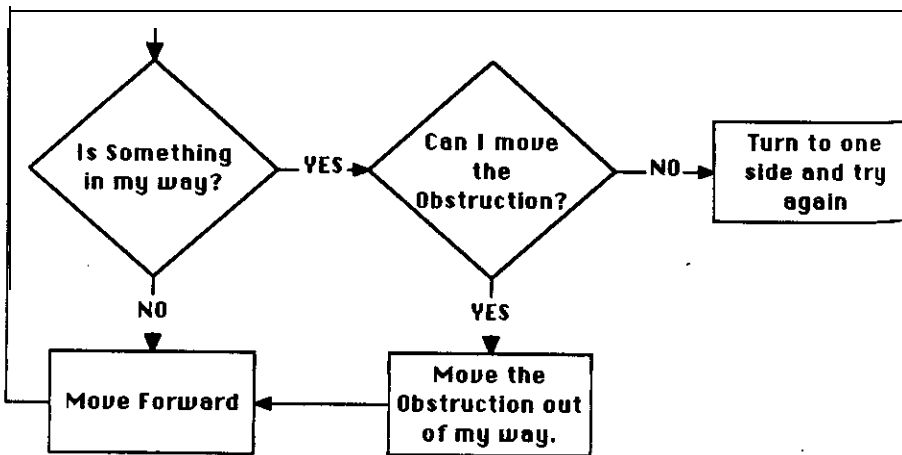


Diagram 6.6.3.2 – Process flow of complex movement

The above diagram shows the flow of your thinking while attempting to move around a room.

To See how this flow diagram works, try a specific Situation. Suppose that you are in the corner of a room. To your left is a wall and Straight ahead is a wall. So, starting at the top of the diagram and following the arrows, you ask yourself "Is Something in my way?" The answer is "Yes, there is a wall in my way", therefore, you follow the arrow labeled "YES" and then ask yourself, "Can I move the obstruction?" Since the obstruction is a solid wall, the answer is "No." Since the wall cannot be moved. follow the arrow labelled "NO" and you turn either to the left or right and repeat the process.

Since a cybertank cannot physically pick up and move an object in its path, a commonly used technique is to attempt to destroy it. If after shooting on obstruction it is Still intact, then it is known to be an indestructible object (like a wall, fortified building or water) and the cybertank must move around it.

The result Of converting all the above ideas into cybertank terminology is shown below in Diagram 6.6.3.3.

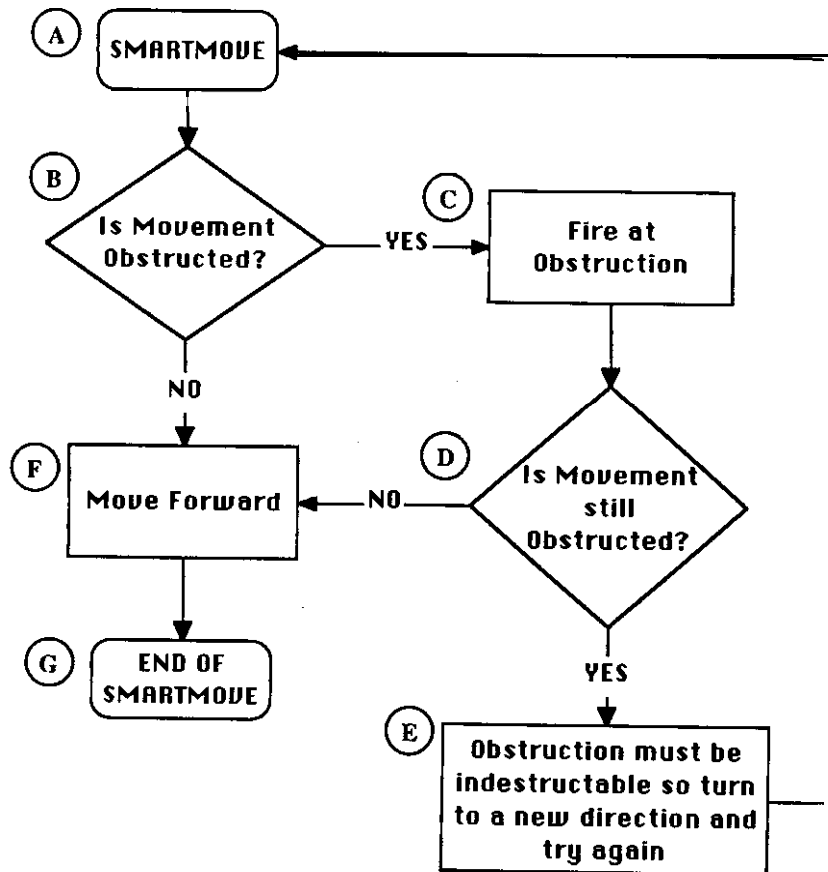


Diagram 6.6.3.3 -- Process flow of cybertank movement

Once you have determined the thought process for some function, converting that process to CCL commands is a fairly simple process. For example, the above flow diagram can be written in CCL as follows:

```

A ==> SMARTMOVE
B ==> DETECT OBSTRUCTION ATTANK DIRECTION
      IF MOVEMENT IS NOT OBSTRUCTED THEN BRANCH
      TO GO
C ==> FIRE WEAPON AT OBSTRUCTION
  
```

```

D ==> DETECT OBSTRUCTION ATTANK DIRECTION
      IF MOVEMENT IS NOT OBSTRUCTED THEN BRANCH
      TO GO
E ==> TURN TANK LEFT 1
      BRANCH TO SMARTMOVE
F ==> GO
G ==> MOVE TANK FORWARD 1
      RESUME
  
```

The letters along the left side correspond to the circled letters in the flow diagram. For example, the box labeled "B" represents the instructions "DETECT OBSTRUCTION ATTANK DIRECTION" and "IF MOVEMENT IS NOT OBSTRUCTED THEN BRANCH TO GO". You may have noticed that the label "GO" was included. This is because all boxes that have more than one arrow coming into them need to be preceded by a label. Since box "F" can be entered from boxes "B" and "D", it needs a label.

When developing an idea to use in a cybertank's AI, it is a good idea to use the following three step procedure:

1. Determine the thought process required for you as a human to accomplish the goal.
2. Convert your human thought process to that of a cybertank. Always keep in mind the limitations of a cybertank. In the above examples, a person could have picked up a chair and moved it out of his or her path. A cybertank does not have the luxury of arms with which to physically move objects; therefore, a cybertank must accomplish the needed action the best way it can. Since a cybertank cannot physically move the obstruction, it would attempt to shoot and destroy it.
3. The last step in developing an AI routine is converting the thought process to CCL instructions that the cybertank can understand. If you use the type of flow diagrams shown in the above examples, this conversion process should be painless.

To aid in your design training, this three step procedure will be used in the next two sections.

The above SMARTMOVE routine is going to be an integral part of your first cybertank created from scratch, so go ahead and enter it into the AI editor and **AUTHORIZE** it. When Authorization is complete, proceed to the ECM. When the File Modification Panel (FMP) asks if you want to save the changes you have made to **GAMMA**, select **YES**.

Once you are in the ECM, proceed to the Simulation Design Module (SDM) and design a battle simulation using your new cybertank, **GAMMA**. Include all of the other tanks you have worked on in previous sections of this Training Guide. Choose Austin as the battlefield. Austin has a lot of trees and buildings which **GAMMA** will have to maneuver around, Save the simulation design as **GAMMASIM**.

After designing the simulation, proceed to the Combat Simulation Module (CSM) and select the **GAMMASIM** simulation design. If you did everything correctly, you should see **GAMMA** moving around the battlefield. **GAMMA** should be shooting its way through trees and small buildings, but should be turning away from large buildings, brick walls, and water. If **GAMMA** does not seem to function Correctly, go back to the AI Module and check the AI you entered.

After watching **GAMMA** for a while, you will notice that it does not search for enemy cybertanks and does not fight back when an enemy attacks it. That is because no AI has yet been designed to handle these situations. This is what will be covered in the next section.

At this time, proceed back to the AI Module.

#### 6.6.4 Searching For an Enemy

Searching for an enemy cybertank is actually One of the easier tasks in designing AI. Think of a battle simulation as a game of "Hide and Seek." Your cybertank is "IT" and all

the other cybertanks are somewhere out on the battlefield hiding. It is your job to find them.

If you were "IT" in a game of hide and seek, how would you go about finding the other players? If you are like most people, you would go from area to area, always looking around **YOU** for any sight of a head bobbing up from behind a table or a foot sticking out from under the curtains. This thought process is depicted in Diagram 6.6.4.1.

Begin Here

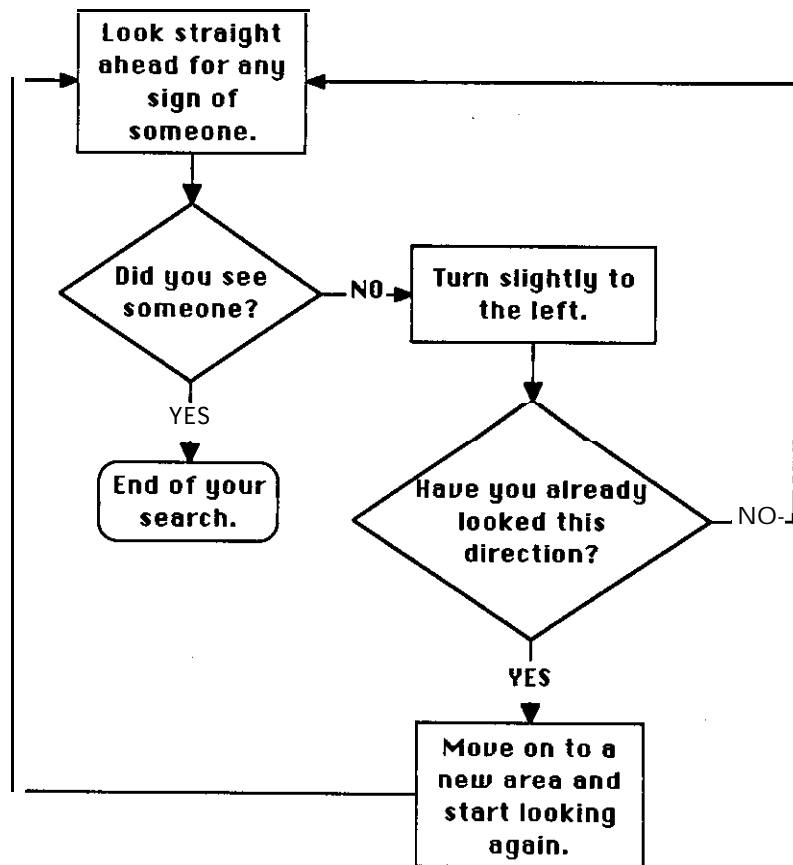


Diagram 6.6.4.1 – Process flow of Hide and Seek

When converting the above process flow into cybertank terminology, you must take into account the differences between humans and cybertanks. Whereas a human has eyes, a cybertank has a scanner mechanism. It uses the

scanner to “look” in a particular direction. If the scanner detects an enemy cybertank, it informs, the on-board computer system just as the eyes would inform the brain that a person has been seen hiding under a table. With this in mind, the above human thought process can be converted to cybertank terminology as shown in Diagram 6.6.4.2.

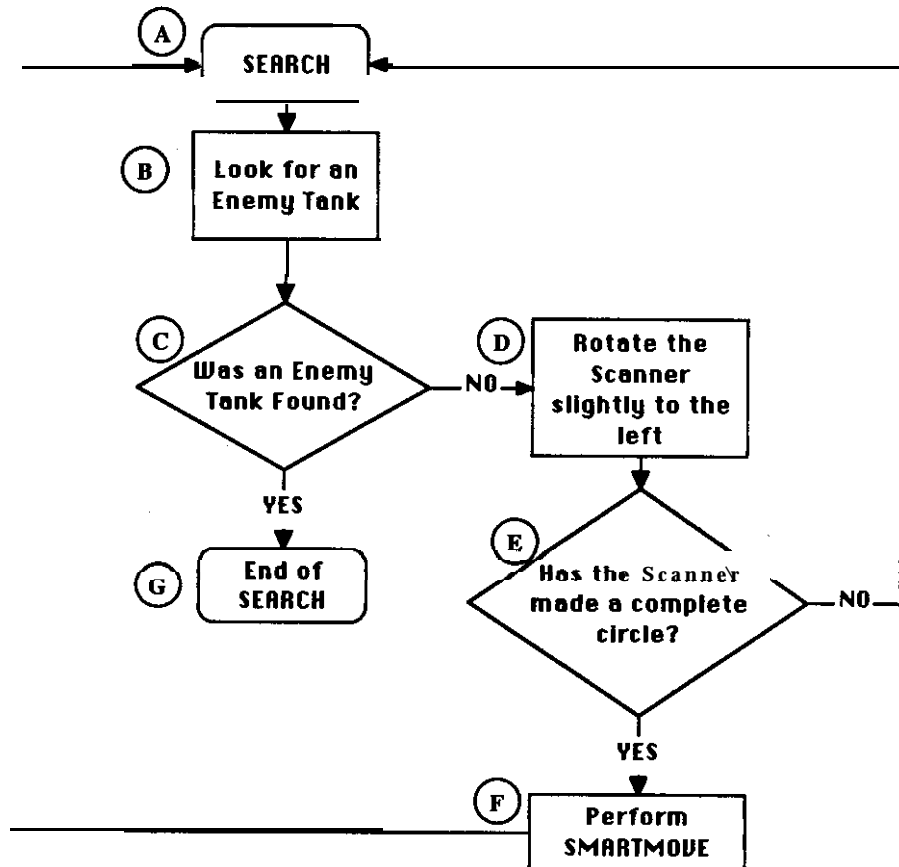


Diagram 6.6.4.2 -- Process flow of Cybertank Search

There are several points regarding the cgbertank thought process that bear further discussion. The box labeled "F" uses the SMARTMOVE routine which was designed in the previous section. It is analogous to the "Move to a new area and start looking again" box in the Hide and Seek thought process. By moving the cgbertank forward (or possibly off in a new direction due to obstacles), it is better able to cover a larger area of the battlefield in search of enemy cybertanks than it would if it just sat in one place. Going back to the Hide and Seek example, if a human stayed in one spot continually looking for people, the game would never end.

Another item that warrants further discussion is Box "E". Box "E" performs the same function as the "Have you already looked in this direction?" in the Hide and Seek thought process. Box "E" is only true (an answer of yes) when the scanner has made a complete 360° revolution. When this is true, Box "F" will be performed and the whole process will repeat.

Going back to the Hide and Seek example, assume that your head can rotate a complete 360° revolution. If you walked into a new area to search, you could continually scan the area for people as you slowly rotated your head. As soon as your head returned to its "normal" position (i.e., straight ahead), you would know that you had scanned the entire area and could therefore move on to another area. This same type of procedure can be used with cybertanks. By checking to see if the scanner is aligned with the chassis of the cybertank, it is possible to determine if the scanner has rotated 360°.

With these facts in mind, the above cybertank search process can be converted to CCL instructions as follows:

```
A ==> SEARCH
B ==> SCAN FOR ENEMY TANK
C ==> IF ENEMY TANK WAS FOUND THEN BRANCH TO
      ENDSEARCH
D ==> ROTATE SCANNER LEFT 1
```

```
E ==> IF TANK IS NOT ALIGNED WITH SCANNER THEN
      SEARCH
F ==> DO SMARTMOVE
      BRANCH TO SEARCH
G ==> ENDSEARCH
      RESUME
```

Go ahead and enter this SEARCH routine into GAMMA's AI. Since this is a "routine", we need a few instructions which "use" or call it. You can accomplish this with the following lines:

```
START
DO SEARCH
BRANCH TO START
```

These lines should be the first instructions in GAMMA's AI. Since the routine SEARCH exits (or ends) when an enemy cybertank is found, the BRANCH TO START instruction is used to send the cybertank's on-board computer back to the beginning of the AI (the label START).

With these three lines, the SMARTMOVE routine, and the SEARCH routine entered into GAMMA's AI, GAMMA should be able to move around the battlefield searching for an enemy. At this time, go ahead and AUTHORIZE GAMMA. If your version of GAMMA did not AUTHORIZE properly, check your AI commands to make sure you entered them correctly.

Once you have an AUTHORIZED version of GAMMA, proceed to the Combat Simulation Module (CSM). When the File Modification Panel (FMP) asks if you want to save the changes you have made to GAMMA, select YES.

When the CSM asks which simulation to use, you should Select GAMMASIM.

once the simulation begins, you will see GAMMA moving around the battlefield. Since your cybertank's turret always rotates with the scanner, when a new direction is specified, you should see GAMMA's turret turning in a

counter-clockwise direction. If GAMMA happens to detect on enemy cybertank, it will stop moving and continually scan in the direction of the detected enemy cybertank. This is because there is no AI in GAMMA that is designed to hunt or track down on enemy. As soon as the SEARCH routine detects an enemy cybertank, it exits and the on-board computer system returns to the line directly after the "DO SEARCH" instruction. Since the next instruction after the "Do SEARCH" is a "BRANCH TO START" instruction, the on-board computer system begins executing the instructions directly after the label "STAR". Since the instruction directly after the label "START" is "DO SEARCH", the computer system directs AI execution to the routine SEARCH. The first instruction in the SEARCH routine is "SCAN FOR ENEMY TANK". At this point, there is a very good chance that the enemy cybertank found earlier will be found again. If the enemy cybertank is found again, then the SEARCH routine exits, the computer system directs AI execution back to the "BRANCH TO START" instruction, and the process repeats. In this situation, GAMMA's on-board computer system will continue this loop until the enemy cybertank moves out of GAMMA's view. When (and if) the enemy cybertank moves out of GAMMA's view, GAMMA will go back to its normal scanning pattern until it detects another enemy cybertank. To solve this problem, the next section describes the creation of a "HUNT" routine.

After watching GAMMA search for enemy cybertanks for a while, proceed to the AI Module to create the last basic function of a cybertank.

#### 6.6.5 HUNTING THE ENEMY

Now that your cybertank is moving around the battlefield and searching for enemy cybertanks, it is time to tackle the last aspect of designing a cybertank from scratch -- hunting down and destroying the enemy.

Going back to the example game of "Hide and Seek," assume that you not only have to find the people hiding, but you must also "tag" them before they make it back to home base. Under this situation, you must ask yourself "Once I

have found someone, how do I get close enough to tag him?" If you are like most people, you would move in the direction in which you last saw the person. For example, if you walk into a room and see someone in the back-right corner, you will begin moving towards the back-right corner. As long as the person stays in that corner, you will continue moving towards him. If, however, the person sees you coming and starts to run away, you would change your direction of pursuit to follow the person. Once you move to within arms-reach of the person, you would reach out and attempt to "tag" him.

The above human thought process could be represented like that shown in Diagram 6.6.5.1

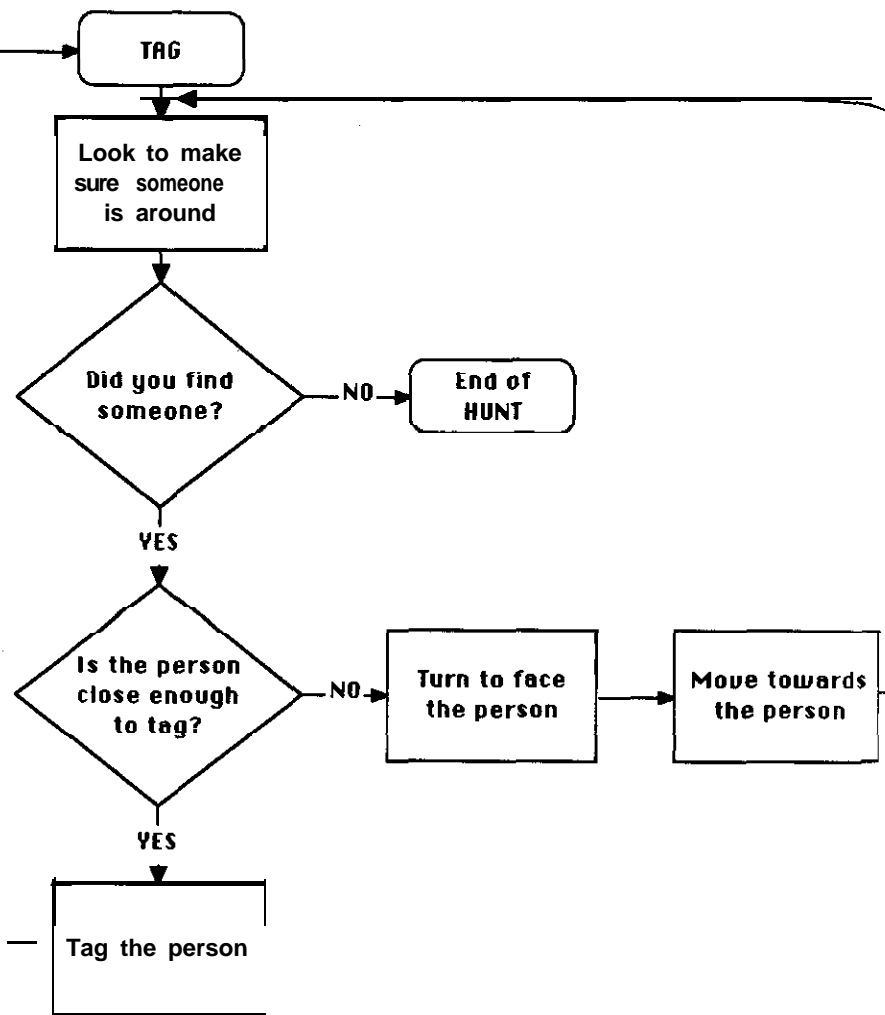


Diagram 6.6.5.1 -- Human thought process of tagging an opponent

When converting the above human thought process to that of a cybertank, you must remember that the purpose of the cybertank is to destroy the enemy, not simply "tag" it.

Converted to cybertank terminology, the above Diagram would look something like Diagram 6.6.5.2.

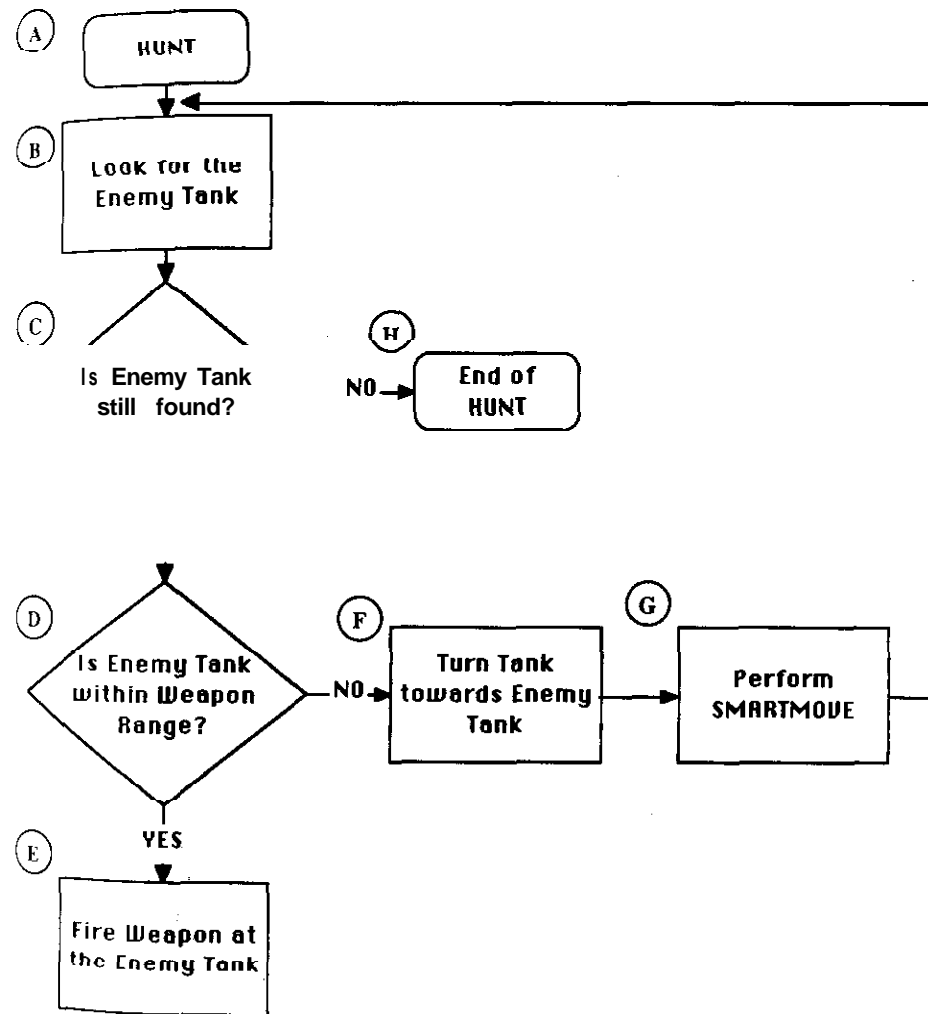


Diagram 6.6.5.2 - Process flow of cybertank HUNT



four cybertank's HUNT routine will only be called when the SEARCH routine (designed in Section 6.6.4) has succeeded in detecting a cybertank. It should be noted that the HUNT routine will abort if the enemy cybertank manages to elude it. In other words, if the HUNT routine loses sight of the enemy, it will abort and execution will go back to the SEARCH routine.

It should also be noted that a cybertank's weapon has a maximum range of four (4) hectometers, therefore a cybertank must move very close to the enemy before firing at it is practical.

Once the cybertank process flow is created, it can be converted to actual CCL commands as follows:

```
A ==>    HUNT
B ==>        SCAN FOR ENEMY TANK
C ==>        IF ENEMY TANK WAS NOT FOUND THEN BRANCH
              TO HUNTDONE
D ==>        IF ENEMY TANK IS BEYOND WEAPON RANGE THEN
              BRANCH TO CLOSEIN
E ==>        FIRE WEAPON AT ENEMY TANK
              BRANCH TO HUNT
F ==>    CLOSEIN
              TURN TANK TO FACE ENEMY TANK
G ==>        DO SMARTMOVE
              BRANCH TO HUNT
H ==>    HUNTDONE
              RESUME
```

Go ahead and enter this HUNT routine into GAMMA's AI. Since this is another routine, you need another instruction to "use" or call it when necessary. This is accomplished by inserting the line "DO HUNT" before the "BRANCH TO START" instruction at the beginning of GAMMA's AI. The beginning of GAMMA's AI should look like the following:

```
START
  DO SEARCH
  DO HUNT
  BRANCH TO START
```

With these instructions, the SMARTMOVE routine, the SEARCH routine, and the newly created HUNT routine entered into GAMMA's AI, GAMMA will now be able to move around the battlefield, search for enemy cybertanks, move towards any enemy cybertanks found, and attempt to destroy them. At this time, go ahead and AUTHORIZE GAMMA. If your version of GAMMA does not AUTHORIZE properly, check all of your AI commands to make sure you have entered them correctly.

Once you have an AUTHORIZED version of GAMMA, proceed to the Combat Simulation Module (CSM). When the OSI/CACD system 2 asks if you want to save the changes you have made to GAMMA, select YES.

When the CSM asks which simulation is to be used, you should select GAMMASIM.

once the simulation begins, you should see GAMMA moving around the battlefield searching for enemy cybertanks. When GAMMA detects an enemy cybertank, it should turn to face it and begin moving towards it. Remember, if an obstruction blocks GAMMA's scanner the HUNT routine will "give up" and quit hunting. At that point, GAMMA will resume searching for other enemy cybertanks. Once GAMMA finds a clear path to an enemy cybertank, it should move to within weapon range (4 hectometers) and then begin firing. GAMMA will continue to fire at the enemy cybertank until one of three conditions is met: 1) GAMMA is destroyed, 2) the enemy cybertank is destroyed, or 3) the enemy cybertank moves in such a way that it is no longer detected by GAMMA. Of course, the condition we are most interested in is the destruction of the enemy cybertank.

After watching GAMMA search for enemy cybertanks and (hopefully) destroy a few, pat yourself on the back for a job

well done. You have successfully designed and implemented a cybertank from scratch. You have seen what it takes to Create a cybertank without the use of library Capsules and you have done well. If you keep in mind the three steps outlined in the previous sections in regards to creating a cybertank's AI, you will do very well when creating future cybertank designs. Remember to always ask yourself the basic question "If I were a cybertank, what would I do?"

---

## 6.7 GOING AT IT ALONE

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Now you are ready to design your own cybertanks using the Full Custom Design techniques discussed in the previous three sections. Use what you have learned to design the best AI you can. Borrow ideas from other designs and add your own. Remember to use the three step procedure outlined in the above sections.

- 1> Determine the thought process necessary for a human to accomplish the task.
- 2> Convert the human thought process to that of a cybertank.
- 3> Convert the cybertank thought process to actual CCL commands.

You will probably have problems getting your first few designs authorized. If this happens, do not panic. Check your commands carefully and try again.

Once your cybertank design has been successfully authorized, save it. Next, you should create a new simulation design using your new cybertank as the primary cybertank, and with GAMMA, ALPHA, BETA, and VIPER as the other cybertanks. Choose a battlefield and save the simulation design.

Run the simulation and see how your new cybertank fares.

If you do not like it, transfer back to the Design Control Module (OCM) and improve it. Testing your cybertank design is the topic of the next section.

## SECTION 7 TESTING A CYBERTANK

4

### SECTION BRIEF

This section describes the Cybertank Test Module (CTM), the Primary diagnostic tool for design problems.

### 7.1 THE CYBERTANK TEST MODULE

OSI/CACD System 2 includes a facility used for testing cybertanks known as the Cybertank Test Module (CTM). The CTM is particularly helpful when a cybertank is not behaving as the designer intended. Such discrepancies are usually due to incorrectly formulated AI, and are known as "bugs". The CTM is commonly referred to as the "debugger."

#### 7.1.1 loading the Simulation Design

In order to test a cybertank, you must first have a simulation design in which the cybertank to be tested is the Primary Cybertank. In this section, GAMMA will be tested using the simulation design GAMMASIM.

To begin testing your cybertank, select TEST CYBERTANK from the DESIGN menu. When the File Retrieval Panel (FRP) appears, select GAMMASIM.

#### 7.1.2 The CTM Control Panel

After you select the simulation design to be used for testing, the OSI/CACD loads the related cybertanks and battlefield, then transfers you to the CTM. The CTM automatically starts the simulation. The CTM is actually an extensively modified version of the Combat Simulation Module (CSM).

The CTM differs from the CSM in several ways. The instrument panel has been replaced by a display area, and the SIMULATE menu has been replaced by the DEBUGGER

menu. The CTM operates in one of two modes -- Trace Mode and Status Mode. The mode can be toggled by selecting and deselecting TRACE MODE ON from the DEBUGGER menu.

NOTE: If during the following sections of the Training Guide, GAMMA gets destroyed, select RESTART from the DEBUGGER menu.

### 7.2 TRACE MODE

When the CTM is in Trace Mode, as it is now, the display are on the right side of the screen shows the cybertank's AI. The upper part of this display area shows the cybertank number and name (currently #01: GAMMA), and the label of the section of AI currently being executed. The lower part of this display area shows the cybertank's "thoughts".

A great deal can be learned by watching the cybertank's behavior on the battlefield while examining its AI being processed. Trace Mode allows you to see the cybertank's commands as they are being processed.

#### 7.2.1 Pausing the Test

Press the PAUSE key to pause the test. The PAUSE key works the same way in the CTM as it does in the CSM. That is, pressing it toggles the pause mode on and off. See the OSI/CACD System 2 Reference Card to determine the PAUSE key for your particular terminal type.

#### 7.2.2 Single Stepping

When the test is paused, pressing the STEP key causes the test to run just long enough to process one CCL command, after which the test remains paused. This allows you to examine the AI and its effects one command at a time. This feature is known as single stepping. See the OSI/CACD System 2 Reference Card to determine the STEP key for your particular terminal type.

Experiment with pausing and single stepping now.

---

### 7.3 STATUS MODE

---

Status Mode lets you examine the cybertank's current status registers. These status registers are comprised of various System and User Variables used by the cybertank. User variables and certain System Variables can be altered for testing under specific conditions.

#### 7.3.1 Selecting Status Mode

Change from Trace Mode to Status Mode by deselecting TRACE MOOE ON from the DEBUGGER menu. The display area on the right side of the screen shows one of several different pages of status registers.

**Note:** When Trace Mode is on, you will notice a check mark in the Oebugger menu. When Trace Mode is off, the check mark is removed.

Three groups of System Variables are displayed on the current page. Use the PAGE SELECT keys to view other pages. Consult the OSI/CACD System 2 Reference Card to determine which keys to use on your terminal.

#### 7.3.2 Changing Status Registers

It is sometimes useful to change the value of a specific status register while testing a cybertank. This can help you check the cybertank's response to a particular situation. Status registers can Only be altered when you have paused the test.

**Note:** Not all of the status registers can be altered. Consult Part 2, Section 5.5 of the Engineer's Handbook to determine which registers can be altered.

To alter a status register, first use the PAGE SELECT keys until the appropriate register is displayed. Next, select the register by using either a mouse/joystick or the REGISTER SELECT keys (consult the OSI/CACD System 2 Reference Card to determine which keys to use on your terminal). The

current value of the status register is highlighted. Finally, enter the new value using the keyboard and press RETURN.

**Note:** Most status registers have restrictions on what value can be entered. For example, the X-location of the cybertank ranges from 1-62. Entering a value larger than 62 is invalid.

Experiment with changing status registers. Changing the li location and Y Location under TANK relocates the cybertank to the new location entered.

when you are finished testing your cybertank, select EXIT from the DEBUGGER menu. The OSI/CACD transfers you to the ECM.

## SECTION 8 CLEARANCE EVALUATION

### SECTION BRIEF

This section describes procedures used in obtaining a Clearance Evaluation.

### 8.1 PROMOTION CRITERIA

As an OSI employee, you may request an evaluation at any time. The Cybernetic Engineering Division of OSI uses employee performance as the sole criterion for advancement. Promotions are accompanied by an automatic Clearance Level upgrade and an increased budget.

To aid OSI management in making objective performance assessments, an automated system for evaluating cybertanks has been installed in the OSI/CACD System 2. When you request a Clearance Evaluation, you are required to submit a cybertank design as an example of your work.

Your cybertank will be subjected to ten (10) simulated battles – against a cybertank created by OSI, and on a battlefield created by OSI. If your cybertank design is adequate (wins at least 7 out of the 10 battles), as demonstrated by its success in combat, the Director will approve your promotion.

### 8.2 REQUESTING A CLEARANCE EVALUATION

You may request a Clearance Evaluation electronically through your terminal. Select CLEARANCE EVALUATION from the EMPLOYEE menu. The File Retrieval Panel (FRP) appears. You should then select your best authorized cybertank for evaluation.

## 8.3 THE EVALUATION PROCESS

After you have selected your cybertank, the OSI/CACD loads your cybertank, an OSI cybertank, and an OSI battlefield. The OSI cybertank is your cybertank's enemy during the evaluation. A modified version of the Combat Simulation Module (CSM) is used to perform the evaluation. Most of the functions of the standard CSM, such as the satellite view, are available under the EVALUATION menu.

To complete the evaluation process as quickly as possible, you can turn off the sound and graphics. It is advisable, however, to examine the battles closely to identify the enemy's weaknesses.

### 8.4 PROMOTION APPROVAL

When your evaluation is complete, an official OSI Employee Evaluation Report is filed. The Printer Setup Panel (PSP) appears and you can display the report on your terminal screen or send it to your printer (if one is connected). For more information regarding the PSP, please refer to the OSI/CACD System 2 Reference Card.

**NOTE:** For users of Commodore 64 terminal only:

The OSI Employee Evaluation Report cannot be directed to a printer.

If your cybertank fared well (wins at least 7 of the 10 battles), the report is stamped "Promotion Approved," and your Clearance Level is raised accordingly. If not, do not be discouraged. Your skills will improve with experience.

---

## 8.5 TIME FOR A VACATION

---

Congratulations. You are now conversant in the basics of cybernetics. YOU have completed the OSI training program in record time, and your accomplishments have been noted. The Director has granted you a two-week vacation. Enjoy it if you can!

---

## PART 2 MODULEREERENCE

---

### SYNOPSIS

This section is designed for new and experienced employees. The Module Reference provides quick access to all functions of the OSI/CACD System 2 operating environment. All sections of the OSI/CACD System 2 are covered in detail.

## SECTION 1 EXTERNAL CONTROL MODULE

### SECTION BRIEF

This section describes the menu commands and functions of the External Control Module (ECM).

### 1.1 ECM FUNCTION AND LAYOUT

The External Control Module (ECM) is the launching point for all modules in the OSI/CACD System 2.

On the menu bar at the top of your terminal you will see four selection menus. These are:

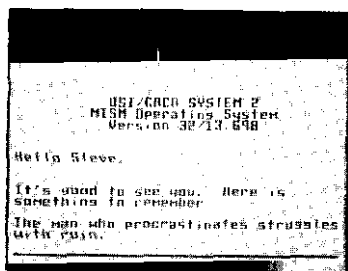


Diagram 1.1.0 -- OSI/CACD System 2 ECM menu bar

These selection menus represent gateways into other areas of the OSI/CACD System 2.

### 1.1.1 The SYSTEM Menu

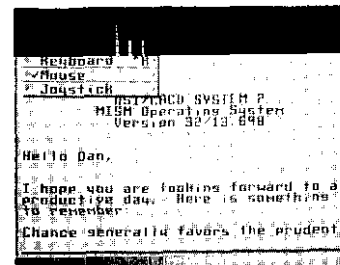


Diagram 1.1.1 --SYSTEM Menu

This menu, represented by the cybertank icon, is referred to as the SYSTEM Menu. The following functions are available within it:

#### ABOUT OMEGA

Displays the copyright notice and the name of the principal system designer.

#### KEYBOARD

Selects the keyboard as your primary input device.

#### MOUSE

Selects the mouse as your primary input device.

#### JOYSTICK

Selects the joystick as your primary input device

**Special Note:** Not all Input *devices are supported on all terminal types.*

### 1.1.2 The EMPLOYEE Menu

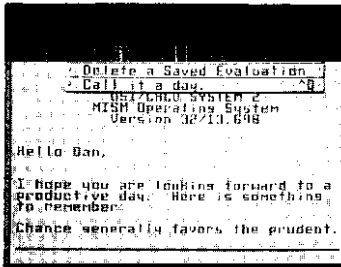


Diagram 1.1.2 --EMPLOYEE Menu

#### NEW EMPLOYEE

Returns you to the Security Entrance Procedure at OSI's main complex entrance.

#### CLEARANCE EVALUATION

Initiates an Employee Evaluation request for possible promotion to a higher clearance level.

#### CONTINUE AN EVALUATION

Continues a previously saved Clearance Evaluation.

#### DELETE SAVED EVALUATION

Deletes a previously saved Clearance Evaluation. See Section 9.3 for more information on using the File Termination Panel (FTP).

#### CALL IT A DRY

Performs a security shutdown of your computer terminal and unlocks your office door so you can leave. Excessive early departures will be duly noted.

### 1.1.3 The SIMULATE Menu

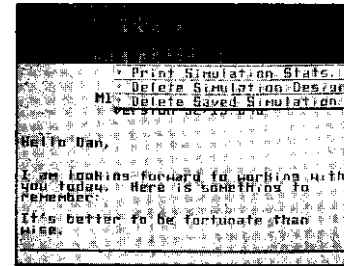


Diagram 1.1.3 --SIMULATE Menu

#### START A SIMULATION

Invokes the Combat Simulation Module.

#### CONTINUE A SIMULATION

Invokes the Combat Simulation Module and continues a previously saved simulation.

#### DESIGN A SIMULATION

Invokes the Simulation Design Module.

#### PRINT SIMULATION STATS

Prints the various statistics of a simulation to your Printer. See Section 1.2 for detailed information.

#### DELETE A SIMULATION DESIGN

Deletes a simulation design that was created with the Simulation Design Module.

#### DELETE SAVED SIMULATION

Deletes a simulation that was saved from the Combat Simulation Module.



### 1.1.4 The DESIGN Menu

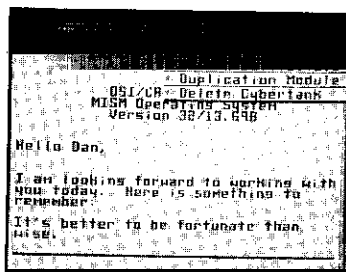


Diagram 1.1.4 --DESIGN Menu

#### DESIGN CYBERTANKS

Invokes the modules used to create and modify cybertanks.

#### TEST CYBERTANK

Invokes the Cybertank Test Module used to test cybertanks in a simulation.

#### DESIGN BATTLEFIELD

Invokes the Battlefield Design Module.

#### DUPLICATION MODULE

Invokes the Data Duplication Module.

#### DELETE CYBERTANK

Deletes a cybertank from a your ID Disc.

### 1.2 SIMULATION STATISTICS

A very useful feature of the ECM is the ability to print simulation statistics. At any time, you can choose this option to view the various statistics for a simulation design. Below is a sample printout of simulation statistics:

NUMBER OF TANK 4

NUMBER OF BATTLES: 12

[CUMULATIVE RANKINGS ]

TANK NAME	1	2	3	4	5	6	7
ALPHA	6	3	2	1			
BETA	4	4	3	1			
GAMMA	1	4	5	2			
DINKY	1	1	2	8			

Diagram 1.2 -- Simulation Statistics

The above example of Simulation Statistics tells us a number of things. This example tells us that the cybertank ALPHA was the most successful. ALPHA won 6 out of the 12 simulations. Next was BETA which won 4 out of the 12 simulations. These numbers are discovered by examining the numbers along the column labeled "1". This column tells us how many times each cybertank came in "first place." The other columns tell us how many times each cybertank came in all of the other places (second thru seventh place). By examining the Simulation Statistics for a given Set of battles, it is rather easy to determine each cybertank's relative strength and effectiveness.

---

### 1.3 ELECTRONIC MAIL SYSTEM

---

An important feature of the ECM is its electronic mail system (EMAIL). All OSI memorandums are posted through the EMAIL system. Additionally, it is important that key personnel be kept abreast of world events. The ECM will brief you on current national and world events, as well as internal news bulletins. These news briefings, along with OSI memorandums, are mandatory reading for all personnel.

---

## SECTION 2 DESIGNING A CYBERTANK

---

### SECTION BRIEF

This section describes the OSI/CACD System 2 modules used to create and modify cybertank designs.

---

### 2.1 GENERAL INFORMATION

---

The two main areas of cybertank design are: 1) the chassis, and 2) artificial intelligence (AI).

The chassis includes the hardware and mechanical components of a cybertank. Chassis design is limited only by your budget. The chassis is created and modified using the Chassis Design Module (CDM).

Once a chassis is designed, the cybertank must be given the intelligence to function. A cybertank's intelligence is limited only by your skill as a cybernetics engineer. A cybertank's AI is created and modified using the Artificial Intelligence Module (AI Module).

OSI authorization is mandatory for all cybertank designs. Only those cybertanks that conform to OSI design specifications are cleared for combat simulations. Cybertank designs are authorized using the Cybertank Authorization Module (CAM).

---

### 2.2 DESIGN CONTROL MODULE

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The Design Control Module (DCM) is the initial launching Point for the Chassis Design Module (CDM), Artificial

Intelligence Module (AI Module), and Cybertank Authorization Module (CBM).

The DCM is entered by selecting DESIGN A CYBERTANK from the DESIGN menu in the External Control Module (ECM).

The DCM screen displays the designer's name, clearance, and the current cybertank design, if one has previously been loaded (see Diagram 2.2.0).

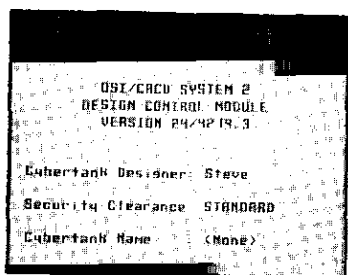


Diagram 2.2.0 -- DCM

To design a new cybertank or edit an existing one, select either NEW or LOAD, both located within the CYBERTANK menu. For a new cybertank, enter the name of the cybertank to be created and press SAVE. You will be transferred to the Chassis Design Module (see Section 2.3) to create your cybertank's chassis. If you wish to edit an existing cybertank, select the LOAD option in the CYBERTANK menu. The selected cybertank is loaded and you are transferred to the AI Module (see Section 2.4).

The next time you enter the DCM, you are immediately transferred to the AI module, with the last modified cybertank design loaded. This default option is provided for your convenience, since you will probably edit your cybertank's AI instead of its chassis. If you wish to edit the chassis, simply select the CHASSIS option in the CYBERTANK menu.

**NOTE:** *Where are several instances in which the last cybertank design will not be loaded. It usually occurs when the design was not located in any of the available access slots. If this happens, the design must be loaded manually.*

The DCM, CDM, and AI Module all share the same menus. Different menu items are enabled or disabled depending upon the module you are using. The menus are described in this section. Features unique to each module are discussed in the following sections.

### 2.2.1 The CYBERTANK Menu

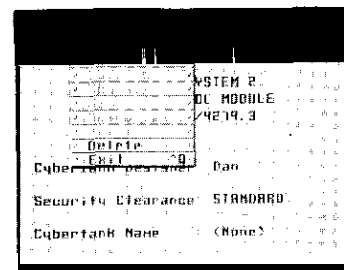


Diagram 2.2.1 CYBERTANK Menu

**NEW**

Allows you to create a new cybertank design. If selected, the File Storage Panel (FSP - see Section 9.1) appears. Enter the name of your new cybertank design and select the SAVE button. You will be transferred to the CDM to design the new cybertank's chassis (see Section 2.3).

**LOAD**

Lets you retrieve a previously saved cybertank design. If selected, the File Retrieval Panel (FRP - see Section 9.2) appears. Select the cybertank design you wish to load and you are transferred to the AI Module (see Section 2.4).

**SAVE**

Stores the current cybertank design to your ID Disc.

**SAVE AS**

Allows you to save the current cybertank design using a new name. If selected, the FSP appears. Enter a new name for your cybertank design. It should be noted that the new version of the design is totally separate from the original. The original remains unchanged. After saving, the new cybertank design file becomes the working design.

**CHASSIS**

Transfers you to the Chassis Design Module (CDM) (see Section 2.3).

**AI**

Transfers you to the AI Module (see Section 2.4).

**AUTHORIZE**

Transfers you to the Cybertank Authorization Module (CAM) for approval of your cybertank design in conforming to OSI's specifications (see Section 2.6).

**PRINT**

Prints the current cybertank design. The printout contains the cybertank's chassis components and a complete listing of its artificial intelligence. Refer to the OSI/CACD System 2

Reference Card for more specific printing instructions.

**DELETE**

Used for deleting cybertank designs from your ID Disc. If selected, the File Termination Panel (FTP - see Section 9.3) appears with the names of all the cybertank designs on your ID Disc displayed. Highlight the name of the cybertank design you wish to remove and select the DELETE button.

**WARNING:**

Once a cybertank design is terminated, it cannot be recovered!

**QUIT**

Exits the DCM and returns you to the External Control Module(ECM).

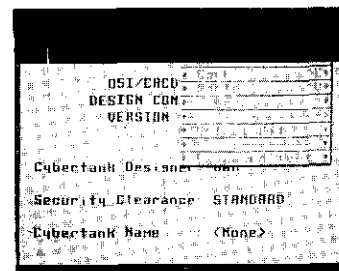
**2.2.2 The EDIT Menu**

Diagram 2.2.2 --EDIT Menu

**CUT**

Removes selected text from the AI and places it in temporary storage.

**COPY**

Places selected text into temporary storage without removing it from the AI.

*NOTE: Only the last saved text is kept in temporary storage. When you cut or copy new text, previously stored text is lost.*

**PASTE**

Inserts all text in temporary storage at the current cursor position. If text has been highlighted/selected, it is replaced by the pasted text.

**CLEAR**

Removes selected text from the AI without disturbing the contents of the temporary storage buffer.

**SELECT ALL**

Selects all of the text in the AI.

**EXPANDED TEXT**

Toggles between the short command structure and the long, verbose structure when using the CCL Construction Panel (CP - see Section 2.5). For example, the command "If Tank Found Then Shoot" becomes "If Enemy Tank Was Found Then Shoot" when EXPANDED TEXT is turned on. The default setting is EHPRNDED TEXT on, denoted by a checkmark preceding the EHPRNDED TEXT menu item.

**UNDO**

*Special Note: The UNDO feature is not supported on Commodore 64 and Apple //+,c,e terminals.*

There will be times when you mistakenly delete portions of AI and you suddenly realize the error of doing so. If you immediately select the UNDO option from the EDIT menu, then your lost action will be undone. Please note that this only works if you *immediately* select UNDO.

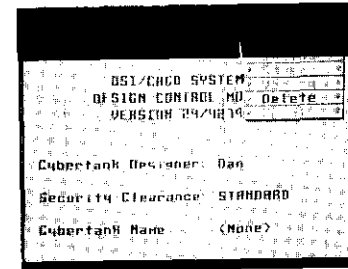
**2.2.3 The CAPSULE Menu**

Diagram 2.2.3 --CAPSULE Menu

*Special Note: See Part 4 for a complete description of the creation and use of AI Capsules.*

**NEW**

Used to initiate the design of a new AI Capsule. When selected, you are transferred directly to the AI Module (see Section 2.4).

**LORD**

Used to retrieve a previously saved AI Capsule. If selected, the FRP appears. Highlight the desired capsule and select the LOAD button. You are transferred to the AI Module (see Section 2.4), with the selected capsule loaded.

**INCLUDE**

Used to place an AI Capsule into your cybertank's AI. When Selected, the FRP is displayed. Select the desired AI Capsule and it will be inserted at the current cursor position.

**SAVE**

Used to save the current AI Capsule.

**VERIFY**

Used to check an **iii Capsule** for syntax errors. This process is analogous to the **Authorization procedure** used when designing cybertanks, but no **chassis design** is required.

**DELETE**

Used to remove **AI Capsules** from your **ID Disc**. When selected, the **FTP** displays the names of all **AI Capsules** on your **ID Disc**. Highlight the **AI Capsule** you want to delete and select the **DELETE** button.

**WARNING**

Once an **AI Capsule** has been deleted, it cannot be recovered!

**PRINT**

Prints a complete listing of the current **AI Capsule** to your printer. Refer to the **OSI/CACD System 2 Reference Card** for more specific instructions for printing.

---

## 2.3 CHASSIS DESIGN MODULE

---

**2.3.1 GENERAL**

The **Chassis Design Module (CDM)** is used to create and modify a cybertank's chassis, including its tank class, fuel cells, drive system, weapon type, scanner, and assorted special items.

A varied selection of components provides endless possibilities for chassis design - limited only by budget restrictions. Due to variations in price and attributes, it is important to be selective with the components used in your design. Some tank classes weigh more than others, some Weapons fire faster than others, etc. To assist in the design phase, the attributes of each component are included in tables in this section.

You must choose at least one of each component, with the exception of special items. If you fail to equip your cybertank with one of each component, your cybertank will be useless and thus not authorized for combat simulations.

Chassis design is limited by your budget. Your budget is limited by your security clearance. Entry-level security clearance is designated **STANDARD**. There are ten clearance levels available to cybernetic engineers. Promotions to higher clearance levels are based upon the efficiency and effectiveness of your cybertanks (see Section 6, **CLEARANCE EVALUATION**). A budget of 1000 credits accompanies a **STANDARD Clearance**. Each successive clearance level increases your budget by 1000 credits.

### 2.3.2 CDM CONTROLS

Upon entering the CDM, the cybertank's general specifications are displayed in the the Main Display Area (see Diagram 2.3.2). These specifications can be displayed at any time by selecting the Specifications button.

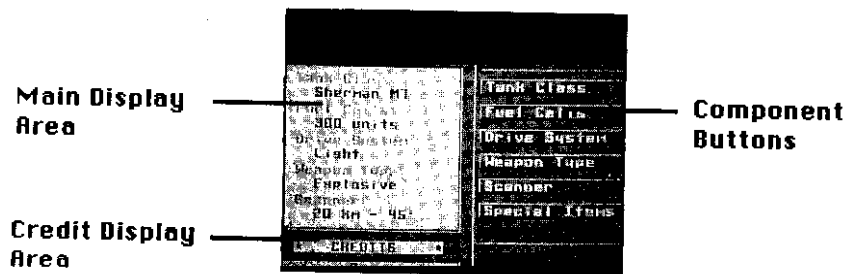


Diagram 2.3.2 -- Chassis Design Module (CDM)

Select any of the other component buttons (Tank Class, Fuel Cells, Drive System, Weapon Type, Scanner, or Special items) to display a list of specific options for that component. Choose the desired component and the small, circular button directly to the left of the item becomes highlighted. With the exception of Special items, you can select only one option per component. You can select all of the options in Special items (if you have enough credits).

**NOTE:** For users of Commodore 64 and Apple II+,c,e terminals only:

Selected items are designated by a small diamond to the left of item, not a small, circular button.

### 2.3.3 TANK CLASSES

Tank classes have the following attributes: weight, armor, and water resistance. Weight affects movement, and light cybertanks move faster than heavy cybertanks. Strong armor offers better damage protection than light armor. Only amphibious cybertanks can traverse water without damage. The following table itemizes the attributes of each tank class:

<u>TANK CLASS</u>	<u>WEIGHT</u>	<u>ARMOR</u>	<u>AMPHIBIOUS</u>	<u>COST</u>
Cougar X	Medium	Weak	No	200
Sherman M7	Heavy	Weak	Yes	350
Olympia	Light	Weak	No	500
Bradley M4	Medium	Average	No	650
Mercury	Medium	Weak	Yes	750
Centaur	Light	Average	No	825
Challenger	Heavy	strong	No	975
M5 Turtle	Medium	Average	Yes	1100
Britannia	Medium	Strong	Yes	1500
Bentley	Light	Strong	Yes	2000

### 2.3.4 FUEL CELLS

Fuel is required for all cybertank functions. The more fuel cells a cybertank carries, the longer it will run. When a cybertank's fuel supply is exhausted, no mechanical functions will operate.

### 2.3.5 DRIVE SYSTEMS

The drive system controls all mechanical functions. its weight affects movement and fuel consumption. The heavier the drive, the slower the cybertank and the more fuel it consumes. Drive system speed is rated from one to five, one being slowest, fiue being fastest.

<u>Drive System</u>	<u>Weight</u>	<u>Speed</u>	<u>Cost</u>
Light	Light	1	150
Standard	Medium	2	275
Heavy	Heavy	3	400
Turbo	Medium	3	525
Dual-Turbo	Light	3	700
Gyro	Heavy	4	900
Flux	Medium	4	1200
Fission	Light	4	1500
Fusion	Medium	5	2000
Ion	Light	5	2500

### 2.3.6 WEAPON TYPES

Cybertanks can be equipped with only one weapon. Weapons vary in their firing speed, damage capabilities, and areas of damage.

Weapons that use shells are slower than others, since they must reload after every shot. Lasers do not require any reloading time and are the fastest weapons.

Projectile weapons (**Piercing**, **Explosive**, and **High Explosive**) inflict medium damage on external instrumentation. Armor and

Lasers create havoc internally, but have little effect on external components.

Gauss guns are electrical weapons that inflict heavy damage on external mechanisms (scanner, weapon, etc.), but have little effect on internal systems.

Plasma guns are extremely effective against armor, but do little damage internally.

Nuclear weapons cause very heavy damage to all cybertank systems.

<u>Weapon</u>	<u>Speed</u>	<u>Damage Amount</u>	<u>Damage Area</u>	<u>Cost</u>
Piercing	Slow	Light	Ext. Armor/Instruments	175
Explosive	Slow	Lt-Med	Ext. Armor/Instruments	250
High Explosive Anti-Tank	Slow	Medium	Ext. Armor/Instruments	475
Laser	Fast	Medium	Internal	675
Turbo Laser	Fast	Med-Heavy	Internal	750
Gauss Gun	Average	Heavy	Ext. Instruments/Weapon	900
Plasma Gun	Average	Heavy	Ext. Armor	1300
Nuke	Slow	Heavy	Ext./Int.	1800

### 2.3.7 SPECIAL ITEMS

Special items are optional and not required for authorization. You can equip your cybertank with as many special items as your budget allows. Some special items require accompanying logic in your cybertank's artificial intelligence. Others are automatically activated when placed in your cybertank's chassis. The following provides detailed information on each special item:

#### Energy Miser

Reduces the fuel consumption rate by approximately 50%.

This device can be activated without special AI instructions.

#### Comm-Link

Used to communicate with other cybertanks on your team. In team combat, a cybertank without a Comm-Link is unable to communicate with team members.

This device requires special AI instructions. See Part 3, Section 6 for more information.

#### Repair Kit

Multi-purpose repair kits can repair any damage to a cybertank. There are only four repairs allowed per kit, SO use them wisely.



This device requires special AI instructions. See Part 3, Section 5.1 for more information.

#### Scanner Lock

A normal scanner only identifies the current location of an enemy cybertank and movement cannot be detected unless you perform multiple scans. You can lock onto an enemy cybertank and track its movement by using the Scanner lock. By using this item, your scanner will rotate automatically to face the enemy and is unaffected by your cybertank's movement.

You can unlock your scanner at any time. It unlocks automatically if the target cybertank is destroyed or the scanner's view is obstructed. In addition, an enemy cybertank can unlock your scanner by disrupting your signal with a Jammer (described below).

This device requires special AI instructions. See Part 3, Section 3.6 for more information.

#### Listener

Determines whether or not an enemy cybertank has locked onto you with its scanner. Identifies the need to jam an enemy signal.

This device requires special AI instructions. See Part 3, Section 3.7 for more information.

#### Jammer

Used to jam an opponent's scanner signal once lock-on has been discovered. The Jammer disrupts an enemy's scanner signal and forces it to unlock. A Listener device need not be installed for the Jammer to function.

This device requires special AI instructions. See Part 3, Section 3.8 for more information.

#### Launcher

This device launches a remote scanner into the air. A remote scanner links your Cybertank Scanner System (CSS) with the OSICOM I satellite. Once linked, you are relayed the location of the enemy cybertank nearest you.

Remote scanners remain airborne only briefly and are destroyed upon impact with the ground. Each Launcher is equipped with only four remote scanners and should be used wisely.

This device requires special AI instructions. See Part 3, Section 3.9 for more information.

#### Defense Shield

This offers additional protection against enemy cybertanks. Although damage is greatly reduced with the shield up, it is not eliminated.

You can raise and lower the shield at any time, but a raised shield restricts the use of other systems - the scanner range is cut in half, fuel consumption increases, and most importantly, the cybertank is unable to fire its weapon. All systems function normally when the shield is lowered.

This device requires special AI instructions. See Part 3, Section 5.2 for more information.

#### Rccelerator

Increases the processing speed of a cybertank's on-board computer. Logic operations are twice as fast. An Rccelerator does not speed up mechanical cybertank operations, such as movement or scanner rotation.

No AI instructions are required for this device.

## 2.4 ARTIFICIAL INTELLIGENCE MODULE

### 2.4.1 GENERAL

A special Cybertank Command language (CCL) was developed to aid in the design of a cybertank's artificial intelligence. The creation of a cybertank's AI is performed using the Artificial Intelligence Module (AI Module).

The AI Module contains a full-featured text editor. CCL commands can be entered from the keyboard or with the CCL Construction Panel (CP) (see Section 2.5). Once entered, commands can be edited using cut, copy, paste, insert and delete functions.

AI design can be facilitated using predesigned AI library Capsules. library Capsules are self-contained segments of artificial intelligence that perform isolated functions. You can modify existing library Capsules or create new Capsules using the AI Module. See Part 4 for more information on library Capsules.

### 2.4.2 THE INSERTION CURSOR

All text, whether entered by keyboard or with the CP, is inserted at the thin vertical bar referred to as the Insertion Cursor (IC). You can move the IC anywhere in the edit window by moving the mouse/joystick pointer and clicking the button. In addition, you can move the IC with the following CURSOR keys (please refer to the OSI/CACD System 2 Reference Card to determine the appropriate keys for your terminal type):

The CURSOR-LEFT key moves the IC one character to the left. If the IC is at the beginning of a line, CURSOR-LEFT moves it to the end of the previous line.

The CURSOR-RIGHT key moves the IC one character to the right. If the IC is already at the end of a line, CURSOR-RIGHT moves it to the beginning of the following line.

The CURSOR-UP key moves the IC to the beginning of the current line. If the IC is already at the beginning of a line, CURSOR-UP moves it to the beginning of the previous line.

The CURSOR-DOWN key moves the IC to the end of the current line. If the IC is already at the end of the line, CURSOR-DOWN moves it to the end of the following line.

### 2.4.3 Inserting Text

The purpose of the IC is to indicate the point in the text at which characters can be inserted or deleted. Text can be inserted between any two characters. To insert text, simply move the IC to the position at which you want to start adding text and begin entering the text you want to insert.

### 2.4.4 Deleting Text

Text can be removed one character at a time using the DELETE key. Each time you press DELETE, the character to the left of the IC is removed. Characters to the right of the IC move left to fill in the gap.

### 2.4.5 Adding New lines

New lines can be added anywhere in the text. Labels always begin in the far left column. Other lines are indented. Since labels are less common than other lines, the AI Module will automatically indent each new line when you press RETURN.

To move the IC from the indentation column to the far left column (ie., remove the indentation), press DELETE. To move the IC from the far left column to the indentation column (ie., indent), press TAB. Please refer to the OSI/CACD System 2 Reference Card to determine the TRB and DELETE keys for your particular terminal type.

### 2.4.6 Scrolling

You can scroll the text by clicking anywhere on the scroll-bar located directly to the right of the edit window. Clicking directly on the scroll-bar will scroll the text several lines. Clicking on the small arrows directly above and below the scroll-bar will scroll one line. By clicking on the small plaque (or "thumbprint" as it is often called), you can drag the

plaque to any location in the scroll-bar. This thumbprint represents the location of the text currently visible in the edit window. For example, if the edit window is displaying the first few lines of text, then the thumbprint will be at the very top of the scroll-bar. On the other hand, if the edit window is currently displaying the last few lines of text, then the thumbprint will be at the very bottom of the scroll-bar.

**NOTE:** For users of Commodore 64 and Apple //+.c,e terminals only:

You can scroll the text in the edit window by clicking on any of the six scroll arrows at the right side of the edit window. The upward-pointing arrows move the window toward the beginning of the text, and the downward-pointing arrows move the window toward the end. There are three sizes of arrows. The smallest arrows scroll one line. The medium-sized arrows scroll several lines. The longest arrows scroll all the way to the beginning (or end) of the text.

You can also scroll the text using the SCROLL keys. There are six scroll keys, one for each of the scroll arrow buttons. See the OSI/CACD System 2 Reference Card to determine which keys to use on your terminal.

#### 2.4.7 SELECTING TEXT

You can select and edit sections of text, such as words, lines, or paragraphs. Selected sections of text appear highlighted.

Text can be selected by dragging the mouse/joystick from a beginning selection point to an end point. Move the pointer to the beginning of the text you wish to select, press and hold the button down, and move the pointer to the end of the text section. Then release the button and the text will be highlighted.

To select text with the keyboard, move the IC to the beginning of the text you wish to select, press the MARK key (refer to the OSI/CACD System 2 Reference Card for keyboard control of the AI Module), then move the IC to the end of the text. Text is highlighted as it is selected.

When using a mouse or joystick, text is deselected by moving the IC. With the keyboard, text is deselected by pressing the MARK key a second time.

#### 2.4.8 Deleting a Section of Text

To delete a section of text, select the text by using one of the methods discussed above (it will be highlighted) and press DELETE.

#### 2.4.9 Replacing a Section of Text

To replace a section of text, simply select it and type the replacement text. There is no need to press DELETE.

#### 2.4.10 Cutting and Pasting Text

You can easily rearrange sections of text using the Cut and Paste functions. You can remove (Cut) a selected section of text, like a sentence or paragraph, and move it to another location (Paste).

To Cut, select the desired text section and choose CUT from the EDIT menu. The selected text is removed from the edit window and stored internally by the AI Module.

To Paste that section into a new location, move the IC to a Position that marks the beginning of the insertion. Select PRSTE from the EDIT menu. The text you stored (Cut) is inserted at the IC.

### 2.4.11 Copying and Pasting Text

You can duplicate (copy) a section of text and place it in a new location. This function does not remove selected text from its current location in the edit window.

To Copy, select a section of text and choose COPY from the EDIT menu. A duplicate or copy of the selected text is stored internally by the AI Module.

To Paste, move the IC to a position that marks the beginning of the insertion. Select PASTE from the EDIT menu. A copy of the stored text is inserted at the current location of the IC. You can continue to paste that section into new locations by moving the IC and selecting PASTE from the EDIT menu.

**WARNING:** *A cut or copied section of text is only stored temporarily. Each time you cut or copy a new section of text, any previously stored text is removed from internal storage.*

### 2.4.12 UNDO

**Special Note:** *The UNDO feature is not supported on Commodore 64 and Apple //+,c,e terminals.*

There will be times when you mistakenly delete portions of AI and you suddenly realize the error of doing so. If you immediately select the UNDO option from the EDIT menu, then your last action will be undone. Please note that this only works if you immediately select UNDO.

## 2.5 USING THE CCL CONSTRUCTION PANEL (CP)

The CCL Construction Panel (CP) can assist in the design of a cybertank's AI. The panel, located at the bottom of the AI Module screen, provides access to OSI command language instructions. Using the CP, you can easily incorporate any of the instructions into your cybertank design.

If you are using a mouse or joystick, the CP is always enabled when using the text editor. If you are using the keyboard, you can use the CP as follows: (1) Press the CONNECT key, (2) Use the CURSOR keys to highlight the desired plaque, (3) Press RETURN. When you are done using the CP, press the CONNECT key to disconnect from the CP. Please see the OSI/CACD System 2 Reference Card to determine the CONNECT, CURSOR, and RETURN keys for your particular terminal type.

The CP is a series of plaques corresponding to specific cybertank functions (See Diagram 2.5.1 below). Move the pointer to the desired function and click on the plaque.

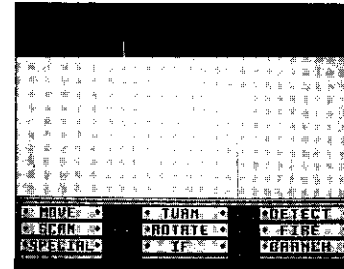


Diagram 2.5.1 – AI Module Construction Panel (CP)

The plaque marked Special is used to implement special items and instructions (ex: Self Destruct instruction). The if Plaque provides all conditional instructions. The blank Plaque skips a line in the AI text editor.

The CP guides you through all the combinations of instructions authorized by OSI for cybertank design. The CP

is critically important if you are unsure of the instructions needed to implement a design element. The CP can simplify the design process.

For example, you want to make your cybertank move, but are unsure of the Specific command language needed to implement movement.

Select the Move plaque. The panel now displays Forward and Backward plaques, since a cybertank can only move in those directions. Select one of the plaques and you will be taken to the next step in the design phase for movement.

For example, click on the Forward plaque. The panel now displays a series of number plaques. The number plaques are used to specify the amount of forward movement. The plaque marked '1' represents one hectometer, '2' equals two hectometers, and so forth. There is also a plaque marked Var that lets you specify a system or user variable as the number of hectometers. [This should only be used by advanced users familiar with variables.]

Select the plaque marked 1. In the tent editor, you will see the AI computer type out Move Tank Forward 1'. You have just instructed your cybertank to move forward by one hectometer.

As you can see, selecting a Series of plaques results in the appropriate instruction being included in your cybertank's AI. The AI computer automatically types the instruction into your tent editor and resets the plaques on the CP.

Some commands require that you enter a label or variable, or decide between a "BRRNCH TO" and a "DO" structure. For example, see Diagram 2.5.2

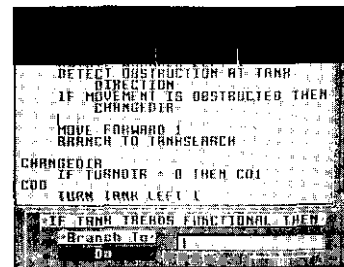


Diagram 2.5.2 -- Partially completed AI line using the CP

In the above diagram, the bottom left portion of the screen shows the two options: "BRANCH TO" and "DO". You can select either of these options left before entering the label.

All "IF/THEN" commands need either a "BRANCH TO" or "DO" and the entry of a label. (For more information on using various commands, See Part 3 of this handbook.) Once you have chosen the appropriate instruction and selected "BRANCH TO" or "DO", you should enter a routine name (called a "Label").

The best way to become familiar with the CP is simply to Play around with it. Most plaques are self-explanatory.

**NOTE:** You can always return to the previous series of Plaques by clicking anywhere on the CP (except a plaque). This is extremely helpful if you have mistakenly selected an incorrect plaque.

You can return to the main series of plaques by clicking anywhere in the text editor.

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## 2.6 THE AUTHORIZATION MODULE

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Once you have selected your cybertank's chassis and designed its AI, you must Authorize it. This process checks the Chassis for design flaws, and **compares your list of AI instructions** against those approved by OSI.

During the authorization procedure, OSI notifies you of unacceptable instructions. Once notified of an unauthorized instruction you can resume the procedure (to receive notification of all other errors), or abort authorization altogether. When an error exists in instructions, you are automatically returned to the AI module for corrections. If a problem occurs in your chassis design, you are transferred to the Chassis Design Module (CDM).

Your cybertank design must be authorized by OSI before it is allowed on a battlefield. If your cybertank design does not pass Authorization, refer to Appendix 5 for a complete list of all Authorization errors and their possible remedies.

Once your design has been approved, OSI creates a cybertank ready for battle. Once the cybertank is created, you are given a choice of whether to exit to the ECM or return to the design module.

When you return to the design module, the design used to invoke the authorization process is displayed. You can then make additional modifications, save the cybertank design, or quit,

**WARNING:** *Authorizing your cybertank's design* does **NOT save the design to your ID Disc. You must save the design yourself.**

**NOTE:** *Whenever you use the cybertank editor to modify a design, you must obtain authorization for the design changes. If you fail to re-authorize a design and enter a*

***battle, the cybertank will use its old chassis and AI and not the modified design.***

## SECTION 3 SIMULATION DESIGN MODULE

### SECTION BRIEF

This section describes all parts of battle simulation design.

### 3.1 SDM FUNCTION AND LAYOUT

The Simulation Design Module (SDM) is used to select the field of battle and designate authorized cybertanks for combat. Any authorized cybertanks can be selected for battle. You can also specify that duplicate cybertanks compete against one another. After simulation design, the battle begins.

To gain access to the SDM, select DESIGN A SIMULATION from the SIMULATE menu.

Diagram 3.1.1 illustrates the SDM display. The employee's name and clearance level is shown on the left side of the screen. Riso on the left side of the screen are three areas labeled PRIMARY TANK, OTHER TANKS, and BATTLEFIELD. The selected cybertank and battlefield names are displayed in this area.

in the bottom right corner of the screen, are three buttons labeled SELECT, CATEGORY, and DRIVE. The SELECT button is used to designate cybertanks and/or a battlefield. You must select a PRIMARY TANK before selecting other cybertanks or a battlefield. The CATEGORY button is used to access the PRIMARY TANK, OTHER TANKS, and the BATTLEFIELD selections. The DRIVE button is used to change the active access slot (disc drive).

**NOTE:** For users of Commodore 64 and Bppie //+,c,e terminals only:

These terminals are equipped with a SLOT button rather than a DRIVE button. By pressing the SLOT button you are able to access additional access slots (or disc drives) that may be connected to your terminal.

The three areas in the upper right are unlabeled information areas. The upper area displays your current selection category – either Tank Files or Battlefields. The middle area identifies the disc in the active access slot. in most cases, your employee identification disc is identified. The information displayed in the third area is based on the current selection category. The Tank Files category shows all authorized cybertanks on the active DISC; the Battlefields category shows all battlefield maps found on the current disc.

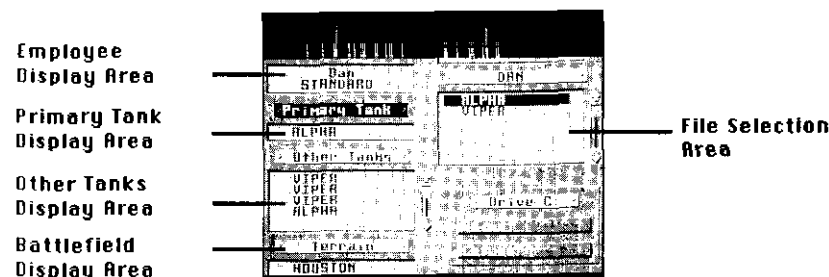


Diagram 3.1.1- Simulation Design Module (SDM)

NOTE: When designing a simulation, the selected battlefield and cybertanks **must** reside on the same disc. If the necessary data files are on different discs, the Combat Simulation Module (CSM) displays an error message. For information on how to copy data files from disc to disc, see Section 8.

Additional options are available under the menu heading called DESIGN:

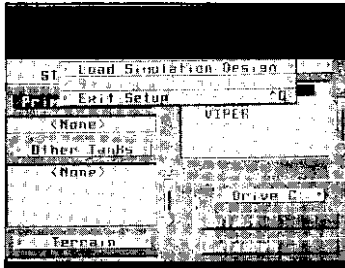


Diagram 3.1.2 -- DESIGN Menu

**SELECT CYBERTANKS** is used to designate the cybertanks you want included in the battle simulation.

**SELECT TEAMS** is used to specify cybertank teammates. You are allowed two teams with as many as seven cybertanks per team. See Section 3.2 for more information.

**POSITION HEADQUARTERS** is used to designate the position of the headquarters on the map. See Section 3.3 for more information.

## LOAD SIMULATION DESIGN

*Special Note: On Commodore 64 and Apple //+,c,e terminals the LOAD SIMULATION DESIGN feature is not supported.*

This is used to retrieve a previously saved Simulation Design. If selected, the FRP appears. Highlight the desired Simulation Design and select the LOAD button. At this point, you can edit any part of the design.

**SAVE SIMULATION DESIGN** saves the current simulation setup to your ID DISC. You must select a primary tank, at least one other cybertank, and a battlefield before you can save a design. **SELECT TERMS** and **POSITION HEADQUARTERS** are optional.

**EXIT SETUP** exits the SDM and returns you to the ECM.

When selecting cybertanks, note that the primary cybertank is the only one which can be fully tested and analyzed in the Cybertank Test Module (CTM, see Section 5).

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## 3.2 SELECTING TEAMS (OPTIONAL)

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You are allowed two teams in a battle simulation with a maximum of seven cybertanks per team. If you select more cybertanks than you place on teams, the remaining cybertanks will compete individually. Available cybertanks that have not been placed on a team are listed on the right side of the screen.

The **SWITCH TEAM** button toggles between selecting cybertanks for TEAM 1 and TEAM 2.

**INIT TEAM** removes all cybertanks from the currently selected team and places them on the available list.

The **SELECT TANK** button places the highlighted cybertank into the currently selected team.



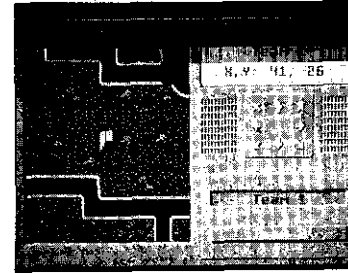
### 3.3 POSITIONING HEADQUARTERS (OPTIONAL)

When designing team simulations, you can position a headquarters for each team. This headquarters is an important target for enemy cybertanks. When competing in a simulation that includes a headquarters, there are two routes to victory: 1) terminate all opposing team-members, or 2) destroy the enemy team's headquarters. As you can easily see, protecting your team's headquarters is of paramount importance.

The positioning headquarters option is not available until you specify a battlefield and select team members.

**NOTE:** A *headquarters is NOT necessary in order to compete with teams.*

Diagram 3.3 shows the screen used to position a headquarters building (terrain features may vary depending upon the battlefield you select).



**Diagram 3.3 -- Positioning a Headquarters Building**

The left side of the screen shows a section of the battlefield with a headquarters building centered in the display. Use the scroll arrows on the right side of the screen to position the headquarters. The currently selected team number (1 or 2) is shown with the current coordinates of its headquarters in the area above the scroll arrows. The TERM 1 and TEAM 2 buttons on the lower right are used to toggle between the two teams. (Please see the OSI/CACD System 2 Reference Card for information about using the keyboard.)

**NOTE:** A *headquarters cannot be mooved through indestructible objects.*

## SECTION 4

**COMBAT SIMULATION MODULE****SECTION BRIEF**

This section describes observing a simulation and analyzing the performance of your cybertank.

**4.1 CSM FUNCTION AND LAYOUT**

The first step in starting a simulation is to select the simulation design you want to use. All selected cybertanks and the battlefield **MUST** reside on the SRME disc (see Section 8 for information on how to copy data files from one disc to another).

Select **START A SIMULATION** from the **SIMULATE** menu. The File Retrieval Panel (FRP) is displayed with a list of simulation designs found on the current disc. Highlight the desired design and select the **LORD** button. You are transferred then to the Combat Simulation Module (CSM). After the OSI/CACD loads the cybertanks and battlefield, the simulation will begin.

**4.2 GENERAL COMMANDS**

At the start of the simulation, the Battlefield Display Area displays the cybertank selected as the "Primary Tank" in the center of the display area. To view the other cybertanks, use the Cybertank Selection Keys. The next cybertank is centered in the display area with the name of the cybertank displayed directly below the display area. If a crater or destroyed tank is displayed in the center of the area, then that cybertank has been destroyed.

To pause the action, press the **PAUSE**. Press it again to resume the simulation.

The **SELECTION** and **PRUSE** keys can be found in your OSI/CACD System 2 Reference Card.

**4.3 THE INSTRUMENT PANELS**

The right side instrument panel displays the gauges for a selected cybertank. The gauges are defined as follows:

- F** - Fuel level
- I** - Internal damage (AI Computer. Engine)
- A** - Armor damage
- T** - Tread damage
- S** - Scanner damage
- W** - Weapon damage
- SL** - Scanner Lock (off = unlocked: on = locked)
- DS** - Defense Shield (off = down: on = up)
- LD** - Listener Device (on = being scanned)

Directly to the left of the scanner lock LED is an indicator, known as the **Cybertank Directional Indicator**, that shows the direction the cybertank is facing and the direction the scanner is pointing (for specific details on the **Cybertank Directional Indicator**, refer your OSI/CACD System 2 Reference Card).

The instrument below the **Cybertank Directional Indicator** depicts what the scanner is "seeing" (for a complete description of the **Cybertank Vision Indicator**, see your OSI/CACD System 2 Reference Card).

The lower right of screen provides four categories of battle information. The categories are:

- T - Total number of battles to be simulated
- B - Number of battles previously fought
- S - Number of successful battles
- A - Number of active cybertanks remaining

When a battle is over, the results are recorded to disc. This running tabulation is retained as long as the specific simulation design exists.

---

#### 4 . 4 OTHER OPTIONS

---

The options below are available from the Simulation menu:

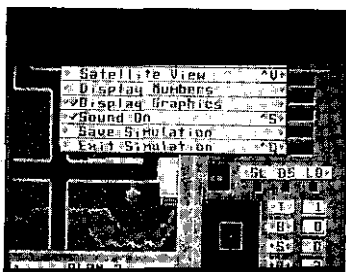


Diagram 4.4 -- SIMULATION Menu

**RESTART SIMULATION** is used to start the current simulation over again. All battles simulated and all cybertank victories are cleared.

**SET NUMBER OF BATTLES** is used to select the number of battles per simulation. If more than one battle is selected, the simulation automatically starts each successive battle. The simulation ends when all battles are completed.

**POSITION CYBERTANKS** is used to manually position the cybertanks in the simulation. You can move a cybertank to a new location or turn a cybertank to face a new direction. Select the large dot between the scroll arrows to toggle between POSITION and DIRECTION, then use the arrows for movement or rotation. Select Restart to begin the simulation using the new positions.

**SATELLITE VIEW** provides an overhead view of the battlefield as seen from the OSICOM I satellite. The entire battlefield is shown with the cybertanks appearing as flashing blips. When viewing the Satellite transmission, you can observe all the cybertanks' actions. To exit the satellite view, press any key or click the mouse or joystick button.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

The square box surrounding a small portion of the battlefield represents the region currently selected in the Battlefield Display Area. Note that the cybertanks are automatically paused during the Satellite viewing mode. Simulations cannot operate while viewing the satellite transmission. Press any key to return to the close-up view.

**DISPLAY CYBERTANK NUMBERS** displays the cybertanks as numbers. The numbers correspond to those shown when the CSM loaded the cybertanks from your ID Disc at the beginning of the simulation. Select this option again to return to the normal cybertank view.

**DISPLAY GRAPHICS** is used to toggle the Battlefield Display Area on and off. When the Battlefield Display Area is off,

the speed of the simulation is increased and the battle time is decreased.

**SOUND ON** is used to toggle your terminal's speaker on and off. When the speaker is off, simulation speed increases.

**SAVE SIMULATION** is used to save a simulation in-progress. You can restart a saved simulation. Terminated cybertanks are not re-activated until the start of the next battle.

**EXIT SIMULATION** exits the CSM and transfers you back to the ECM.

---

## SECTION 5 CYBERTANK TEST MODULE

---

### SECTION BRIEF

This section details the operation of the Cybertank Test Module (CTM).

---

### 5.1 CTM FUNCTION AND LAYOUT

---

The Cybertank Test Module (CTM) displays all instructions during a battle simulation instead of the instrument panel shown using the Combat Simulation Module (CSM). Instructions are viewed one at a time and you can observe the internal status of a cybertank to track its reaction to a specific command or situation. Instructions are viewed and tested in Trace Mode. Various cybertank status registers can be edited in Status Mode.

To use the CTM, select **TEST A CYBERTANK** from the **DESIGN** menu. The File Retrieval Panel (FRP) will appear. Highlight the desired simulation design and select the **LOAD** button. You are transferred to the CTM. After the OSI/CACD loads the specified cybertanks and battlefield, the testing will begin.

---

### 5.2 GENERAL COMMANDS

---

At the start of the simulation, the Battlefield Display Area shows, the cybertank selected as the "Primary Tank" in the center of the display area. To view the other cybertanks, use the Cybertank Selection Keys. The next cybertank is centered in the Battlefield Display Area with the name of the cybertank appearing directly below the display area. If a crater or destroyed cybertank is

displayed in the center of the area, that cybertank has been destroyed.

To Pause the action, press the PAUSE key. press it again to resume the simulation.

The locations of the SELECTION and PAUSE keys can be found in the OSI/CACD System 2 Reference Card.

### 5 . 3 OTHEROPTIONS

The options below are accessed from the Debugger menu.

RESTART is used to start the current simulation over again.

SATELLITE VIEW provides an overhead view of the battlefield as seen from the OSICOM I satellite. The entire battlefield is shown with the cybertanks appearing as flashing blips. When viewing the Satellite transmission, you can observe all the cybertanks' actions. To exit the satellite view, press any key or click the mouse or joystick button.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

The square box surrounding a small portion of the battlefield represents the region currently selected in the Battlefield Display Area. Note that the cybertanks are automatically paused during the Satellite viewing mode. Simulations cannot operate while viewing the satellite transmission. Press any key to return to the close-up view.

SOUND ON toggles your terminal's speakers on and off, With the speaker off, the simulation speed is increased.

TRACE MODE ON toggles between Trace Mode and the AI

status Mode (see Sections 5.4 and 5.5, respectively). The default setting is Trace Mode, which is represented by a check-mark preceding the TRACE MODE ON option.

EXIT exits the CTM and transfers you back to the ECM.

### 5.4 TRACEMODE

Diagram 5.4 represents the screen displayed when AI Trace Mode is activated (details in AI and terrain may vary). Trace Mode is used to observe specific instructions during a simulation and their effect on the selected cybertank.

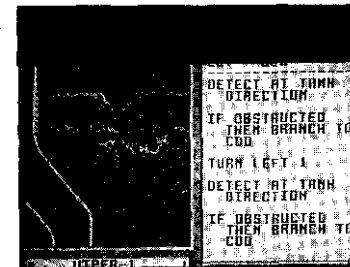


Diagram 5.4 – Cybertank Test Module (CTM)

When the CTM is in Trace Mode, the display area on the right side of the screen shows the cybertank's AI. The upper Part of this display area shows the cybertank number and name, and the Label of the section of AI currently being executed. The lower part of this display area shows the

cybertank's "thoughts." It should be pointed out that only the AI Of the tank selected as the Primary Tank in the Simulation Design Module (SDM) can be shown. For security reasons, the At of all other tanks in the simulation cannot be shown.

A great deal can be learned by watching a cybertank's behavior on the battlefield while examining its AI being Processed. Trace Mode allows you to see the cybertank's commands as they are being processed.

Press the PRUSE key to halt execution of the AI. The PRUSE key works the same way in the CTM as it does in the CSM. That is, pressing it toggles the pause mode on and off. See the OSI/CACD System 2 Reference Card to determine the PAUSE key for your particular terminal type. When the test is paused, pressing the STEP key causes the test to run just long enough to process one CCL command, after which the test remains paused. This allows you to examine the AI and its effects one command at a time. This feature is known as single stepping. To determine the STEP key for your particular terminal type, see the OSI/CACD System 2 Reference Card.

To return execution to full speed, press the PAUSE again.

By watching a cybertanks AI, you can gain a great deal of insight into logic and cybertank control. For example, if you are experiencing problems with a firing routine (ex. routine named 'SHOOTIT'), then let the AI execute at full speed until you see the label "SHOOTIT" displayed. Press the PAUSE key to halt execution and then single-step through the firing routine to examine the execution of the AI instructions closely.

## 5.5 STATUS MODE

Diagram 5.5 represents the screen display for the Status Mode. Use this mode to change the various cybertank status registers.

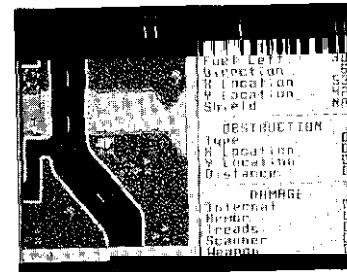


Diagram 5.5 -- AI Edit Mode

The entries on the right side of the screen represent the values of various System end User Variables. Several different screens (pages) are used to show the status of your cybertank, due to the many variables possible. Use the Cybertank Status Page Keys tree the OSI/CACD System 2 Reference Card) to scan the available pages.

The table below lists all of the entries which can be changed along with their respective System variable name:

	<u>ENTRY NAME</u>	<u>SYSTEM VARIABLE</u>
Page 1	Fuel Left Direction X Location Y Location	FuelLevel TankDir TankX TankY
	Type X Location Y Location Distance	ObstacleType ObstacleX ObstacleY ObstacleDist
	Internal Armor Treads Scanner Weapon	IntDamage ArmorDamage TreadDamage ScanDamage WeapDamage
Page 2	Direction  X Location Y Location Distance	ScanDir  EnemyX EnemyY EnemyDist
	Type X Location Y Location Distance	ObjType ObjX ObjY ObjDist
	X Location Y Location Distance	EnemyHQX EnemyHQY EnemyHQDist
Page 3	Ally Number Code Received	AllyNum AllyCode

	X Location Y Location Distance	AllyX AllyY AllyDist
	X Location Y Location Distance Direction	AllyEnemyX AllyEnemyY AllyEnemyDist AllyEnemyDir
Page 4	Ally Number Code Received	CopyNum CopyCode
	X Location Y Location Distance	CopyX CopyY CopyDist
	X Location Y Location Distance Direction	CopyEnemyX CopyEnemyY CopyEnemyDist CopyEnemyDir
Page 5	Repair Kits Launchers XY Distance Random #	KitsLeft RemotesLeft XYDist RandomNum
	X Location Y Location	AllyHQX AllyHQY

Pages six and higher list all the User Variables in the Cybertank's AI. All User Variables can be edited.

To change the value of a System or User Variable, halt execution (see Section 5.2) using the PAUSE key. If you are using a mouse or joystick, simply click on the register you wish to change and it becomes highlighted. If you are using the keyboard, please refer to the OSI/CACD System 2 Reference Card to determine the appropriate keys to use to highlight the various status registers. Once you have highlighted the variable you want to edit, Simply Use the

keyboard to enter the new value and press RETURN. Your cybertank then reflects the new status. If you enter an illegal value or attempt to select a variable which cannot be changed, a beep is generated and the highlight bar move to the first entry on the page which can be edited.

---

## SECTION 6 CLEARANCE EVALUATION

---

### SECTION BRIEF

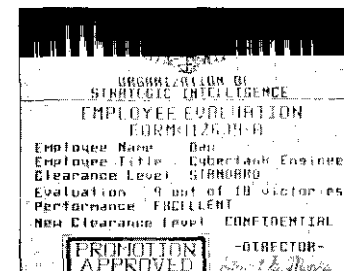
This section describes the importance of clearance evaluations and the method of accessing an evaluation.

---

### 6 . 1 CEM FUNCTION AND LAYOUT

---

The Clearance Evaluation Module (CEM) is used to evaluate the performance of your cybertank in a simulated battle against one of OSI's cybertanks. If your design is successful in the battle, you are promoted to the next Clearance level (see Diagram 6.1). Promotions result in a larger budget which can be used to select better components for your next cybertank design. The CEM is very similar to the Combat Simulation Module (CSM) in layout and function.



**Diagram 6.1 -- Promotion Approved**



To access the CEM, select CLEARANCE EVALUATION from the EMPLOYEE menu. The File Retrieval Panel (FRP) is displayed. Highlight the cybertank you wish to use in the evaluation and select the LOAD button. You are then transferred to the CEM. After the OSI/CACD loads your cybertank, OSI's cybertank, and the battlefield chosen by OSI, the evaluation will begin.

---

## 6.2 GENERAL COMMANDS

---

Your cybertank is automatically centered in the Battlefield Display Area. To view OSI's cybertank, use the Cybertank Selection Keys to center the OSI cybertank. The name of the currently displayed cybertank is shown below the display area. Action cannot be paused in the CEM.

---

## 6.3 THE INSTRUMENT PANELS

---

The instrument panel is exactly identical to that of the Combat Simulation Module (CSM), described in Section 4.3.

---

## 6.4 OTHER OPTIONS

---

The following options are available from the Evaluation menu in the CEM:

SATELLITE VIEW provides an overhead view of the battlefield as seen from the OSICOM I satellite. The entire battlefield is shown with the cybertanks appearing as flashing blips. When viewing the Satellite transmission, you can observe all the cybertanks' actions. To exit this view, press any key or click the mouse or joystick button.

NOTE: For users of Commodore 64 and Apple //+,c,e terminals only:

The Square box surrounding a Small portion Of the battlefield represents the region currently selected in the Battlefield Display Area. Note that the cybertanks are automatically paused during the Satellite viewing mode. Simulations cannot operate while viewing the satellite transmission. Press any key to return to the close-up view.

DISPLAY GRAPHICS is used to toggle the Battlefield Display Area on and off. When the display area is off, the speed of the evaluation is increased and battle time is decreased.

SOUND ON toggles your terminal's speaker on and off. When the speaker is off, the speed of the evaluation is increased.

SAVE EVALUATION lets you save an evaluation in-progress. A saved evaluation can be continued at another time.

EXIT EVALUATION exits the CEM and then transfers you to the ECM.

---

SECTION 7  
**BATTLEFIELD DESIGN MODULE**

---

**SECTION BRIEF**

This section describes the procedures used to create custom battlefields.

---

7.1 BDM FUNCTION AND LAYOUT

---

The Battlefield Design Module (BDM) is used to create custom battlefield designs for simulated cybertank battles. To access the BDM, select DESIGN BATTLEFIELD from the SIMULATE menu.

You must be familiar with the following terminology before designing a custom battlefield:

**TILE** -- A tile is a single terrain feature used to build more complicated features. Examples of tiles include: a tree, a section of grass, part of a building, or part of a coastline. Tiles form the foundation of all battlefield designs.

**BLOCK** -- A block is a group of tiles. Its maximum size is five tiles wide by five tiles tall. Using blocks, you can greatly simplify the construction of complex and/or repetitive terrain elements. For example, constructing a large highway is easier using blocks.

Blocks are like "large tiles", but unlike tiles, blocks can be edited, modified and deleted. You can design various block configurations and save them onto your ID Disc.

Diagram 7.1.0 represents the screen display of the BDM.

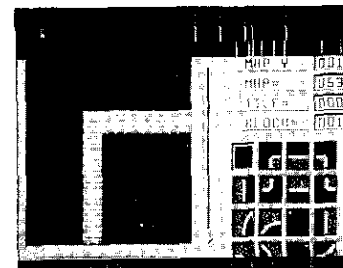


Diagram 7.1.0 -- Battlefield Design Module (BDM)

The left side of the screen shows a portion of the battlefield. This main display area can be scrolled to different areas of the battlefield using the four directional scroll arrows found to the right and below the display area.

The lower right section of the screen displays 16 tiles. The currently selected tile is enclosed by a small box. You can scroll through additional tile selections by using the up and down scroll arrows located directly above the tile area.

The following options are available from the BATTLEFIELD selection menu:

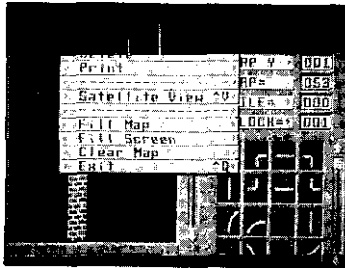


Diagram 7.1.1 - BATTLEFIELD Menu

**LOAD** lets you retrieve a previously saved battlefield design. If selected, the File Retrieval Panel (FRP) will appear. Highlight the desired battlefield design and select the **LOAD** button.

**SAVE** lets you save the current battlefield design under a new name. If selected, the File Storage Panel (FSP) will be displayed. Enter the new name of your battlefield design. The new version of the design will be totally separate from the original. The original design will remain unchanged, unless you give it the same name as the original.

**DELETE** lets you remove battlefield designs from your ID Disc. If selected, the File Termination Panel (FTP) will be displayed with the names of all the battlefield designs on your ID Disc. Highlight the battlefield design you wish to remove and select the **DELETE** button. Please be careful- once a battlefield design is terminated, it cannot be recovered!

**PRINT** lets you print the current battlefield design to your printer. Refer to the OSI/CACD System 2 Reference Card for more information.

**SATELLITE VIEW** provides an overhead view of the battlefield as seen from the OSICOM 1 satellite. To exit the satellite view, simply press any key or click the mouse or joystick button.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

The square box surrounding a small portion of the battlefield represents the region that was displayed in the normal close-up view of the battlefield before choosing Satellite View. Pressing any key will return you to the close-up view.

**FILL MRP** fills the entire battlefield with the currently selected tile. Be extremely careful when using this option, as it affects the entire battlefield.

**FILL SCREEN** fills only the portion of the battlefield shown in the main display area with the currently selected tile.

**EXIT** will exit the BDM and return you to the ECM.

The following options are available from the **BLOCK** selection menu:

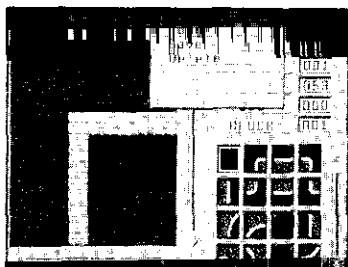


Diagram 7.12 -BLOCK Menu

**LORD** lets you retrieve a previously saved block configuration. When selected, the File Retrieval Panel (FRP) will appear. Select the desired block configuration and it will be loaded into the BDM. At this point, the blocks can be used or edited in any way.

**SAVE** lets you save the current block configuration under a new name. When selected, the File Storage Panel (FSP) will be displayed. Enter the new name of your block configuration. The new version of the block configuration will be totally separate from the original. The original will remain unchanged.

**DELETE** lets you remove block configurations from your ID Disc. When selected, the File Termination Panel (FTP) will be displayed with the names of all the block configurations on your ID Disc. Highlight the desired block configuration and select the **DELETE** button. Be careful-- once a block configuration is terminated. It cannot be recovered!

**CLEAR BLOCK** erases the currently selected block.

**CLEAR COPY** deactivates any block copy currently in progress. Section 7.2 offers more information on copying blocks.

The following options are available from the **EDIT** selection menu:



Diagram 7.13 - EDIT Menu

**DISPLAY TILES** sets the lower right portion of the screen to display tiles. This setting allows you to use tiles in battlefield design. This option overrides the **DISPLAY BLOCKS** mode.

**DISPLAY BLOCKS** sets the lower right portion of the screen to display blocks. This setting allows you to use blocks in battlefield design. This setting will override the **DISPLAY TILES** mode.

**PEN DOWN** is used to “draw” with the currently selected tile. When activated, the selected tile is drawn onto the battlefield at the center of the main display area. The tile is

shown in inverse. Move the battlefield to draw multiple tiles. This mode is most useful to add large areas of the same terrain type. For example, PEN DOWN is very helpful in adding large forested areas to a battlefield design. PEN DOWN mode is only available when the DISPLAY TILES mode is active.

PLOP MODE ON is used to place individual tiles. Battlefield movement has no effect on a placed tile. If you are using a mouse or joystick, you can simply click anywhere in the main display area to place the current tile. If you are using the keyboard, please refer to the OSI/CACD System 2 Reference Card for more information.

COPY MODE ON lets you create a block by copying a section of your battlefield (See Section 7.2 for more information).

---

## 7.2 USING BLOCKS

---

To create a block, select the DISPLAY BLOCKS option from the EDIT menu. Next, select the COPY MODE ON option from the EDIT menu. Move the map to the area of the battlefield you wish to use in creating the block. If you are using a mouse or joystick, simply click on the tiles that you want to be part of the block. If you are using the keyboard, see the OSI/CACD System 2 Reference Card for more information.

You can select any tiles on the battlefield, but they must be a part of the same 5 X 5 tile area. After selecting the tiles you want, click anywhere in the Block Display Area (bottom right area of the screen) to create the new block (again, if you are using the keyboard, see the OSI/CACD System 2 Reference Card). You can use the up and down scroll arrows located above the block display area to scroll through the complete set of blocks.

Once you have the blocks, select PLOP MODE ON from the EDIT selection menu. You can move around on the battlefield and “plop” the currently selected block onto the battlefield by clicking anywhere in the main display area. If you are using the keyboard, please refer to the OSI/CACD System 2 Reference Card for more information.

To return to using tiles to create the battlefield, select the DISPLAY TILES option from within the EDIT selection menu.

## SECTION 8 DATA DUPLICATION MODULE

### SECTION BRIEF

This section describes how to copy various data files from one disc to another.

### 8.1 DDM FUNCTION AND LAYOUT

The Data Duplication Module (DDM) lets you copy cybertank data files from one disc to another. You can copy cybertank AI designs, battlefields designs, capsule designs, simulation designs, and authorized cybertanks.

Select the DUPLICATION MODULE option from the DESIGN menu. Diagram 8.1 below illustrates the Duplication Module screen display.

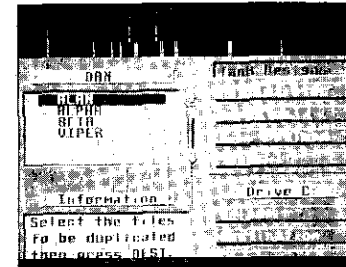


Diagram 8.1 -- Data Duplication Module (DDM)

The right side of the screen displays the categories of data files you can copy (TANK DESIGNS, BATTLEFIELDS, CAPSULES, SIMULATION DESIGNS, and TANKS).

Four selection buttons, DRIVE, CBTEGORY, SELECT, and DESTINATION, are located on the lower right section of the display. The DRIVE button is used to select the active access slot (or disk drive). As the DRIUE button is selected, the name of the disc located in the active slot is displayed in the SOURCE field.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

These terminals are equipped with a SLOT button rather than a DRIUE button. By pressing the SLOT button you are able to access additional access slots (or disc drives) that may be connected to your terminal. You should remember this difference in terminal types while reading this manual.

The **CATEGORY** button is used to step through the four data file categories. Once a category is selected, data files within that category (if any) are displayed in the left-middle portion of the screen. You cannot copy files from different categories in a single procedure.

To select a data file to copy (source file), highlight it and choose the **SELECT** button. A "checkmark" is displayed to the left of a selected file. You can select multiple files within a category. To "deselect" a data file, highlight it, and the **SELECT** button will change to a **DE-SELECT** button. Simply select the **DE-SELECT** button to "deselect" the highlighted file.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

To select a data file to copy (source file), highlight it and choose the **SELECT** button. A "diamond" is displayed to the left of a selected file. You can select multiple files within a category. To "deselect" a data file, highlight it, and click the **SELECT** button again.

Once you have selected the data file(s) you want to copy, you must identify a destination for those files. Select the **DESTINATION** button. Three new buttons, **DRIVE**, **COPY** and **CANCEL**, are displayed.

The **DRIVE** button is used to select the destination or target access slot for the copy procedure. Select the **DRIVE** button until the desired disc name is displayed in the **DESTINATION** field at the upper left of the screen.

To begin the duplication procedure, select the **COPY** button. Various status messages will appear in the lower-left area of the screen labeled **INFORMATION**. These messages give you specific instructions (if needed) for completing the duplication process.

The **CANCEL** button is used to abort the duplication process and return to the data file selection process.

To exit the **DDM** and return to the **ECM**, select the **EXIT DUPLICATOR** option from the **DUPLICATION** menu.

## SECTION 9 SYSTEM OPERATIONS

### SECTION BRIEF

This section describes the operation of data file operation panels.

### 9.1 THE FILE STORAGE PANEL (FSP)

The FSP is used to store data files on your ID Disc. Diagram 9.1 illustrates the FSP panel. The name of the disc in the current access slot (or disk drive) is displayed on the upper left of the panel. Below the disc name is a list of all data files found on the current disc. Only files appropriate to the current module are displayed. For example, if you are in the Simulation Design Module (SDM), only previously saved simulation design data files are displayed. If there are more than three names, use the up and down scroll arrows to scroll through the list of names. Below the list of names is a small area labeled SAVE AS:. Enter the new file name.

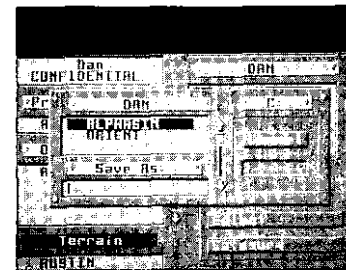


Diagram 9.1 -File Storage Panel (FSP)

On the right side of the panel are three buttons labeled DRIVE, SAVE, and CANCEL. The DRIVE button is used to access other discs in other access slots. When the DRIVE button is selected, the name of the newly selected disc will be displayed.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

These terminals are equipped with a SLOT button rather than a DRIVE button. By pressing the SLOT button you are able to access additional access slots (or disc drives) that may be connected to your terminal. Keep this difference regarding terminal types in mind while reading this manual.

Select the SAVE button to save the data file to the current disc using the name you entered. You CANNOT save a file without first giving it a name.

The CANCEL button lets you abort the save process. You are returned to the current module.



---

## 9.2 THE FILE RETRIEVAL PANEL (FRP)

---

The FRP is used to retrieve data files from your ID Disc. Diagram 9.2 illustrates the FRP panel. The name of the disc in the current access slot for disc drive) is displayed on the upper left of the panel. Below the disc name is a list of all data files found on the current disc. Only files appropriate to the current module are displayed. For example, if you are working in the Cybertank Design Module (CDM), only previously saved cybertank designs are displayed. If there are more than six names, use the up and down scroll arrows to scroll through the list.

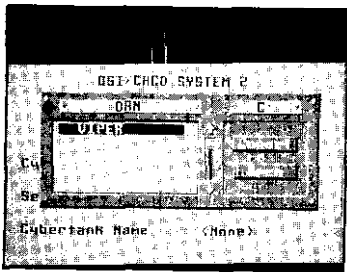


Diagram 9.2 --File Retrieval Panel (FRP)

On the right side of the panel are three buttons labeled DRIVE, OPEN, and CANCEL. The DRIVE button is used to access discs in other access slots (disc drives). When the DRIVE button is selected, the name of the newly selected disc is displayed.

Select the OPEN button to load the highlighted data file from the selected access slot.

**NOTE:** For users of Commodore 64 and Apple II+,c,e terminals only:

These terminals are equipped with a SLOT button rather than a DRIVE button. By pressing the SLOT button you are able to access additional access slots (or disc drives) that may be connected to your terminal.

These terminals are also equipped with a LOAD button rather than a OPEN button. By pressing the LOAD button, you can load data files from the selected access slot.

These differences in terminal types should be kept in mind while reading this manual.

The CANCEL button is used to abort the retrieval process. You are returned to the current module.

---

## 9.3 THE FILE TERMINATION PANEL (FTP)

---

The FTP is used to remove data files from your ID Disc. Diagram 9.3 illustrates the FTP panel. The name of the disc in the current access slot (or disc drive) is displayed on the Upper left side of the panel. Below the disc name is a list of all data files found on the current disc. Only files appropriate to the current module are displayed. For example, if you are working in the Cybertank Design Module (CDM), only previously saved cybertank designs are displayed. If there are more than six names, use the up and down scroll arrows to scroll through the list.

The CANCEL button is used to abort the termination process. The FTP is removed and you are returned to the current application.

**Warning:** *Be very careful when using the FTP. Once a file is terminated, it can not be recovered.*

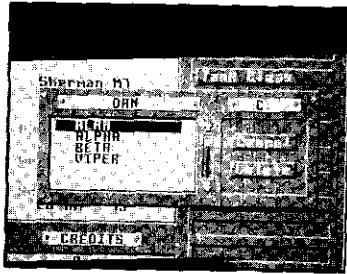


Diagram 9.3 – File Termination Panel (FTP)

On the right side of the panel are three buttons labeled DRIVE, DELETE, and CANCEL. The DRIVE button is used to access other discs in other access slots. When the DRIVE button is selected, the name of the newly selected disc will be displayed.

**NOTE:** For users of Commodore 64 and Apple //+,c,e terminals only:

These terminals are equipped with a SLOT button rather than a DRIVE button. By pressing the SLOT button you are able to access additional access slots (or disc drives) that may be connected to your terminal.

Select the DELETE button to delete the highlighted data file from the current access slot.

---

## PART 3 CYBERTANK COMMAND LANGUAGE

---

### SYNOPSIS

This section presents the commands available for designing a cybertank's Artificial Intelligence (AI). The CCL Reference is a must for all inexperienced employees and contains a great deal of useful information for the experienced employee. Each section of the CCL Reference contains examples to clearly demonstrate the use and function of the commands.

---

## SECTION 1 CYBERTANK COMMAND LANGUAGE

---

Before moving right into the CCL commands, several basic and fundamental concepts must be covered.

---

### 1.1 GENERAL DEFINITIONS

---

The Cybertank Command Language (CCL) was designed by OSI language engineers to facilitate the creation of cybertank artificial intelligence (AI). The Cybertank Command Language was modeled after the English language for maximum comprehension and utilization.

There is usually more than one command that can be used to perform a given function. The CCL designers created simple commands for common functions normally executed using traditional programming structure. Take, for example, the need to turn your cybertank to face in the direction of a scanned enemy. The traditional command structure requires the use of "System Variables" as follows:

Turn Tank To EnemyX EnemyY

Noting the frequency that cybertank engineers utilized the above command, OSI designers added the following command to the CCL to perform the same function:

Turn Tank To Face Enemy Tank

Obviously, this command is easier to understand.

---

### 1.2 CYCLE COUNT

---

All commands require a period of time to execute. Command execution time is measured in cycles. There are two fundamental types of commands in the CCL: 1) action

commands that require physical or mechanical actions by the cybertank, such as turning to face a new direction, and 2) logic commands that do not have the cybertank perform physical or mechanical actions. Logic commands execute in 1 cycle, while action commands vary in execution time. Rotating the scanner, for example, requires less time than turning the entire cybertank.

Always keep cycle counts in mind when designing your cybertank's AI. For example, a cybertank using 10 cycles in its firing intelligence fires twice as fast as one with 20 cycles. Reducing cycle counts usually improves performance. It should also be noted that the cycle counts given in this handbook are base figures. For example, the command ROTATE SCANNER LEFT 1 takes 10 cycles to execute, but the command ROTATE SCANNER LEFT 4 takes 40 cycles to execute (10 cycles per angle of rotation times 4 angles.)

---

### 1.3 RESERVED WORDS

---

CCL commands, operators, and System Variables are "reserved" for specific purposes and cannot be incorporated in user-defined variables. See Appendix 1 for a list of Reserved Words.

---

### 1.4 STRUCTURE CONVENTIONS

---

The following conventions are used throughout this section for descriptive purposes:

"Tank" For the sake of brevity, all CCL commands refer to cybertanks as tanks.

□ Optional words in CCL commands are enclosed in square brackets. Commands will execute correctly with or without the bracketed words.

**“User Variable”** This designates where a User Variable name is to be *used*.

**“Any Variable”** This designates where either a User Variable name or a System Variable name is to be used.

**“#”** This designates where a User Variable name, a System Variable name, or a numeric digit is to be used.

**“Label”** This designates where a label name is to be used.

**:** (colon) This designates an alternative. For example **[Branch To : Do]** indicates that either **Branch To or Do** can be used.

**cyc** This designates a command's cycle count. All initial command definitions include their cycle count.

**“X”** This designates that an K-coordinate on the map is to be used.

**“Y”** This designates that a u-coordinate is to be used on the map.

---

## 1.6 LABELS

---

labels used to designate the beginning of an AI segment can be executed with either the Do (Gosub) or **Branch To** (Goto) commands. A label may be composed of any alphanumeric character or symbol, with a 10 character maximum length. A label may contain a reserved word. If, during the Authorization process (discussed in Part 2, Section 2.61, you receive an “Out of label memory space” error message, try shortening the length of your labels. For a description of all possible Authorization errors, see Appendix 5.

---

## 1.6 SYSTEM VARIABLES

---

System Variables are used by the CCL for internal operations. They can be used in computations, but cannot be altered. System Variables are very useful, and Often necessary, in designing cybertank AI. See Appendix 2 for a list of all of the System Variables.

---

## 1.7 USER VARIABLES

---

A User Variable is defined by the employee. Unlike System Variables, User Variables can be altered, can be composed of any alphanumeric character or symbol, and can be up to 15 characters in length. A User Variable name can contain a reserved word, but cannot consist of a reserved word alone. For example, “Turn” is a reserved word while “MyTurn” is a legal User Variable name.

---

## 1.8 OPERATORS

---

CCL supports the operators: “+” (addition), “-” (subtraction), “<” (less than), “>” (greater than), “=” (equals), “<=” (less than or equal), “>=” (greater than or equal), and “<>” (not equal). The operators are used as shown below.

**1 cyc** **“User Variable”** = “#”

**1 cyc** **“User Variable”** = **“Any Variable”** + “#”

**1 cyc** **“User Variable”** = **“Any Variable”** - “#”

The above commands are called Assignment statements because the left side of the “=” is “assigned” the value of the right side.

**1 cyc** **If** **“Any Variable”** = “#” **Then** **[Branch To : Do]** **“Label”**

**1 cyc** **If** **“Any Variable”** = **“Any Variable”** + “#” **Then** **[Branch To : Do]** **“Label”**

**1 cyc** **If** **“Any Variable”** = **“Any Variable”** - “#” **Then** **[Branch To : Do]** **“Label”**

The above commands are called **Conditional statements** (or **IF/THEN statements**.) These statements help control the flow of AI by checking various settings or conditions. Note that anywhere the "=" is used in the above Conditional examples, any of the operators ("**<**", "**>**", "**<=**", "**>=**", "**<>**") can be substituted.

Now for a few examples:

```
MyTurn = TankDir + 1
```

This sets the User Variable "MyTurn" to the System Variable "TankDir" plus one. So, if "TankDir" is currently equal to three, then "MyTurn" would be assigned the value of four.

```
If Myturn >= 2 Then Branch to Done
```

This example causes the AI to branch to the label "Done" if and only if the User Variable "MyTurn" is greater than or equal to two. Based upon the first example, "MyTurn" was set to four; therefore, the AI would indeed branch to the label "Done."

```
If Mytum = TankDir + 1 Then Branch to Done
```

This line causes the AI to branch to the label "Done" if and only if the User Variable "MyTurn" is equal to the System Variable "TankDir" plus one. So, the cybertank logic unit retrieves the value of "TankDir" and adds one to it. It then compares this value to "MyTurn." If they are equal, then the branch is taken.

*Note: Adding one to "TankDir" is only for purposes of comparison. The value of "TankDir" does NOT change until an instruction is encountered which directs the cybertank to turn.*

---

## SECTION 2 MOVING THE CYBERTANK

---

Mobilizing *your* cybertank is a rather simple task, but one of extreme importance. With superb tactical maneuvering, your cybertank can sneak-up on the enemy without the enemy ever knowing what hit it. By the same token, bad judgement in movement can mean a quick termination of your cybertank. Many factors must be weighed when designing a path of movement: movement consumes fuel, a cybertank's treads must be functional, and obstacles must be avoided. With all this to consider, a cybertank must still be aware of its prime objective -- survival.

---

### 2 . 1 TREAD DAMAGE AND REPAIR

---

#### COMMAND STRUCTURE

```
1cyc  If [Tank] Treads [are] Functional Then [Branch To : Do]
      "Label"
1 cyc  If [Tank] Treads [are] Not Functional Then [Branch To : Do]
      "Label"
60 cyc  Repair Treads
```

SYSTEM VARIABLES AFFECTED  
TreadDamage

#### EXAMPLE USAGE

```
CheckTread
      If Tank Treads are Functional Then Branch To
          CT_Exit
          Repair Treads
CT_Exit
      Resume
```

Cybertanks use treads for MOVING and turning. When treads are destroyed, cybertanks cannot move. Repair kits, if purchased, can be used at any time to repair damaged treads. Refer to Section 5.1 for detailed information on cybertank repair.

---

## 2.2 MOVING

---

### COMMAND STRUCTURE

40cyc **Move [Tank] Forward**  
 40cyc **Move [Tank] Backward "#"**

### SYSTEM VARIABLES AFFECTED

**TankX**  
**TankY**

### EXAMPLE USAGE

#### **MoveClear**

**Detect Obstruction at Tank Direction**  
**If Movement is Not Obstructed Then Branch To MC\_Move**  
**Fire Weapon at Obstruction**  
**Branch To MoveClear**

#### **MC-Move**

**Move Tank Forward 1**  
**Resume**

Cybertanks can move forward (the direction they are facing) or backward (opposite the direction they are facing). You must specify the number of hectometers your cybertank is to move. Movement can range from 0 (useless) to 62 (dangerous).

Once instructed to move, your cybertank will not stop until it either reaches its destination or runs into an obstruction. If an obstruction is encountered, your cybertank incurs damage and stops. The amount of damage is determined by the object hit: buildings cause more damage than trees. Some objects (e.g. trees, bushes, houses, and headquarters) can eventually be destroyed if you continually ram them,

while others, such as the battlefield barrier (resembling a brick wall) and reinforced buildings are indestructible. Your cybertank Will eventually destroy itself if it continues to ram indestructible objects.

Moving a cybertank requires fuel. If your cybertank is instructed to move without fuel available, precious time is spent uselessly trying to start the engines.

Movement also requires functional treads. If a movement command is encountered and the treads are inoperable, the cybertank will waste time "spinning its wheels."

---

## 2.3 TURNING

---

### COMMAND STRUCTURE

16 cyc **Turn [Tank] Left "#"**  
 16 cyc **Turn [Tank] Right "#"**  
 16 cyc **Turn [Tank] To "angle"**  
 16 cyc **Turn [Tank] To "X" "Y"**  
 16 cyc **Turn [Tank] To Face [Enemy] Tank**  
 16 cyc **Turn [Tank] To Face Enemy HQ**  
 16 cyc **Align Tank [with Scanner]**

### SYSTEM VARIABLES AFFECTED

**TankDir**

### EXAMPLE USAGE

#### **FindOpen**

**Detect Obstruction at Tank Direction**  
**If Movement is Not Obstructed Then Branch To FO\_Move**  
**Turn Tank Right 1**  
**Branch To FindOpen**

#### **FO\_Move**

**Move Tank Forward 1**  
**Resume**

Cybertanks turn in eighths of a circle (45\* increments).

When commanding a turn, the number of eighths to turn is specified. The following command will turn the Cybertank one eighth (45°) to the right:

Turn Tank Right 1

The following command turns the cybertank three eighths (135 degrees) to the left:

Turn Tank Left 3

Cybertanks can also turn to specific angles. The angles are illustrated below in Diagram 2.3.

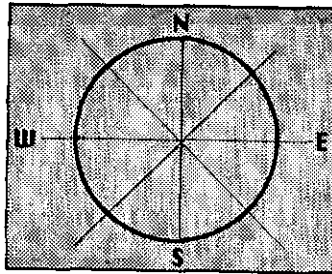


Diagram 2.3 --The eight possible directions

The following command turns the cybertank to face northwest, regardless of the direction it is currently facing:

Turn Tank To 7

There are many instances where you need to have your cybertank move to a known location, but are not sure of the needed direction. Four different commands in the CCL will automatically turn your cybertank in the nearest direction to face a known location.

The following command will turn your cybertank in the nearest direction to face coordinates X=20 and Y=14:

Turn Tank To 20 14

Always list the X coordinate first, followed by a space and then the Y coordinate. **Do not use a comma to separate** the coordinate pair.

Use the following command to turn your cybertank to the closest direction to face an enemy cybertank at **its last** scanned position:

Turn Tank To Face Enemy Tank

Similarly, the following command will turn your cybertank toward the closest direction to face the enemy headquarters, if found:

Turn Tank to Face Enemy HQ

The following command will turn your cybertank to the direction its scanner is pointing:

Align Tank with Scanner

---

## 2.4 DETECTING MOVEMENT OBSTRUCTIONS

---

### COMMAND STRUCTURE

4 cyc Detect [Obstruction] at "#"  
 4 cyc Detect [Obstruction] at Tank Direction  
 4 cyc Defect [Obstruction] at Scanner Direction  
 1 cyc If [Movement is] Obstructed Then [Branch To : DO] "Label"  
 1 cyc If [Movement is] Not Obstructed Then [Branch To : Do] "Label"  
 1 cyc If Obstruction [is] Enemy HQ Then [Branch To : Do] "Label"  
 1 cyc If Obstruction [is] Ally HQ Then [Branch To : Do] "Label"



## SYSTEM VARIABLES AFFECTED

**ObstacleX**                      **ObstacleDist**  
**ObstacleY**                      **ObstacleType**

## EXAMPLE USAGE

MoveClear

```

Detect Obstruction at Tank Direction
If Movement is Not Obstructed Then Branch To
    MC_Move
Fire Weapon at Obstruction
Branch To MoveClear
MC_Move
Move Tank Forward 1
Resume

```

All cybertanks are equipped with a Movement Obstruction Sensor (MOS). This sensor determines whether an obstruction is in a specified direction. Any objects that can inflict damage to your cybertank in a collision are movement obstructions.

Using the MOS is different than using your scanner to find the closest object. Since scanners cover a large area, you would have to perform a series of complicated calculations to determine whether an object found in a scanner's area would impede movement. The MOS detects only obstacles between 1 and 3 hectometers from your cybertank's location in a specified direction.

The above example uses the "Detect **Obstruction at Tank Direction**" command. Once a "Detect . . ." command has been executed, you should use one of the "If. . ." commands to determine the results of the detection.

A common technique in the use of the sensor is to destroy an obstacle in your path. This is usually faster than trying to move around it. The above example illustrates this technique. An inherent problem in the example is that some obstacles cannot be destroyed. You could end up repeatedly trying to destroy an indestructible object.

This problem is overcome by checking the value of the System Variable `ObstacleType` to identify the obstacle. If it is indeed indestructible, you can design your AI to move around it. Refer to Appendix 3 for a complete description of **object** types. It is important to note that a cybertank's MOS is operational even when the Scanner is destroyed, but is not when your cybertank runs out of fuel.

---

## 2.5 DETERMINING CYBERTANK FACING

---

## COMMAND STRUCTURE

```

1 cyc If Tank [is] Facing [Enemy] Tank Then [Branch To : Do]
    "Label"
1 cyc If Tank [is] Not Facing [Enemy] Tank Then [Branch To : Do]
    "Label"
1 cyc If Tank [is] Aligned [with Scanner] Then [Branch To : Do]
    "Label"
1 cyc If Tank [is] Not Aligned [with Scanned Then [Branch To :
    Do] "Label"
1 cyc If Tank [is] Facing Enemy HQ Then [Branch To : Do]
    "Label"
1 cyc If Tank [is] Not Facing Enemy HQ Then [BranchTo : Do]
    "Label"
1 cyc If Tank [is] Facing "X" "Y" Then [Branch To : Do] "Label"
1 cyc If Tank [is] Not Facing "X" "Y" Then [Branch To : Do] "Label"

```

## SYSTEM VARIABLES AFFECTED

None

## EXAMPLE USAGE

MoveClear

```

Detect Obstruction at Scanner Direction
If Movement is Not Obstructed Then Branch To MC_ChkDir
Fire Weapon at Obstruction
Branch To MoveClear
MC_ChkDir
If Tank is Aligned with Scanner Then Branch To
    MC_Move
Align Tank with Scanner
MC-Move
Move Tank Forward 1
Resume

```

The relevance of these commands may not be readily apparent, but will become so when considering the impact of cycle counts.

The above example has the cybertank trying to move in the direction the scanner is facing. If you remove the command that checks alignment with its scanner, then the command “**Align Tank with Scanner**” is executed. This is extremely undesirable since turning a cybertank requires many cycles. It is more efficient to expend one cycle checking the cybertank’s alignment than to waste numerous cycles turning the cybertank.

---

## SECTION 3 USING THE SCANNER

---

All cybertanks are equipped with the Cybertank Scanner System (CSS), an essential piece of hardware. Various equipment can be built into the CSS, including a Scanner, a Remote launcher, a Scanner Lock, a Listening Device, in addition to a Jammer.

Scanners vary in angle of effectiveness (or sweep angle) and range. The primary function of a Scanner is to quickly probe an area and return the results to the cybertank’s main computer systems. Scanners are capable of detecting enemy cybertanks, headquarters, and various terrain features, and play an important role in cybertank design. Without a scanner, a cybertank is very limited in its range of sight (the MOS has a range of 3 hectometers with a one degree wide sweep angle -- see Section 2.4).

***NOTE: The use of a defense shield halves the range of all scanners. (For more information on Defense Shields. see Section 5.2.)***

---

### 3.1 SCANNER DAMAGE AND REPAIR

---

#### COMMAND STRUCTURE

```
1 cyc  If Scanner [is] Functional Then [Branch To : Do] “Label”
1 cyc  If Scanner [is] Not Functional Then [Branch To : Do]
       “Label”
60 cyc Repair Scanner
```

#### SYSTEM VARIABLES AFFECTED

ScanDamage

**EXAMPLE USAGE****CheckScan**

If Scanner is Functional Then Branch To CS\_Exit  
Repair Scanner

**CS\_Exit**

Resume

The cybertank uses its scanner to find enemy cybertanks and locate objects. When its scanner is destroyed, a cybertank is essentially blind and normally doomed to fail. Repair kits, if purchased, can be used at any time to repair a damaged scanner. Scanners are reliable until they are completely destroyed.

**3.2 SCANNING FOR ENEMY CYBERTANKS****COMMAND STRUCTURE**

8 cyc Scan for [Enemy] Tank  
1 cyc If [Enemy] Tank [was] Found Then [Branch To : Do] "Label"  
1 cyc If [Enemy] Tank [was] Not Found Then [Branch To : Do] "Label"

**SYSTEM VARIABLES AFFECTED**

EnemyX EnemyDist  
EnemyY

**EXAMPLE USAGE****FindTank**

Rotate Scanner Right 1  
Scan For Enemy Tank  
If Enemy Tank was Not Found Then Branch To  
FindTank

**FT\_FoundIt**

Resume

These commands are used to locate enemy cybertanks. It is necessary to execute the "Scan For Enemy Tank" command first, then use one of the "If. . ." commands to determine

the results. The above example has the cybertank continuously scanning in all directions until an enemy cybertank is found.

**3.3 SCANNING FOR OBJECTS****COMMAND STRUCTURE**

8 cyc scan for [Closest] Object  
1 cyc If [Closest] Object [was] Found Then [Branch To : Do] "Label"  
1 cyc If [Closest] Object [was] Not Found Then [Branch To : Do] "Label"

**SYSTEM VARIABLES AFFECTED**

ObjX ObjY  
ObjType ObjDist

**EXAMPLE USAGE****ClearArea**

Tree = 4  
House = 5  
Align Tank with Scanner

**CA-Loop**

Scan For Closest Object  
If Closest Object was Not Found Then Branch To  
CA\_Rotate

If ObjType = Tree then CA-Destroy  
If ObjType = House then CA-Destroy

**CA-Rotate**

Rotate Scanner Right 1  
If Scanner Not Aligned with Tank Then Branch To CA\_Loop

**CA-Exit**

Resume

**CA-Destroy**

If Closest Object is Beyond Weapon Range then Ca\_Rotate  
Fire Weapon at Closest Object  
Branch To CA-Loop

These commands are used to locate the closest object to Your cybertank. You must first execute the "Scan For Closest Object" command, then **use one** of the "If.. ." commands to determine the results.

One of the more common uses of these commands is to clear objects out of the way that might be interfering with your cybertank's ability to "see" an enemy tank. The above example illustrates this use. See Appendix 3 for a complete list of Object types.

### 3.4 FINDING THE HEADQUARTERS

#### COMMAND STRUCTURE

```
8cyc  Scan for Enemy HQ
1cyc  If Obstruction [is] Enemy HQ then [Branch To : Do] "Label"
1cyc  If Obstruction [is] Ally HQ then [Branch To : Do] "Label"
1cyc  If Enemy HQ [was] Found then [Branch To : Do] "Label"
1cyc  If Enemy HQ [was] Not Found then [Branch To : Do]
      "Label"
```

#### SYSTEM VARIABLES AFFECTED

```
EnemyHQX           EnemyHQY
EnemyHQDist
```

#### EXAMPLE USAGE

##### CheckBase

```
Scan for Enemy HQ
If Enemy HQ was Found Then ShootIt
Rotate Scanner 1
Branch to CheckBase
```

##### ShootIt

```
Fire Weapon at Enemy HQ
Resume
```

All cybertanks are equipped with a special Headquarters Sensing Device (HSD) that allows the scanner to detect the presence of an enemy or allied base station. Once a base is detected and identified as friend or foe, a cybertank can decide whether to attack or defend it. The above commands

are primarily used during team combat where the destruction of an enemy base Station results in a victory.

### 3.5 ROTATING THE SCANNER

#### COMMAND STRUCTURE

```
16cyc Rotate [Scanner] Left "#"
16cyc Rotate [scanned Right "X"
16cyc Rotate [Scanner] To "angle"
16cyc Rotate [Scanner] To "X" "Y"
16cyc Rotate [Scanner] To Face [Enemy] Tank
16cyc Align Scanner [with Tank]
1cyc If Scanner [is] Aligned [with Tank] Then [Branch To : Do]
     "Label"
1cyc If Scanner [is] Not Aligned [with Tank] Then [Branch To :
     Do] "Label"
```

#### SYSTEM VARIABLES AFFECTED

```
ScanDir
```

#### EXAMPLE USAGE

##### FindTank

```
Rotate Scanner Right
Scan For Enemy Tank
If Enemy Tank was Found Then Branch To FT_FoundIt
Branch To FindTank
```

##### FT\_FoundIt

```
Resume
```

**Scanners** rotate in eighths of a circle (45\* increments). When commanding rotation, the number of eighths to turn is specified. The following command rotates the scanner one eighth (45 degrees) to the right:

```
Rotate Scanner Right 1
```

The following command will rotate **the scanner** three eighths (135 degrees) to the left:

```
Rotate Scanner Left 3
```

Scanners can also rotate to specific directions. The directions are illustrated in Diagram 3.5 below.

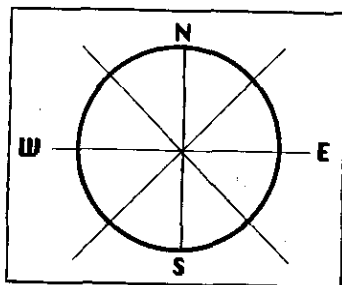


Diagram 3.5 -- The eight possible directions

The following command will rotate the scanner to face northwest, regardless of the direction it is currently pointing:

```
Rotate Scanner To 7
```

There are many instances where you need to point your scanner toward a known location, but are not aware of the proper direction. Many CCL commands automatically rotate your scanner in the nearest direction to face a known location.

The following command will rotate your scanner in the nearest direction to face the coordinates  $X=20$  and  $Y=14$ :

```
Rotate Scanner To 20 14
```

Always list the X coordinate first, followed by a space and then the Y coordinate. Do not use a comma to separate the coordinate pair.

Use the following command to rotate your scanner to the nearest angle to face an enemy cybertank at its last scanned position:

```
Rotate Scanner To Face Enemy Tank
```

The following command rotates your scanner to the direction the cybertank is facing:

```
Align Scanner with Tank
```

---

### 3.6 LOCKING THE SCANNER ON A TARGET

---

#### COMMAND STRUCTURE

```
5 cyc  Lock [Scanner]
5 cyc  Unlock [Scanner]
1 cyc  If [Scanner is] Locked then [Branch To : Do] "Label"
1 cyc  If [Scanner is] Unlocked then [Branch To : Do] "Label"
```

#### SYSTEM VARIABLES AFFECTED

None

#### EXAMPLE USAGE

##### FindTank

```
Scan for Enemy Tank
If Enemy Tank was Found then FT_Found
Rotate Scanner Right 1
Branch to FindTank
```

##### FT\_Found

```
Lock Scanner
If Scanner is Unlocked then Branch To FindTank
Resume
```

The Scanner lock, a special item built into the CSS, can be purchased in the Chassis Design Module (CDM) if you have enough credits in your budget. Whenever a "lock Scanner" instruction is executed, your cybertank's scanner locks onto the last scanned object, whether it is a tree, house, or another cybertank. Since trees and houses do not move, the

most useful application for the scanner is to track the movement of enemy cybertanks.

**NOTE:** If an obstacle comes between your scanner and the scanned object, the scanner can no longer “see” the object and Will automatically unlock. Also, enemy cybertanks may be equipped with Jammers that can “unlock” your scanner. Once your scanner is unlocked, you must continue scanning and try to detect the cybertank again.

---

### 3.7 DETECTING A SCANNER LOCKED ON YOU

---

#### COMMAND STRUCTURE

```
1 cyc  If [Tank is] Being Scanned Then [Branch To : Do] "Label"
1 cyc  If [Tank is] Not Being Scanned Then [Branch To : Do]
      "Label"
```

#### SYSTEM VARIABLES AFFECTED

None

#### EXAMPLE USAGE

```
Detect      If Tank is Not Being Scanned Then Branch To DT_No
             Jam Scanner Signal
DT_No       Resume
```

Determining if another cybertank is locked onto your cybertank requires a special listening Device available in the Chassis Design Module. When activated, the Listening Device checks whether or not your cybertank has been locked onto by another cybertank's scanner. The above example assumes the cybertank is equipped with a Listening Device and a Jammer (see Section 3.8), both of which are fairly expensive items.

---

### 3.8 JAMMING THE ENEMY'S SCANNER

---

#### COMMAND STRUCTURE

```
8 cyc  Jam [Scanner Sign.41]
```

#### SYSTEM VARIABLES AFFECTED

None

#### EXAMPLE USAGE

```
Detect      If Tank is Not Being Scanned Then Branch To DT_No
             Jam Scanner Signal
DT_No       Resume
```

The Jam Scanner Signal command is useful only if your cybertank is equipped with a Jammer, a special device available in the Chassis Design Module (CDM). The Jammer will automatically unlock all enemy cybertank scanners which have locked onto your cybertank. This provides an opportunity for escape (hopefully) while enemy cybertanks try to re-scan and detect your new location.

---

### 3.9 LAUNCHING REMOTE SCANNERS

---

#### COMMAND STRUCTURE

```
15 cyc Launch [Remote Scanner]
1 cyc  If Remote [Scanner is] Available Then [Branch To : Do]
      "Label"
1 cyc  If Remote [Scanner is] Unavailable Then [Branch To : Do]
      "Label"
```

#### SYSTEM VARIABLES AFFECTED

```
EnemyX      EnemyY
EnemyDist    RemotesLeft
```

## EXAMPLE USAGE

**TryLaunch**

**If Remote Scanner is Unavailable Then Branch To  
TL\_No  
Launch Remote Scanner**

**TL\_No**

**Resume**

A Remote Scanner is a special device available in the Chassis Design Module (CDM). When you purchase a Remote Scanner launcher it is built into the CSS.

Remote launchers hold four Remote Scanners. When the "launch Remote Scanner" command is executed, the Remote launcher hurls a Remote Scanner into the air. Remote Scanners are links between your cybertank and the OSICOM I satellite.

Once a Remote Scanner is airborne and linked to the satellite, it obtains the location of the enemy cybertank nearest your cybertank. Remote Scanners are single use items since they are destroyed upon impact with the ground. At the start of each battle, your cybertank is loaded with four Remote Scanners if it has been equipped with a Remote launcher.

---

## SECTION 4 USING THE WEAPON

---

Effective use of the Cybertank Weapon System (CWS) is crucial to the design of a potent fighting machine. Knowing when and where to fire is critical, and weapon maintenance plays an important role in your survival. Some weapons fire faster than others, and the amount and type of damage inflicted on the enemy depends on weapon type.

**NOTE: NO cybertank weapon can fire through its own defense Shield.**

With all the variables that affect a weapon, it is important to be thorough and exercise caution before deciding to "pull the trigger."

---

### 4.1 WEAPON DAMAGE AND REPAIR

---

## COMMAND STRUCTURE

1 cyc **If Weapon [is] Functional Then [Branch To : Do] "Label"**  
 1 cyc **If Weapon [is] Not Functional Then [Branch To : Do]  
 "Label"**  
 60 cyc **Repair Weapon**

## SYSTEM VARIABLES AFFECTED

**WeapDamage**

## EXAMPLE USAGE

**CheckWeap**

**If Weapon is Functional Then Branch To CW\_Exit  
Repair Weapon**

**CW\_Exit**

**Resume**

The CWS is used to damage and destroy the enemy as well as ravage the landscape. A well maintained weapon is one of the keys to survival. When the CWS is destroyed, your cybertank is defenseless and generally doomed to oblivion. Repair kits are available in the Chassis Design Module (CDM) and, if purchased, can be used at any time to reconstruct the CWS.

---

## 4.2 DETERMINING IF AN OBJECT IS WITHIN RANGE

---

### COMMAND STRUCTURE

```
1 cyc If [Enemy] Tank [is] Within [Weapon] Range then [Branch
To : Do] "Label"
1 cyc If [Enemy] Tank [is] Beyond [Weapon] Range then [Branch
To : Do] "Label"
1 cyc If [Closest] Object [is] Within [Weapon] Range then
[Branch To : Do] "Label"
1 cyc If [Closest] Object [is] Beyond [Weapon] Range then
[Branch To : Do] "Label"
1 cyc If Enemy HQ [is] Within [Weapon] Range then [Branch To :
Do] "Label"
1 cyc If &my HQ [is] Beyond [Weapon] Range then [Branch To :
Do] "Label"
```

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE USAGE

#### FindTank

```
Scan for Enemy Tank
If Enemy Tank Was Found Then Branch To CheckRange
Rotate Scanner Right 1
Branch to FindTank
```

#### CheckRange

```
If Enemy Tank is Beyond Weapon Range Then TooFar
Fire Weapon at Enemy Tank
Branch to FindTank
```

#### TooFar

```
Resume
```

Scanners range from 20 to 50 hectometers, while the weapons have only a four (4) hectometer maximum range. CCL designers developed the above commands to determine whether the last scanned object, enemy cybertank or enemy headquarters, is within (or beyond) your cybertank's weapon range. The above example first scans to find an enemy cybertank. Once found, it checks to see if the enemy is beyond its maximum weapon range. If the enemy is beyond range, the cybertank resumes-normal operation. If an enemy is within range, the cybertank fires a shot and returns to scanning.

---

## 4.3 FIRING THE WEAPON

---

### COMMAND STRUCTURE

```
40 cyc Fire [Weapon] at [Enemy] Tank
40 cyc Fire [Weapon] at [Closest] Object
40 cyc Fire [Weapon] at Obstruction
40 cyc Fire [Weapon] at "X" "Y"
40 cyc Fire [Weapon] at Tank Direction
40 cyc Fire [Weapon] at Scanner Direction
40 cyc Fire [Weapon] at Enemy HQ
```

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE "SAGE"

```
ClearPath
```

```
Detect Obstruction at Tank Direction
If Movement is Not Obstructed then LetsMove
Fire Weapon at Obstruction
```

```
LetsMove
```

```
Move Tank Forward 1
Resume
```

The CWS is a very intelligent apparatus. Using the many Possible variations of the above command, your cybertank can handle a wide variety of combat scenarios. For example, when the command "Fire Weapon at Enemy Tank" is executed, your CWS obtains the coordinates of the last



scanned enemy cybertank from the Cybertank Scanner System (CSS). The weapon system turns the turret to the correct direction and fires the weapon. The same procedure is used to fire at specific locations. When firing at either the Tank Direction or Scanner Direction, the CWS first aligns the turret to the tank or the scanner direction.

After firing in a given direction, the projectile or laser hits the first object in its path. If no object is in the path, the projectile hits whatever is at the maximum weapon range (if anything). When a shot impacts an object, that object is damaged according to the type of weapon used. Most objects, like trees and houses, are easily demolished. Enemy cybertanks, on the other hand, are more difficult to destroy. Brick walls and large buildings are impervious to a cybertank's firepower due to their reinforced design and construction. Attempting to move through an indestructible object is futile, and very damaging to your cybertank.

*Special Note: The CWS WILL NOT fire the weapon if your Defensive Shield is up (see Section 5.2 for more information on the Defense Shield).*

## SECTION 5 MISCELLANEOUS COMMANDS

### SECTION BRIEF

This section presents a collection of diverse commands which are generally useful, but not commonly used.

### 5.1 REPAIRING DAMAGE

COMMAND	STRUCTURE
60 cyc	<b>Repair Internal</b>
60 cyc	<b>Repair Armor</b>
60 cyc	<b>Repair Treads</b>
60 cyc	<b>Repair Scanner</b>
60 cyc	<b>Repair Weapon</b>
1 cyc	If [Repair] Kit [is] Available then [Branch To : Do] "Label"
1 cyc	If [Repair] Kit [is] Unavailable then [Branch To : Do] "Label"

### SYSTEM VARIABLES AFFECTED

IntDamage	TreadDamage
ArmorDamage	WeapDamage
ScanDamage	KitsLeft

### EXAMPLE USAGE

```
TreadFixer
    If Tank Treads are Not Functional Then FixTreads
    Resume
FixTreads
    If Repair Kit is Available Then FixIt
    Resume
FixIt
    Repair Treads
    Resume
```

A Repair Kit is a special item available in the Chassis Design Module (CDM). It contains many contraptions, gizmos, and gadgets used to repair the various mechanisms and

instruments on a cybertank. When a "Repair..." command is executed, assuming a Repair Kit is available, a percentage of the damaged equipment is repaired. Only a small amount of damage Will be completely fixed. Four separate repair kits are included when this option is purchased.

---

## 5 . 2 DEFENSE SHIELD

---

### COMMAND STRUCTURE

10 cyc     **Raise [Shield]**  
 5 cyc     Lower [Shield]  
 1cyc     **If Shield [is] Up Then [Branch To : Do] "Label"**  
 1cyc     **If Shield [is] Down Then [Branch To : Do] "Label"**

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE USAGE

#### ChkShield

**If Shield is Down Then ShootIt  
 Lower Shield**

#### ShootIt

**Fire Weapon at Enemy Tank  
 Resume**

A Defense Shield is a special item available in the Chassis Design Module (CDM) which helps protect your cybertank from damage. When the Defense Shield is raised, an electro-magnetic field surrounds your cybertank reducing the amount of damage incurred by enemy cybertank fire.

There are three drawbacks to using a Defense Shield. The electro-magnetic field created by the shield reduces the maximum range of the cybertank's scanner; the CWS WILL NOT fire a weapon through the shield (in order to fire, your cybertank must first lower its Shield); the shield, when raised, consumes fuel. It is recommended that you raise the Defense Shield only when necessary and lower it as quickly as possible.

---

## 5.3 DETERMINING FUEL LEVEL

---

### COMMAND STRUCTURE

1 cyc     **If Fuel [is] Empty Then [Branch To : Do] "Label"**  
 1 cyc     **If Fuel [is] Remaining Then [Branch To : Do] "Label"**

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE USAGE

#### ChkFuel

**If Fuel is Empty Then Branch to NoMove  
 Move Forward 1**

#### NoMove

**Resume**

All cybertanks require fuel to power onboard mechanical devices. Without fuel, a cybertenk is a sitting duck. A tack of fuel affects the following:

1. The MOS, CSS, and CWS are inoperable.
2. All movement is terminated.
3. All CommLink communications are halted.
4. The Defense Shield cannot be raised.

As you can see, running out of fuel is no trivial matter. It is an important consideration in the design of your cybertank's AI. Always try to keep movement to a minimum, since it is a big fuel consumer. The Energy Miser, available in the Chassis Design Module (CDM), is an important option Since it reduces fuel consumption by approximately 50%.

NOTE: Even though your cybertank may run out of fuel, its internal computer systems still continues processing logic functions. The AI still executes and TRYS to carry out all commands. If you design your cybertank to check its fuel level regularly, you can have it branch to a special routine (Possibly self-destruct at that point) when it detects a tack of fuel.

---

## 5.4 WHEN ALL ELSE FAILS

---

**COMMAND STRUCTURE**

```
1 cyc Self Destruct
```

**SYSTEM VARIABLES AFFECTED**

All

**EXAMPLE USAGE****CheckAll**

```
If Tank Treads are Functional Then Branch to OK
If Scanner is Functional Then Branch to OK
If Weapon is Functional Then Branch to OK
If Fuel-is Remaining Then Branch to OK
If Repair Kit is Available Then Branch to OK
Self Destruct
```

OK

Resume

This command is pretty self-explanatory. When your cybertank is really down and out, the only noble thing to do is Self Destruct.

---

## 5.5 GENERALLY USEFUL. COMMANDS

---

**COMMAND STRUCTURE**

```
1 cyc Get Distance [To] "X" "Y"
1 cyc Get Random [To #]
1 cyc Beep
0 cyc * (asterisk)
```

**SYSTEM VARIABLES AFFECTED**

XYDist                      RandomNum

**EXAMPLE USAGE****CheckDist**

```
Get Distance To 1 1
If XYDist > 30 then MaybeGo
```

\* This is a comment line

**MoveIt**

```
Turn Tank to 11
Move Tank Forward 1
Beep
```

Resume

\* You can put anything you want here

**MaybeGO**

```
Get Random to 100
If RandomNum > 50 then NoGo
Branch to MoveIt
```

\* All of this is ignored by the computer systems

NoGo

Resume

The above commands were developed after some of the staff at OSI fought long and hard for their development. The commands, while not necessary for the "everyday" use of a cybertank, prove useful in some instances.

The "Get Random" command was developed because some employees wanted their cybertanks to randomly move left or right when searching for any enemy.

Another employee wanted to know which corner of the map was nearest his cybertank so he could decide where to go when it was time to run and hide. The "Get Distance" command proved very useful in this case.

The "Beep" command produces a short beep sound useful in debugging certain routines in your AI.

The last statement cannot really be called a command. The "\*" (asterisk) is used to comment your AI design. The cybertank's on-board computer system recognizes any line that starts with an asterisk as a comment line and does not attempt to execute it. It should be noted that the asterisk must be in the left-most column. Any text, comments, or explanations which follow an asterisk are ignored. It is

suggested that all employees comment their AI. Commenting is extremely helpful when examining AI code months after it was originally written.

NOTE: For users of Commodore 64 and Rppie //+,c,e terminals only:

The asterisk character appears as a diamond shape on these terminal types.

## 5.6 SETTING A "BREAKPOINT"

### COMMAND STRUCTURE

Ocyc Break

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE USAGE

CheckEnemy

Scan for Enemy Tank

**If Enemy Tank Was Not Found Then Branch To Done**

**If Enemy Tank Is Not Within Weapon Range Then Branch To Done**

**Break**

**Done**

**Resume**

The "Break" command is only important when testing a cybertank in the Cybertank Test Module (CTM) (see Part 2, Section 5). When executed, the "Break" command halts execution, but only in the CTM. While battling in the Combat Simulation Module (CSM) (see Part 2, Section 4), the "Break" command does absolutely nothing. The cybertank's on-board computer system ignores the command and continues execution with the next instruction.

## 5.7 ATTAINING MANUAL CONTROL

### COMMAND STRUCTURE

1 cyc **If [Last] Key [Pressed] Then [Branch To : Do] "Label"**

**1 cyc If [Last] Key [Pressed] = "1 character" Then [Branch To : Do] "Label"**

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE USAGE

#### ReadKey

**If Last Key Pressed = "I" then Branch to MoveForwd**

**If Last Key Pressed = "F" then Branch to Fire**

**Resume**

#### MoveForwd

**Move Tank Forward 1**

**Branch to Done**

#### Fire

**Fire Weapon at Closest Object**

#### Done

**Resume**

The Cybertank Remote System (CRS) provides a great deal of control over your cybertank's actions. The CRS is basically a link between your terminal's keyboard and your cybertank. By issuing one letter commands [A-Z] from your terminal's keyboard during simulations, you can alter the behavior of your cybertank.

The above example checks to see if the "I" or "F" keys have been pressed. If either were pressed, the CRS passes the information to the cybertank's AI so it can respond accordingly by branching to the correct label. If neither the "I" nor "F" key were pressed, then the cybertank continues to function as usual.

Cybertanks that rely on the CRS to respond to keyboard control are often called Manual cybertanks. Manual cybertanks have a tremendous advantage over standard AI

cybertanks because the cybertank benefits from the designer's logic and reasoning capabilities during a simulation. When designing Manual cybertanks, you do not have to worry about designing AI to move around indestructible buildings, avoid water, or retreat from the enemy. It is much easier to design a Manual cybertank.

---

## 5.8 SEQUENCE COMMANDS

---

### COMMAND STRUCTURE

**1 cyc Branch To "Label"**  
**1 cyc Goto "Label"**  
**1 cyc Do "Label"**  
**1 cyc Gosub "Label"**  
**1 cyc Resume**

### SYSTEM VARIABLES AFFECTED

None

### EXAMPLE USAGE

#### TankProg

**Do ScanEnemy**  
**Do MoveFrwd**  
**Branch to TankProg**

#### ScanEnemy

**Scan For Enemy Tank**  
**If Enemy Tank Found Then Do ShootIt**  
**Resume**

#### MoveFrwd

**Move Tank Forward 1**  
**Resume**

#### ShootIt

**If Enemy Tank is Within Range Then Do KillIt**  
**Resume**

#### KillIt

**Fire at Enemy Tank**  
**Resume**

The Sequence Commands listed above play an important role

in the design of your cybertank's AI. The "Branch" and "Goto" commands direct the execution of your cybertank's AI to a specific "Label". When a "Branch" and "Goto" command is executed, your cybertank's on-board computer system searches the AI for the specified "Label." Once located, the computer system begins to execute the commands found directly after the "Label."

The "Do" and "Gosub" commands are similar to the "Goto" and "Branch" commands, except that the on-board computer system remembers which instruction the "Do" or "Gosub" is on. When a "Resume" command is encountered, execution is directed to the line directly after the line which contained the "Do" or "Gosub." This is useful if there is a routine in your cybertank's AI which is needed at several locations in your cybertank's AI program. Instead of typing the routine repeatedly, you can execute a "Do" or "Gosub" each time the routine is needed. Using the above example, the small routine named "KillIt" can be called from anywhere in a cybertank's AI. Since the routine ends with a "Resume" statement, execution will ALWAYS resume to the line directly after the "Do KillIt" instruction.

Now to follow the procedure with another example:

### Example

**Do MakePath**  
**Do MoveFrwd**  
**Do ScanEnemy**  
**Branch to Example**

#### MakePath

**Detect Obstruction at Tank Direction**  
**If Movement is Not Obstructed Then Branch To MakeOk**  
**Fire Weapon at Obstruction**

#### MakeOk

**Resume**

#### MoveFrwd

**Move Tank Forward 1**  
**Resume**

**ScanEnemy**

Scan for Enemy Tank

If Enemy Tank Not Found Then Branch To NoEnemy

If Enemy Tank is Beyond Weapon Range Then Branch To  
NoEnemy

Fire Weapon at Enemy Tank

**NoEnemy**

Resume

Ok, now to follow the logic in this AI section:

1. The routine "MakePath" is called with the "Do MakePath" command.
2. The routine "MakePath" checks to see if there is an obstruction. If there is no movement obstruction, then execution branches to "MakeOK". If there is an obstruction, then the cybertank fires at it (and hopefully destroys it).
3. Whether there was an obstruction or not, the AI winds up at "MakeOK". At "MakeOK" there is a "RESUME" command. This command returns the AI back to the command directly after the "Do MakePath". In other words, execution continues at the line "Do MoveFrwd."
4. The command "Do MoveFrwd" sends execution to the routine "MoveFrwd".
5. The "MoveFrwd" routine simply moves the cybertank forward 1 hectometer.
6. The "RESUME" command sends execution back to the line directly after the "Do MoveFrwd" command, which is the "Do ScanEnemy" command.
7. The "00 ScanEnemy" command sends the AI to the routine called "ScanEnemy".
8. The routine "ScanEnemy" checks to see if an enemy can be found and if so, is it within weapon range. If an enemy cybertank is not found, or one is found but is out of weapon range, then the AI will branch to the label

"NoEnemy". If an enemy is found AND it is within weapon range, then the cybertank will fire at it.

9. Whether a cybertank was fired at or not, execution winds up at the label "NoEnemy." At "NoEnemy" there is a "RESUME" command. This command returns the AI to the command directly after the "Do ScanEnemy." In other words, execution continues at the line "Branch to Example."

10. The command "Branch to Example" loops the AI back up to the label "Example" and the whole process is repeated over and over.

---

## 5.9 INCLUDING CAPSULE ROUTINES

---

**COMMANDSTRUCTURE**

0 cyc Include "AI Capsule file name"

**SYSTEM VARIABLES AFFECTED**

None

**EXAMPLE USAGE****TankProg**

Do ScanEnemy  
Do MoveFrwd  
Branch to TankProg

Include ScanEnemy  
Include MoveFrwd

The "Include..." command simply makes it easier to create cybertanks. The directors and engineers at OSI have designed many useful and commonly used routines that can be included in your cybertank's AI. By using the "Include..." command, an OSI AI Capsule is incorporated into your cybertank's AI during the Authorization process. For more information on including Capsules in your AI, please see Part 4.

## SECTION 6 USING THE COMMUNICATIONS LINK

The cybertank Communications Link (Commlink), a special device which can be purchased in the Chassis Design Module (COM), enables communication between cybertanks on the same team. When using cybertanks in the Team mode, it is often useful to transmit various data or instructions to other members of the team. Effective use of the Commlink aids in the performance of complicated tactical maneuvers by a team of cybertanks.

### 6.1 TURNING THE COMMLINK ON AND OFF

#### COMMAND STRUCTURE

```
1cyc  Switch [CommLink]  On
1cyc  Switch [CommLink]  Off
```

#### SYSTEM VARIABLES AFFECTED

None

#### EXAMPLE USAGE

CheckBase

```
Scan for Enemy HQ
If Enemy HQ was Found Then TellTeam
Resume
```

TellTeam

```
Switch CommLink On
Transmit Code 1 To Team
Switch CommLink Off
Resume
```

The above commands switch your cybertank's Commlink on and off. When on, your cybertank can send and receive team member transmissions. When off, your cybertank's Commlink can neither send nor receive transmissions.

### 6.2 TRANSMITTING AND RECEIVING ON THE COMMLINK

#### COMMAND STRUCTURE

```
1 cyc  Transmit [Code] "#" [To Team]
1 cyc  Clear  [CommLink]  Data
1 cyc  Copy   [CommLink]  Data
```

#### SYSTEM VARIABLES AFFECTED

AllyNum	AllyEnemyX	CopyX
AllyCode	AllyEnemyY	CopyY
AllyX	AllyEnemyDist	CopyDist
AllyY	AllyEnemyDir	CopyDir
AllyDist	CopyNum	CopyEnemyX
AllyDir	CopyCode	CopyEnemyY
CopyEnemyDist	CopyEnemyDir	

(For a complete description of these System Variables, see Appendix 2.)

#### EXAMPLE USAGE

CheckComm

```
If AllyCode <> then CodeHere
Clear CommLink
Branch to CheckComm
```

CodeHere

```
Switch CommLink Off
Copy CommLink Data
Switch CommLink On
If CopyCode = 1 Then EnemyFound
If CopyCode = 2 Then BaseFound
Resume
```

The three commands listed above are essential in the operation of the Commlink. By transmitting various codes, a team of cybertanks can consolidate its forces and knowledge, forming a colossal army. The code actually transmitted via Commlink can range from 0 to 100. Cybertanks on a team have the option of ignoring any signal transmitted. For example, if the third cybertank on a team sends a code of 7, which all members of the team have

designated as a distress call, any cybertank on the team can either ignore the distress call or speed to the rescue.

It is important to remember that all incoming transmissions update all of the System Variables in the Commlink (only if your cybertank's Commlink is switched on). To effectively use the Commlink as a receiver, a cybertank should:

1. After checking the "AllyCode", turn off the Commlink with the **Switch Commlink Off** command.

2. Use the **Copy Commlink Data** command to establish a copy of all transmitted variables

3. Use the **Switch Commlink On** command to re-establish communications.

When the **Copy CommLink** command is executed, all of the System Variables within the Commlink are copied over to the "Copy..." System Variables. All of the new copied System Variables begin with the word "Copy" and should be used in any subsequent AI commands. Based upon the above distress call, a cybertank which is instructed to attempt a rescue should do the following:

1. Check to see if the System Variable "AllyCode" equals 7.

2. If "AllyCode" is **7**, then **Switch CommLink Off** to prevent any incoming transmissions which would overwrite the needed System Variables.

3. Use the **Copy CommLink Date** command to make a copy of the needed System Variables.

4. **Switch CommLink On** to allow the checking of new incoming transmissions. This allows the cybertank to change its duties based upon new information. For example, the discovery of enemy headquarter's by another team member may be more important than saving the team member in distress. Remember, as the AI designer, it is up to you to determine your cybertank's priorities.

5. use the "Copy..." System Variables (CopyX, CopyY, etc...) to home in on the team member in distress.

The above, written in CCL, would resemble the following:

Checkcomm

```
. An AllyCode of 7 means team-member being attacked
| An AllyCode of 1 means enemy HQ found
```

```
    If AllyCode = 7 then Branch To Rescue
    If AllyCode = 1 then Branch To FoundHQ
    Resume
```

Rescue

```
* The cybertank now knows that a team-member is being
* attacked.
```

```
    Switch CommLink Off
    Copy CommLink Data
    Switch CommLink On
```

```
* The CommLink is turned off to ensure that new incoming
* transmissions do not over-write the current values in the
* CommLink. The CommLink data is copied into another set
* of System Variables that are NOT over-written by incoming
* CommLink transmissions. It is this second set of System
* Variables that is used in subsequent AI commands. The
* CommLink is turned back on so that the cybertank can
* continue monitoring in case a more important transmission
* is received (like the Enemy HQ being found).
```

GoToTank

```
' This small routine moves the cybertank toward the team-
' member that sent the distress signal. Since the Copy
' CommLink Data command was issued, the System Variables
' CopyX and CopyY are used as the cybertank's destination.
* Along the way, the cybertank continues checking the
* AllyCode System Variable in the Commlink to see if any
team-member has found the enemy HQ.
```

```
    Turn Tank to CopyX CopyY
    Detect Obstruction at TankDir
```



If Movement Is Not Obstructed Then Branch To Move  
Fire Weapon at TankDir

Move

Move Tank Forward 1

Now, check to see if anyone has found the enemy HQ

If AllyCode = 1 then Branch To FoundHQ

Now, check to see if the cybertank is at its destination

If TankX <> CopyX Then Branch To GoToTank

If TankY <> CopyY Then Branch To GoToTank

If at destination, then return to the main AI

Resume

FoundHQ

If the enemy HQ was found, the cybertank should perform the same procedure as when moving to a team-member in distress.

Switch CommLink Off

Copy CommLink Data

Switch CommLink On

Branch To GoToHQ

Now, the cybertank is free to use the "Copy..." System Variables to proceed to the team-member which found the enemy HQ. Since this routine is a great deal like the GoToTank routine used above, we will just assume the routine is written and is called GoToHQ.

## PART 4 CAPSULE REFERENCE

### SYNOPSIS

This section is a must for new employees. The Capsule Routine Reference details the "hows" and "whys" of using pre-defined AI routines. Capsule routines can Simplify the creation of a cybertank's AI. Employees can "plug-in" various routines to perform diverse operations.

---

SECTION 1  
**GENERAL INFORMATION**

---

**SECTION BRIEF**

This section defines Capsules and how they are used.

---

**1.1 WHAT IS A CAPSULE?**

---

A Capsule is a pre-defined AI routine that can be incorporated into a cybertank's AI. Capsule routines can perform any cybertank function. For example, a Capsule routine can hunt for an enemy, move around an obstacle, retreat from a battle, and much more. Capsule routines range from the simple to the complex.

---

**1.2 HOW TO USE A CAPSULE**

---

OSI engineers and designers have created several Capsule routines to perform various tasks.

To examine a" OSI Capsule routine, select DESIGN CYBERTANK from the DESIGN menu in the ECM. Next, select LORD from the CAPSULE menu in the DCM. The File Retrieval Panel (FRP) appears.

Select the name of the desired Capsule and then select the OPEN button.

**NOTE:** For **users of Commodore 64 and Apple //+,c,e terminals** only:

The OSI Capsule routines are found on the RESOURCE disc.

At this point, you are transferred to the AI Module, but you are NOT working on a cybertank's AI -- you are working on a capsule routine. You must INCLUDE (or incorporate) a Capsule in a cybertank's AI.

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**1.3 OSI CAPSULE STANDARDS**

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Except for three Capsules written exclusively for the OSI Training Guide, all Capsules designed by OSI observe the standard conventions listed below. Capsule routines created by new employees do NOT need to follow these capsule standards.

capsule Variables

For all User Variables listed below, a value of zero implies "NOT SET", while a value of one implies "SET".

The following User Variables must be set or cleared BEFORE calling a" OSI Capsule routine. If the variables are undefined they are assumed to have a value of zero (ie., not set).

**LABORT** - If set, all OSI Capsule routines abort if the cybertank incurs any damage during execution. If not set, any damage is ignored during execution of the routine.

**L.WATER** - If set, all OSI Capsule routines traverse through water when moving the cybertank. If this variable is not set, the cybertank always avoids water.

**LCLEAR** - If set, all OSI capsule routines move around any obstructions in the cybertank's path. If not set, all OSI Capsule routines fire the cybertank's weapon at the obstruction, allowing forward movement. If the obstruction cannot be destroyed (ie., a building), the cybertank will move around it.

The following User Variables will be set or cleared AFTER an OSI Capsule routine has executed. This allows you to determine why the Capsule routine has aborted or finished its execution.

**L.DAMAGE?** - Set if the cybertank incurred damage during execution of an OSI Capsule routine. All OSI Capsule routines set this variable if the cybertank is damaged. If you did not set LABORT, damage is not checked during execution and this variable will never be set.

**L.ENEMYFOUND?** - Set if an enemy cybertank is found during a search routine.

**L.ENEMYLOST?** - Set if an enemy tank being tracked is no longer found by the scanner. This occurs during a hunt, when an obstruction comes between the two cybertanks.

**L.INRANGE?** - Set if an enemy cybertank being hunted or scanned is within the cybertank's weapon range.

---

## 1.4 OSI CAPSULE ROUTINES

---

The following is a list of all OSI engineered Capsule routines available on the Resource disc. A brief explanation of each Capsule routine is included. Also included here is the label name that should be used when accessing the Capsule Routines. For example, if you included the routine CenterSearch in your AI, you could use the CCL instruction "Do Center" to perform the CenterSearch routine.

### 1.4.1 'SEARCH FOR ENEMY' CAPSULES

#### CenterSearch

> label to use when calling: CENTER

This Capsule routine moves the cybertank to the center of the battlefield. While moving, it searches for enemy cybertanks. Once the cybertank is in the center of the battlefield, the Capsule routine continues a rapid but thorough search pattern. Any cybertank that uses this routine is looking for trouble.

**Primary Usage:** This Capsule Is very offense-oriented. It is useful against enemy cybertanks that come straight at an enemy. The quick scanner search detects them long before they are within weapon range.

**Weakness:** This Capsule is impeded somewhat by certain battlefield designs. If, for example, a design hinders access to the very center of the battlefield, the cybertank is vulnerable to a sneak attack while searching for a route to the center.

**CornerSearch**

> Label to use when calling: CORNER

This Capsule routine finds the corner nearest the cybertank and moves toward it. During the move, it searches for enemy cybertanks. The theory behind moving to the corner for protection (which was devised by a clever young engineer at OSI) is that your cybertank's "back is covered" and enemy cybertanks can attack your cybertank from only three angles.

**Primary Usage:** This Capsule is a defense-oriented routine. Using the corners of the battlefield, a cybertank gains an advantage due to the protection of the walls. In addition, nestling up in a nice safe corner reduces the need for movement and conserves fuel.

**Weakness:** While this routine is defense oriented, a cybertank using it is usually discovered by enemy cybertanks. This is due, in part, to the nature of some lower-level cybertanks "hugging" the battlefield walls. Another drawback is that retreat or a "break and run" is restricted to a few directions.

**EdgeSearch**

> Label to use when calling: EDGE

This Capsule routine searches for enemy cybertanks by traversing the edges of the battlefield.

**Primary Usage:** This Capsule is effective in searching most of the battlefield. By following the battlefield walls, very little of the battlefield remains unscanned.

**Weakness:** Some battlefield designs are effective in countering this Capsule. Since the Capsule attempts to follow the battlefield walls, battlefield configurations with dead-ends make the cybertank spend a lot of time "getting its bearings." Cybertanks are vulnerable to attack during such periods.

**RandomSearch**

> Label to use when calling: RNDSEARCH

This Capsule routine randomly roams the battlefield searching for enemy cybertanks.

**primary Usage:** Since this Capsule is random in design, it fosters various, unpredictable results. Random movement makes the cybertank difficult to track -- sometimes it moves left, sometimes it moves right.

**Weakness:** The primary downfall of this Capsule is its "randomness" or illogical actions. For example, a cybertank using this Capsule can be in very close proximity to an enemy cybertank and never detect it, while the enemy cybertank, by using a very systematic search pattern, is able to detect the "random" cybertank.

**SitSearch**

> Label to use when calling: SITSEARCH

This Capsule routine instructs the cybertank to sit in one spot and scan for an enemy cybertank. That's all it does -- very sweet, very simple.

**Primary Usage:** This Capsule routine is very effective in detecting any enemies in close proximity. It safeguards against accidentally stumbling upon an enemy with defenses down, and is extremely fuel efficient.

**Weakness:** Because of the lack of movement, a cybertank using this routine is extremely limited in the amount of battlefield it can successfully scan. Also, the initial random placement of cybertanks by the Combat Simulation Module (CSM) may not be in a very advantageous position.

## 1.4.2 "TRACKING" CAPSULES

### BeeLineHunt

> Label to use when calling: BEELINE

As the name implies, this Capsule routine makes a bee-line towards an enemy cybertank. The routine attempts to move towards the enemy cybertank until the enemy is within weapon range. This routine assumes that an enemy cybertank has already been detected.

**Primary Usage:** This Capsule routine is used to quickly approach an enemy cybertank. Slower tracking routines often lose the trail of very mobile enemy cybertanks. This routine was designed to provide maximum speed during "the hunt".

**Weakness:** Since this Capsule is preoccupied with getting to the enemy cybertank quickly, it often moves the cybertank into weapon range without being prepared to attack. A cybertank using this Capsule routine rarely gets off the first shots during a battle confrontation.

### TrackEnemy

> Label to use when calling: TRACK

This Capsule routine tracks a located enemy cybertank. It does NOT actively seek out an enemy, since it assumes an enemy has already been found. As long as the enemy cybertank continues to move closer, this routine instructs the cybertank to remain stationary. If the wait is extended, your cybertank will move toward the enemy.

**Primary Usage:** This Capsule routine is most effective when speed is not of the essence. Since the enemy cybertank is usually moving toward you, your cybertank typically fires the first few shots.

**Weakness:** This routine slowly tracks an enemy cybertank and escape is a definite possibility.

### WaitForEnemy

> Label to use when calling: WAIT

This Capsule routine instructs your cybertank to sit in one spot and wait for an enemy cybertank. This routine assumes that an enemy has already been found.

**Primary Usage:** This Capsule routine is most effective against slow, hulking, very powerful enemy cybertanks. Since a cybertank using this Capsule routine remains stationary while tracking an enemy, it is almost always assured the first shots. Against powerful enemies, the first few shots are extremely important.

**Weakness:** The primary weakness of this routine is that a cybertank is vulnerable to attack when stationary. While waiting for an identified enemy to approach, other cybertanks can approach without **detection**.

## 1.4.3 'ENEMY TERMINATION' CAPSULES

### BerserkAttack

> Label to use when calling: BERSERK

As the name implies, this Capsule routine is a full-force attack on an opponent. This Capsule simply fires the cybertank's weapon ten times in a row -- no thinking, no wasted time, just plain old fashioned brute force.

**Primary Usage:** This Capsule is best suited for attacking slow, hulking cybertanks that come straight in for the kill. The combination of this Capsule with a very fast weapon (lasers) results in a very deadly cybertank.

**Weakness:** This method of attack is only effective as long as the enemy cybertank sits still long enough to receive all ten hits (if it takes that many). This routine is very ineffective against cybertanks that are known to be quick and very mobile.

#### KillTank

> Label to use when calling: KILLTANK

This Capsule routine fires the cybertank's weapon at an enemy cybertank until the enemy is destroyed or is no longer detected by the scanner. If the enemy cybertank moves out of weapon range, then this Capsule will move toward it until obstructed.

**Primary Usage:** This Capsule routine is primarily used against enemy cybertanks that are known to flee from combat. Your cybertank will chase a fleeing enemy.

**Weakness:** This Capsule routine is inefficient against cybertanks that employ a technique known as "back-up and wait". A cybertank which uses this technique will move backward one hectometer, wait for the opposing cybertank to move forward into range, then fire and move backward again. For a cybertank to successfully use this technique it must have a fast weapon and a light chassis for maximum firing and maneuvering speed.

#### NormalAttack

> Label to use when calling: ATTACK

This Capsule is a standard attack routine. Your cybertank fires at an enemy cybertank until it either moves beyond weapon range or is not detected by the scanner.

**Primary Usage:** This Capsule routine is, as the name implies, the normal attacking procedure. Since this Capsule routine does NOT attempt to follow an enemy cybertank, it is very

effective against those cybertanks which use the "back-up and fire" technique (see KillTank above).

**Weakness:** This routine does not have any major weaknesses. It is a basic and predictable attack pattern.

#### 1.4.4 'FLEE FROM ENEMY' CRPSULE

##### Panic

> Label to use when calling: PANIC

This Capsule routine instructs a cybertank to quickly move backwards ten hectometers. It does NOT check for obstacles while backing-up. If there is an indestructible obstacle behind the cybertank, damage will be incurred.

**Primary Usage:** This Capsule routine is typically used to quickly disengage from a combat situation. For example, if your cybertank becomes severely damaged during a battle, it can use this routine to get out of the immediate area for a quick breather (or to attempt repairs).

**Weakness:** Since it does not check for obstacles, the primary weakness of this Capsule is that the cybertank will probably incur damage while backing up.

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**PART 5**  
**COMBAT OBJECTIVES AND**  
**TACTICS**

---

**SYNOPSIS**

The OSI/CACD System 2 offers many different simulation possibilities. Each variation presents its own strategic options and subtleties.

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## SECTION 1 MELEE

---

### SECTION BRIEF

The most common type of simulation is known as Melee. Melee is an all out free-for-all. Each cybertank in a melee simulation is an enemy Of every other cybertank.

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### 1.1 MELEE OBJECTIVE

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The only objective during a melee simulation is to be the last active cybertank left on the battlefield. This objective can be attained through a number of strategic possibilities.

---

### 1.2 MELEE TACTICS

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#### 1.2.: Destroying the Other Cybertanks

The most common method of being victorious in a melee simulation is to destroy all the other cybertanks in the simulation. If there are many other cybertanks in the melee, then a cybertank must be very powerful if it is to have a chance at being victorious. The chances of encountering two or more enemy cybertanks at the same time is relatively high; thus, a cybertank in a large melee must be able to sustain damage "from behind" while attacking another enemy.

During a small, or one-on-one melee, the victory does not necessarily go to the most powerful cybertank, but to the cybertank with the "cleverest" AI design. For example, a small, quick cybertank can move in on a larger, more powerful tank and get off a couple of shots before the larger tank is able to react. If this process is successfully

repeated, then any cybertank can "wear down" a much larger, more powerful tank.

#### 1.2.2 Hiding From the Other Cybertanks

The other commonly used tactic in winning a melee simulation is that of hiding from the other cybertanks. While this method is less exciting, it still produces a large number of victories. The cybertank that attempts to hide usually moves to the closest corner and sits there. By hiding in the corner, a cybertank is protected from assaults from behind by the battlefield wall. A cybertank hiding in the corner is less likely to be detected by other cybertanks, and while hiding, the other cybertanks are roaming around the battlefield, destroying each other. The other cybertanks are using a great deal of fuel moving around the battlefield, while the cybertank in the corner is stationary and conserves fuel.



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## SECTION 2 TEAM COMBAT

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### SECTION BRIEF

Cybertanks can also engage in team combat simulation. Team combat pits groups of cybertanks, composed of up to seven cybertanks, against one another. Team combat offers many strategic possibilities.

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### 2 . 1 ABSOLUTE TERMINATION

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As in a melee simulation, a team of cybertanks can be victorious by destroying all of the cybertanks on the opposing team [see Part 2, Section 3 for more information on the Simulation Design Module (SDM) and setting up cybertank teams]. With up to seven cybertanks per team, this can prove to be a very difficult task. To be effective, a team of cybertanks should employ the use of a Commlink (see Section 2.3 for more information regarding the Commlink). By using the Commlink effectively, a team of cybertanks can pool their resources and information. For example, cybertanks on the same team can come to the rescue of a team-member who is being attacked. It should be noted that any cybertanks in the simulation that have NOT been placed on a team are treated as if they were in a melee simulation (ie., all other cybertanks are the enemy).

---

### 2.2 HEADQUARTERS TERMINATION

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The Simulation Design Module (SDM) allows a headquarters building to be placed on the battlefield for each of the two teams. A team that destroys an enemy's headquarters is the victor in team combat.

When a team combat simulation includes headquarter buildings, the strategic options increase. Since a headquarters is easy to destroy, it must be well protected. It is very effective to divide the offensive and defensive duties of the cybertanks on a team. The offensive tanks should be very good "search" tanks, possessing good scanners and able to cover a great deal of the battlefield as quickly as possible while searching for the enemy headquarters. The defensive tanks should be very powerful tanks. The defensive tanks will not have to move very much, and do not need to be fast or fuel efficient; however, they should be equipped with the best weapons and armor possible. Defensive tanks should also have good scanners so they can detect incoming enemy tanks as soon as possible.

The Commlink is an important part of the strategy in team combat that incorporates a design with a headquarters. Once the enemy headquarters is found by a cybertank, its position can be relayed to all members of the team. By doing so, all firepower can be concentrated in the area of the enemy headquarters.

---

### 2.3 TEAM COMMUNICATIONS

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The cybertank Communications Link (Commlink), a special device, which can be purchased in the Chassis Design Module (CDM), enables communication between cybertanks on the same team. When using cybertanks in the Team mode, it is often useful to transmit various data or instructions to other members of the team. Effective use of the Commlink aids in the performance of complicated tactical maneuvers by a team of cybertanks. By transmitting various codes, a team of cybertanks can consolidate its forces and knowledge, forming a colossal army. For complete information on the usage of the Commlink, please see Part 3. Section 6.

---

## SECTION 3 MANUAL CONTROL

---

### SECTION BRIEF

One of the most interesting simulation possibilities is that of manually controlled cybertanks. By pressing various keys on the computer terminal, a cybertank designer can exercise a great deal of control over the cybertank.

---

### 3.1 WHAT IS MANUAL CONTROL?

---

All cybertanks are equipped with what is known as a Cybertank Remote System (CRS). The CRS is basically a link between your terminal's keyboard and your cybertank. By issuing single letter commands [A-Z] from your terminal's keyboard during simulations, you can greatly alter the behavior of your cybertank.

Cybertanks that rely on the CRS to respond to keyboard control are often called Manual cybertanks. Manual cybertanks have a tremendous advantage over standard AI cybertanks because the cybertank benefits from the designer's logic and reasoning capabilities during a simulation. When designing Manual cybertanks, complex routines to move around indestructible buildings, avoid water, or retreat from the enemy are unnecessary. Such routines can be handled by the cybertank designer during the simulation.

---

### 3.2 HOW TO ACHIEVE MANUAL CONTROL

---

Attaining manual Control is a rather simple process. In the following example, the CCL code continually checks to see if

the last key pressed is an "I", "K", "M", or " " (space). If the last key pressed is one of these keys, the on-board computer system will branch to the appropriate label. After the cybertank turns or moves forward, the on-board computer system branches back to the **ReadKey** label and the process is repeated.

#### ReadKey

```
If Last Key Pressed = "I" then Branch to TurnNorth
If Last Key Pressed = "J" then Branch to TurnWest
If Last Key Pressed = "M" then Branch to TurnSouth
If Last Key Pressed = "K" then Branch to TurnEast
If Last Key Pressed = " " then Branch to MoveForward
Branch to ReadKey
```

#### TurnNorth

```
Turn Tank to 0
Branch to ReadKey
```

#### TurnWest

```
Turn Tank to 6
Branch to ReadKey
```

#### TurnSouth

```
Turn Tank to 4
Branch to ReadKey
```

#### TurnEast

```
Turn Tank to 2
Branch to ReadKey
```

#### MoveForward

```
Move Tank Forward 1
Branch to ReadKey
```

By using the above CCL, you can completely control the movement of your cybertank. If you want your cybertank to turn to the west, move forward one hectometer, and then turn to the south, you would press "J", " ", "M".

For a complete discussion of Manual cybertanks please see Part 3, Section 5.7).

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## **PART 6**

# **TROUBLESHOOTING**

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### **SYNOPSIS**

This section discusses problems which may occur during operation of the OS/CACD System 2. It also defines possible solutions to these problems.

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## SECTION 1 DISC PROBLEMS

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### SECTION BRIEF

During operation of the OSI/CACD System 2, problems can occur during disc access. Some of these are easily rectified.

---

### 1.1 FILE NOT FOUND

---

The File Retrieval Panel (FRP) lets you select files to be loaded from a specified disc. The File Not Found error is often encountered when you are retrieving a data file from a disc and, for some reason, the disc was removed from the access slot.

To avoid this error, simply keep the disc containing the data file in the access slot. The disc may be removed after the OSI/CACD system has retrieved the specified data file.

The File Termination Panel (FTP) may produce this same error if, under the similar circumstances, it is unable to delete a specified data file.

---

### 1.2 DISC WRITE PROTECTED

---

This error occurs when the OSI/CACD tries to save a data file to a write protected disc via the File Storage Panel (FSP). Most discs have write protect features to prevent information being written to them. If a disc is indeed write protected, the OSI/CACD is unable to save any data to the disc and this error message is displayed.

All 5 1/4 inch discs have a small notch in the right side. If the notch is covered, the disc is write protected. If the notch is uncovered, the disc is not write protected and information can be written to it. To avoid the Disc Write protected error, simply remove the material that is covering the notch.

All 3 1/2 inch discs have a write protect tab built in the upper right-hand corner of the reverse side. If the tab is moved and unblocks the hole, the disc is write protected. If the tab is moved to block the hole, the disc is not write protected and information can be written to it. To avoid the Disc Write Protected error, simply move the tab so that it blocks the hole.

---

### 1.3 DISC FULL

---

All discs are limited in the amount of data they can store. If your disc is at its maximum capacity and you instruct the OSI/CACD to save another data file via the File Storage Panel (FSP), this error message will appear. Once your disc is full, you can delete some information to provide space. Use the File Termination Panel (FTP) to delete specific data files from the disc.

The disc Full error can become a recurring problem since most discs have a rather small capacity. The solution below may help.

The FSP can save a file to any disc (not only to Your Employee ID Disc). Saving data files onto several discs can alleviate later problems. For instance, you may want to save cybertank designs on one disc, battlefield designs on another, etc. Remember, the Combat Simulation Module requires that the battlefield and all cybertanks in a simulation design reside on the same disc, resulting in the development of the the Data Duplication Module (DDM).

The DDM lets you copy data files from one disc to another. Using the DDM, you can copy those data files you are currently Using onto your ID Disc, leaving unused data files on other discs, commonly referred to as backup discs.

---

## 1.4 DISC MALFUNCTION

---

The Disc Malfunction error message is displayed when an unknown problem prevents the OSI/CACD System 2 from accessing a disc. Due to the many circumstances that can create this error, only the most likely causes are listed.

If the disc is removed from the access slot during a load, save, or delete the OSI/CACD is unable to complete the procedure and only a portion of the data is processed. The OSI/CACD cannot perform correctly with a partially processed data file.

If this error message occurs when retrieving a data file, that data file is usually lost. This is the main reason that backup copies of data files are necessary. Backing up data files is easy using the Data Duplication Module (DDM). While losing a data file in the above manner is unlikely, it happens on occasion.

---

## SECTION 2 SECURITY ERRORS

---

### SECTION BRIEF

OSI is a high-security complex. Procedures have been implemented to prevent unauthorized entrance into the OSI Complex and unauthorized access to cybertank designs.

---

### 2.1 IDDISCPASSWORDSECURITY

---

In order to verify employment, you must enter the correct password for the Employee ID Disc being used. Failure to enter the correct password prompts a Security Breach alarm and Informs the guards at the OSI Security Gate. This prevents the use of stolen ID discs to gain entrance to the OSI complex. If you forget your password when using your own ID Disc, you will be denied entrance into the OSI Complex. The Orientation Guide details password security.

Being denied access to the OSI Complex is an unfortunate circumstance, but it cannot be corrected unless you identify the correct password. Although the information on your ID Disc can be copied onto another using the Data Duplication Module (DDM), your clearance level is lost.

---

### 2.2 CYBERTANK DESIGN PASSWORD SECURITY

---

Cybertank design protection is a high priority at OSI. Security leaks must be avoided. When an employee creates a new cybertank design, the password used for the Employee ID Disc is incorporated into the cybertank design. Only employees with knowledge of the correct password can access that design.

**NOTE: *If an employee does not identify a password for the ID Disc, then designs created by that employee are not password protected. Those designs are accessible without a password.***

In the Design Control Module (DCM), any cybertank design can be loaded from any disc. The design selected is inspected to ensure it has been properly authorized by OSI. If the passwords on the ID Disc and cybertank design do not match, the Security Breach alarm is then sounded.

Note that cybertanks created by other employees can also be used in simulations.

To obtain authorization *when* the passwords do not match, the designer can duplicate the design using the Data Duplication Module (DDM). The DDM removes the password from the cybertank design and it is now accessible by all employees. If an employee other than the designer tries to duplicate a protected *design*, the Security Breach alarm will sound. Only the designer can duplicate a protected cybertank design.

---

## SECTION 3 SIMULATION ERRORS

---

### SECTION BRIEF

The Combat Simulation Module (CSM) and the Cybertank Test Module (CTM) have a limited amount of memory available for processing simulations. Also, each cybertank in the simulation must be authorized for use.

---

### 3.1 SIMULATION OUT OF MEMORY

---

When loading a simulation, the CSM and CTM are limited by the amount of memory available. In rare cases, there is not enough memory available to load all of the cybertanks in the simulation design. You will be notified when these modules are unable to load all tanks in a design. The only recourse is to redesign the simulation using fewer tanks.

When a memory problem occurs, the active module will abort and you will be transferred to the External Control Module (ECM).

---

### 3.2 CYBERTANK / BATTLEFIELD NOT FOUND

---

The battlefield design and all cybertanks included in a simulation design must reside on the same disc when using the CSM or CTM. If either the battlefield, or any one of the cybertanks are not found on the disc, you will be notified via the terminal. In a situation such as this, the CSM and CTM will abort and transfer you to the External Control Module (ECM).

To rectify this problem, you can either redesign the simulation using the Simulation Design Module (SDM), or copy the cybertenks and battlefield onto the same disc with the Data Duplication Module (DDM).

---

### 3 . 3 **CYBERTANKNOTAUTHORIZED**

---

The CTM requires that the cybertank to be tested to have been authorized by the current employee. If you attempt to test a cybertank using an unauthorized cgbertank design, the Cybertank Not Authorized message is displayed.

The Cybertank Not Authorized error message also appears during Clearance Evaluation if the **cybertank** Selected is not authorized by the current employee.

To resolve this problem, authorize the cybertank using the Design Control Module (DCM).

---

## SECTION 4 **HER ERRORS**

---

### SECTION BRIEF

There are other System error messages which can appear at certain points.

---

### 4 . 1 **AUTHORIZATION ERRORS**

---

**Many** problems can and will occur while authorizing **cybertanks**. The various errors are discussed in detail in Appendix 5 of the Engineering Handbook.

---

### 4 . 2 **ILLEGAL BATTLEFIELD**

---

At the start of a simulation, the Combat Simulation Module (CSM) randomly picks the initial location of all cybertanks. Cybertanks can only be placed on grass, roads, dirt patches, etc. That is, they can only be placed in non-obstructed areas of the battlefield.

The Battlefield Design Module (BDM) lets employees create their own battlefields for **combat** simulations. There are few limitations in battlefield design, but there **MUST be at least 30 non-obstructed areas** (to allow placement of cybertanks) included in a design. If there are less than 30 the Illegal Battlefield error is displayed when YOU attempt to save the terrain.

## **Glossary**

**BACCESS SLOT:** The mechanism used by the OSI/CACD System 2 to access discs. Also known as a disc drive.

**AI:** Artificial Intelligence. The underlying logic by which cybertanks function.

**AUTHORIZE:** The act of creating a cybertank from a cybertank design. All cybertank designs must be authorized by OSI before a cybertank can be created.

**BDM:** Battlefield Design Module. The component of the OSI/CACD System 2 used to create simulation battlefields.

**CBCD:** Computer Bided Cybertank Design. The process of using powerful computers in the design and implementation of cybernetic machinery.

**CUM:** Cybertank Authorization Module. The component of the OSI/CACD System 2 used to identify cybertank design flaws. If any flaws are found, they are reported to the employee.

**CAPSULE ROUTINE:** Pre-written sections of Artificial Intelligence (AI) which perform specific functions. These routines can be incorporated into any employee's AI.

**CCL:** The Cybertank Command Language. The computer language used to construct cybertank AI.

**CDI:** Cybertank Directional Indicator. Shows the direction of the cybertank and scanner during a simulation.

**COM:** Chassis Design Module. The component of the OSI/CACD System 2 used to build a cybertank's chassis/body.



CEM: Cybertank Evaluation Module. The component of the OSI/CACD System 2 which carries out an employee's request for a Clearance Evaluation.

CHASSIS: The body or frame of a cybertank including all electronic devices, weaponry, and armor.

CLEAR: The act of erasing text from the AI by first selecting it then selecting Clear from the Edit menu. The text removed is NOT retained in temporary storage.

CLERRANCE EVALUATION: A formal request for an employee evaluation. If passed, the employee achieves an increase in clearance level.

CLERRANCE LEVEL: Defines an employee's position/rank within the OSI high-security complex. As higher clearance levels are attained, the budget increases and additional information and equipment becomes available.

COMMLINK: A special item available in the Chassis Module which allows communications between cybertank team members. Only useful for team simulation designs.

COPY: The act of duplicating text in the AI by first selecting it then selecting Copy from the Edit menu. The text is retained in temporary storage until other text is copied or cut. Text in storage can be retrieved.

CP: Construction Panel. An automatic, easy-to-use tool used in the construction of a cybertank's AI.

CSM: Combat Simulation Module. The component of the OSI/CACD System 2 used to observe a cybertank battle.

CTM: Cybertank Test Module. The component of the OSI/CACD System 2 used to test a cybertank design. Includes many powerful diagnostic tools.

CUT: The act of removing text from the AI by first selecting it then selecting Cut from the Edit menu. The text removed is retained in temporary storage until other text is copied or cut. Text can be retrieved from temporary storage.

CVI: Cybertank Viewing Indicator. Shows the results of the last scanner usage.

DCM: Design Control Module. The gateway to all aspects of cybernetic design.

DDM: Data Duplication Module. The component of the OSI/CACD System 2 used to duplicate (or copy) data files to and from discs.

ECM: External Control Module. The main component of the OSI/CACD System 2 computer. It is from the ECM that the rest of the OSI/CACD is accessed.

EMAIL: Bulletin board system incorporated into the ECM which allows the posting of OSI memorandums and international news bulletins.

FRP: File Retrieval Panel. The control mechanism used to load data files from a disc.

FSP: File Storage Panel. The control mechanism used to record/save data files to a disc.

FTP: File Termination Panel. The control mechanism used to delete data files from a disc.

LABEL: A name consisting of ten characters or less that identifies a command routine in a cybertank's AI.

LIBRARY CAPSULE: A predefined set of CCL commands which execute a specific function.

**OSI:** The Organization of Strategic intelligence. A pioneer company in the field of cybernetics.

**OSICOM 1 :** The OSI communications and surveillance satellite. It is from the OSICOM 1 that an aerial view of a battlefield can be accessed.

**PRSTE:** The act of inserting temporarily stored text into the AI.

**PSP:** Printer Setup Panel. The control mechanism used to configure a printer for the OSI/CACD system.

**SIMULATION:** A closely approximated model of a cybernetic battle used for testing or experimentation.

**VERIFY:** Checks the cybertank AI for errors and notifies the employee of any problems. Although similar to authorize, verify will not create a cybertank.

## APPENDIX 1 CCL RESERVED WORDS

The following list of words cannot be employed  
in User Defined Variables.

ACTIVE	ALIGN	ALIGNED	ALLY	ARE
ARMOR	AT	AVAILABLE	BACKWARD	BEEP
BEING	BEYOND	BRANCH	BREAK	CLEAR
CLOSEST	CODE	COMMLINK	COPY	DATA
DESTRUCT	DETECT	DIRECTION	DISTANCE	DO
DOWN	EMPTY	ENEMY	FACE	FACING
FIRE	FOR	FORWARD	FOUND	FROM
FUEL	FUNCTIONAL	GET	GOSUB	GOTO
HQ	IF	INACTIVE	INCLUDE	INTERNAL
IS	JAM	KEY	KIT	LAST
LAUNCH	LEFT	LOCK	LOCKED	LOWER
MOVE	MOVEMENT	NOT	OBJECT	OBSTRUCTED
OBSTRUCTION	OFF	ON	PRESSED	RAISE
RRNOOM	RANGE	REMAINING	REMOTE	REPAIR
RESUME	RETURN	RIGHT	ROTRTE	SCAN
SCANEO	SCANNER	SELF	SHIELD	SIGNAL
SWITCH	TANK	TEAM	THEN	TO
TRANSMIT	TREADS	TURN	UNAVAILABLE	UNLOCK
UNLOCKED	UP	WAS	WEAPON	WITH
WITHIN				

## APPENDIX 2 CCL SYSTEM VARIABLES

### 4

The following is a list of all CCL System Variables. Feel free to use them, but remember that they cannot be altered or used as labels.

AllyCode	AllyDir	AllyDist	AllyEnemyDir
AllyEnemyDist	AllyEnemyX	AllyEnemyY	AllyHOX
AllyHQY	AllyNum	AllyX	AllyY
ArmorDamage	CopyCode	CopyDir	CopyDist
CopyEnemyDir	CopyEnemyDist	CopyEnemyX	CopyEnemyY
CopyNum	CopyX	CopyY	EnemyDist
EnemyHQDist	EnemyHOX	EnemyHQY	EnemyX
EnemyY	FuelLevel	IntDamage	KitsLeft
ObjDist	ObjType	ObjX	ObjY
ObstacleDist	ObstacleType	ObstacleX	ObstacleY
RandomNum	RemotesLeft	ScanDamage	ScanDir
TankDir	TankNum	TankX	TankY
TreadDamage	XYDist	WeapDamage	

The following are complete descriptions of the system variables.

AllyCode	Code transmitted by team member. This value ranges from 0-100.
AllyDir	The last direction heading of a transmitting team member.
AllyDist	The distance between the transmitting and the receiving team members.
AllyEnemyDir	The direction heading <b>of</b> an enemy cybertank last scanned by the transmitting team member.

AllyEnemyDist	The distance to the enemy cybertank as it was last scanned by the transmitting team member.
AllyEnemyX	The enemy cybertank's X coordinate as last scanned by transmitting team member: This value ranges from 1 to 62.
AllyEnemyY	The enemy cybertank's Y coordinate as last scanned by transmitting team member. This value ranges from 1 to 62.
<b>AllyHOX</b>	X coordinate of your cybertank's team headquarters.
<b>AllyHQY</b>	Y coordinate of your cybertank's team headquarters.
AllyNum	The identification number of the transmitting team member. Cybertank identification numbers are based on the order in which they were selected in the Simulation Design Module.
<b>AllyX</b>	The X coordinate of the transmitting team member.
AllyY	The Y coordinate of the transmitting team member.
ArmorDamage	This is the current armor damage percentage. ArmorDamage value ranges from 0 (fully intact) to 100 (destroyed). When ArmorDamage reaches 100, the cybertank is destroyed.
<b>CopyCode</b>	Holds a copy of AllyCode when <b>Copy Commlink Data</b> command is executed.
<b>CopyDir</b>	Holds a copy of AllyDir when <b>Copy Commlink Data</b> command is executed.

<b>CopyDist</b>	Holds a copy of AllyDist when <b>Copy CommLink Data</b> command is executed.
<b>CopyEnemyDir</b>	Holds a copy of AllyEnemyDir when <b>Copy CommLink Data</b> command is executed.
<b>CopyEnemyDist</b>	Holds a copy of AllyEnemyDist when <b>Copy CommLink Data</b> command is executed.
<b>CopyEnemyX</b>	Holds a copy of AllyEnemyX when <b>Copy CommLink Data</b> command is executed.
<b>CopyEnemyY</b>	Holds a copy of AllyEnemyY when Copy <b>CommLink Data</b> command is executed.
<b>CopyNum</b>	Holds a copy of AllyNum when <b>Copy CommLink Data</b> command is executed.
<b>CopyX</b>	Holds a copy of AllyX when <b>Copy CommLink Data</b> command is executed.
<b>CopyY</b>	Holds a copy of AllyY when Copy <b>CommLink Data</b> command is executed.
<b>EnemyDist</b>	The distance between your cybertank and the last scanned enemy cybertank.
<b>EnemyHQDist</b>	This is the distance between your cybertank and the enemy headquarters -- unknown to your cybertank until either found by scanning or transmitted by a team member.
<b>EnemyHQX</b>	The X coordinate of the enemy headquarters -- unknown to your cybertank until either found by scanning or transmitted by a team member.

<b>EnemyHQY</b>	The Y coordinate of the enemy headquarters -- unknown to your cybertank until either found by scanning or transmitted by a team member.
<b>EnemyX</b>	The enemy cybertank's X coordinate at last scanned position.
<b>EnemyY</b>	The enemy cybertank's Y coordinate at last scanned position.
<b>FuelLevel</b>	Amount of remaining fuel. This value ranges from 0 (empty) to 100 (full).
<b>IntDamage</b>	Current damage percentage of your cybertank's internal mechanisms. Ranges from 0 (fully intact) to 100 (destroyed). When this value reaches 100, the cybertank is terminated.
<b>KitsLeft</b>	The number of repair kits remaining.
<b>ObjDist</b>	The distance between your cybertank and the last scanned object.
<b>ObjType</b>	The type of object last scanned (see Appendix 3 for list of possible values).
<b>ObjX</b>	X coordinate of the last scanned <b>object</b> . This value ranges from 1 to 62.
<b>ObjY</b>	Y coordinate of the last scanned object. This value ranges from 1 to 62.
<b>ObstacleDist</b>	The distance between your cybertank and the last movement obstacle detected. This value ranges from 0 to 3.
<b>ObstacleType</b>	The type of movement obstacle last detected (see Appendix 3 for list of possible values).

ObstacleX	X coordinate of the last detected movement obstacle. This value ranges from 1 to 62.
ObstacleY	Y coordinate of the last detected movement obstacle. This value ranges from 1 to 62.
RandomNum	Holds the random value generated by the <i>Get Random [to #]</i> command.
RemotesLeft	The number of remaining remote scanners.
ScanDamage	Current damage percentage of your cybertank's scanner. Ranges from 0 (fully intact) to 100 (destroyed). If cybertank is still operational with a destroyed scanner, but it cannot scan.
ScanDir	The direction the scanner is currently facing. This value ranges from 0 to 7.
TankDir	The direction your cybertank is currently facing. This value ranges from 0 to 7.
TankNum	This is the number of your cybertank. Cybertank numbers are based on the order they were selected in the SOM.
TankX	Your cybertank's current X coordinate.
TankY	Your cybertank's current Y coordinate.
TreadDamage	Current damage percentage of your cybertank's treads. This value ranges from 0 (fully intact) to 100 (destroyed). The cybertank still operates with destroyed treads, but it cannot move.
XYDist	This holds the distance between your cybertank and the specified coordinate as calculated by the command <i>Get Distance to "X" "Y"</i> .

WeapDamage	Current damage percentage of your cybertank's weapon. This value ranges from 0 (fully intact) to 100 (destroyed). The cybertank is still operational with a destroyed weapon, but it cannot fire.
------------	---

## APPENDIX 3 OBJECT TYPES

The following list should be used as an aid in incorporating a System variable that reports an 'object's type.'

<u>TYPE NUMBER</u>	<u>DESCRIPTION</u>
00	No object
01	Roads, grass, etc...
02	Water
03	Damaged cybertanks, squashed trees
04	Trees
05	Houses, HQ
06	Buildings, barriers
Greater than 6	Cybertanks

Object types 3-5 are destructible while object type 6 (buildings, barriers) is indestructible.

Object types 2-6 are detectable by the MOS. Cybertanks are also detectable by the MOS as objects with types greater than 6.

Object types 3-6 can be detected with the CCS. Cybertanks are also detectable by the CCS as objects with types greater than 6.

Object types 4-6 block a scanner's line of sight when scanning for cybertanks and other objects.

## APPENDIX 4 QUICK SYNTAX GUIDE

For complete information on the commands, please see Part 3 of this handbook.

### Tank Movement

```

MOVE [TANK] FORWARD "#"
MOVE [TANK] BACKWARD "#"
TURN [TANK] LEFT "#"
TURN [TANK] RIGHT "#"
TURN [TANK] TO "ANGLE"
TURN [TANK] TO "X" "Y"
TURN [TANK] TO FACE [ENEMY] [TANK]
TURN [TANK] TO FACE ENEMY HQ
ALIGN TANK [WITH SCANNER]
IF TANK [IS] ALIGNED WITH [SCANNER] THEN [BRANCH TO : DO]
"LABEL"
IF TANK [IS] NOT ALIGNED [WITH SCANNER] THEN [BRANCH TO :
DO] "LABEL"
IF MOVEMENT [IS] OBSTRUCTED THEN [BRANCH TO : DO] "LABEL"
IF [MOVEMENT IS] NOT OBSTRUCTED THEN [BRANCH TO : DO]
"LABEL"
IF OBSTRUCTION [IS] ENEMY HQ THEN [BRANCH TO : DO] "LABEL"
IF OBSTRUCTION [IS] ALLY HQ THEN [BRANCH TO : DO] "LABEL"
IF TANK [IS] FACING [ENEMY] TANK THEN [BRANCH TO : DO]
"LABEL"
IF TANK [IS] NOT FACING [ENEMY] TANK THEN [BRANCH TO : DO]
"LABEL"
IF TANK [IS] FACING ENEMY HQ THEN [BRANCH TO : DO] "LABEL"
IF TANK [IS] NOT FACING ENEMY HQ THEN [BRANCH TO : DO]
"LABEL"
IF TANK [IS] FACING "X" "Y" THEN LABEL
IF TANK [IS] NOT FACING "X" "Y" THEN LABEL
DETECT [OBSTRUCTION] AT "#"
DETECT [OBSTRUCTION] AT TANK DIRECTION
DETECT [OBSTRUCTION] AT SCANNER DIRECTION
IF [TANK] TREADS [ARE] FUNCTIONAL THEN [BRANCH TO : DO]
"LABEL"
IF [TANK] TREADS [ARE] NOT FUNCTIONAL THEN [BRANCH TO : DO]
"LABEL"

```

USING THE SCANNER

ROTATE [SCANNER] LEFT "#"  
 ROTATE [SCANNER] RIGHT "#"  
 ROTATE [SCANNER] TO "ANGLE"  
 ROTATE [SCANNER] TO "X" "Y"  
 ROTATE [SCANNER] TO FACE [ENEMY] TANK  
 ALIGN SCANNER [WITH TANK]  
 SCAN FOR [ENEMY] TANK  
 SCAN FOR [CLOSEST] OBJECT  
 SCAN FOR ENEMY HQ  
 LOCK SCANNER  
 UNLOCK SCANNER  
 JAM [SCANNER SIGNAL]  
 LAUNCH [REMOTE SCANNER]  
 IF SCANNER [IS] FUNCTIONAL THEN [BRANCH TO : DO] "LABEL"  
 IF SCANNER [IS] NOT FUNCTIONAL THEN [BRANCH TO : DO] "LABEL"  
 IF SCANNER [IS] ALIGNED [WITH TANK] THEN [BRANCH TO : DO]  
 "LABEL"  
 IF SCANNER [IS] NOT ALIGNED [WITH TANK] THEN [BRANCH TO :  
 DO] "LABEL"  
 IF [ENEMY] TANK [WAS] FOUND THEN LABEL  
 IF [ENEMY] TANK [WAS] NOT FOUND THEN LABEL  
 IF [CLOSEST] OBJECT [WAS] FOUND THEN [BRANCH TO : DO]  
 "LABEL"  
 IF [CLOSEST] OBJECT [WAS] NOT FOUND THEN [BRANCH TO : DO]  
 "LABEL"  
 IF ENEMY HQ [WAS] FOUND THEN [BRANCH TO : DO] "LABEL"  
 IF ENEMY HQ [WAS] NOT FOUND THEN [BRANCH TO : DO] "LABEL"  
 IF [CLOSEST] OBJECT [IS] ENEMY HQ THEN [BRANCH TO : DO]  
 "LABEL"  
 IF [CLOSEST] OBJECT [IS] ALLY HQ THEN [BRANCH TO : DO]  
 "LABEL"  
 IF [SCANNER IS] LOCKED THEN LABEL  
 IF [SCANNER IS] UNLOCKED THEN LABEL  
 IF [TANK IS] BEING SCANNED THEN [BRANCH TO : DO] "LABEL"  
 IF [TANK IS] NOT BEING SCANNED THEN [BRANCH TO : DO] "LABEL"  
 IF REMOTE [SCANNER IS] AVAILABLE THEN [BRANCH TO : DO]  
 "LABEL"  
 IF REMOTE [SCANNER IS] UNAVAILABLE THEN [BRANCH TO : DO]  
 "LABEL"

USING THE WEAPON

FIRE WEAPON] AT [ENEMY] TANK  
 FIRE [WEAPON] AT [CLOSEST] OBJECT  
 FIRE [WEAPON] AT OBSTRUCTION  
 FIRE [WEAPON] AT "X" "Y"  
 FIRE WEAPON] AT TANK DIRECTION  
 FIRE [WEAPON] AT SCANNER DIRECTION  
 FIRE [WEAPON] AT ENEMY HQ  
 IF WEAPON [IS] FUNCTIONAL THEN [BRANCH TO : DO] "LABEL"  
 IF WEAPON [IS] NOT FUNCTIONAL THEN [BRANCH TO : DO] "LABEL"  
 IF [ENEMY] TANK [IS] WITHIN [WEAPON] RANGE THEN [BRANCH TO :  
 DO] "LABEL"  
 IF [ENEMY] TANK [IS] BEYOND [WEAPON] RANGE THEN [BRANCH TO :  
 DO] "LABEL"  
 IF [CLOSEST] OBJECT [IS] WITHIN [WEAPON] RANGE THEN  
 [BRANCH TO : DO] "LABEL"  
 IF [CLOSEST] OBJECT [IS] BEYOND [WEAPON] RANGE THEN  
 [BRANCH TO : DO] "LABEL"  
 IF ENEMY HQ [IS] WITHIN WEAPON] RANGE THEN [BRANCH TO : DO]  
 "LABEL"  
 IF ENEMY HQ [IS] BEYOND [WEAPON] RANGE THEN [BRANCH TO : DO]  
 "LABEL"

TANK STATUS

IF FUEL [IS] REMAINING THEN [BRANCH TO : DO] "LABEL"  
 IF FUEL [IS] EMPTY THEN [BRANCH TO : DO] "LABEL"  
 SELF DESTRUCT

DEFENSE SHIELD

RAISE [SHIELD]  
 LOWER [SHIELD]  
 IF ~~SHIELD~~ [IS] UP THEN [BRANCH TO : DO] "LABEL"  
 IF SHIELD [IS] DOWN THEN [BRANCH TO : DO] "LABEL"

TANK REPAIRS

REPAIR INTERNAL  
 REPAIR ARMOR  
 REPAIR TREADS  
 REPAIR SCANNER  
 REPAIR WEAPON  
 IF [REPAIR] KIT [IS] AVAILABLE THEN [BRANCH TO : DO] "LABEL"  
 IF [REPAIR] KIT [IS] UNAVAILABLE THEN [BRANCH TO : DO]  
 "LABEL"

USING THE COMMLINK

TRANSMIT [CODE] “#” TO TEAM]  
 CLEAR [COMMLINK] DATA  
 COPY [COMMLINK] DATA  
 SWITCH [COMMLINK] ON  
 SWITCH [COMMLINK] OFF  
 IF ALLY TANK “#” [IS] ACTIVE THEN [BRANCH TO : DO] “LABEL”  
 IF ALLY TANK “#” [IS] INACTIVE THEN [BRANCH TO : DO] “LABEL”

MISCELLANEOUS COMMANDS

GET DISTANCE [TO] “X” “Y”  
 GET RANDOM [TO “#”]  
 BEEP  
 BREAK

ATTAINING MANUAL CONTROL

IF [LAST] KEY [PRESSED] THEN [BRANCH TO : DO] “LABEL”  
 IF [LAST] KEY [PRESSED] = “1 CHARACTER” THEN [BRANCH TO :  
 DC] “LABEL”

SYSTEM COMMANDS

BRANCH TO “LABEL”  
 GOTO “LABEL”  
 DO “LABEL”  
 GOSUB “LABEL”  
 RESUME

USING LIBRARY

INCLUDE ‘CAPSULE FILENAME”

## APPENDIX 5 AUTHORIZATION ERRORS

The following lists all the possible errors that may occur during the Authorization process in the Cybertank Authorization Module (CRM).

**DUPLICATE LABEL FOUND**

This error occurs when the same label has been used twice in the AI. For a complete discussion of labels, see Part 1, Section 6.4 of this handbook.

**FATAL ERROR: MAXIMUM NUMBER OF LABELS EXCEEDED**

This error occurs when you exceed the memory allocated for label names. To remedy, try using fewer labels or shorter label names. For example, instead of using the label "SHOOTTANK", try using something like 'SHOOT'.

**UNKNOWN COMMAND**

This error occurs when an unrecognizable command is included in the AI. This normally occurs because of a misspelled or missing word.

**USER VARIABLES EXCEEDED**

This error occurs if you attempt to use more than 32 User Variables. The only way to correct this error is to cut down on the number of User Variables. For a complete discussion of User Variables, see Part 1, Section 6 of this manual.

**OOPS NOT COMPUTE IN THE LINE**

This error occurs when an instruction in the AI is incomplete. For example, the instruction "SCAN FOR FRIENDLY TANK" is almost a valid instruction, but not quite since it is not complete.

**VALUE USED IS OUT OF RANGE IN FOLLOWING LINE:**

This error occurs when a value in an instruction is not within the allowable range. For example, in the instruction "TURN TANK TO 9", the 9 is an illegal value because you can only turn Your tank to values 0-7.



**THE LABEL . . . WAS NOT FOUND IN THE FOLLOWING LINE:**

This error occurs when an instruction attempts to reference a label which does not exist.

**THE FOLLOWING LINE IS RN ILLEGAL LABEL:**

When this error occurs, it signifies that a line in the AI, positioned in the left margin, is not a valid label. This is often caused by incorrect spacing or indentation.

**THE FOLLOWING LABEL IS TOO LONG:**

This error occurs when a label of more than 10 characters is encountered. Shorten the length of the label.

**THE FOLLOWING CAPSULE WAS NOT FOUND:**

This error occurs when attempting to INCLUDE a Capsule routine and the Capsule was not found. To remedy this error, simply insert the Disc which contains the Capsule routine into any access slot.

**IF YOU INCLUDE A CAPSULE. THRT CAPSULE CANNOT INCLUDE ANOTHER**

This error occurs when you INCLUDE a Capsule routine and that Capsule attempts to INCLUDE another. To remedy, you must remove all INCLUDE statements from any Capsules you wish to INCLUDE.

**YOUR TANK MUST BE GIVEN INTELLIGENCE BEFORE IT CBN BE AUTHORIZED**

This error occurs if your cybertank has no AI.

**YOU ARE MISSING ONE OR MORE ITEMS FROM YOUR TANK'S CHASSIS**

This error occurs if you have forgotten to install a needed component on your cybertank. For example, a cybertank cannot be Authorized if it has no scanner system. To solve, return to the Chassis Design Module (CDM) and obtain all necessary components.

**THE COST OF YOUR TANK'S CHASSIS EXCEEDS YOUR AVAILABLE BUDGET**

This error occurs when you attempt to Authorize a cybertank designed by someone with a higher clearance level, and the equipment on their cybertank exceeds the budget limitations of your clearance level.

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