

# **WOMBAT-CS**

Version 6

## **Candidate's Manual**

Electronic Edition

Aero Innovation inc.  
[www.aero.ca](http://www.aero.ca)

# **Familiarization with**

## **WOMBAT-CS**

### **Candidate's Manual**

This manual should be  
read attentively by the candidate  
before commencing the practice period  
that precedes WOMBAT-CS.

**For software version CS**

#### **IMPORTANT NOTICE:**

The use of this booklet and any other WOMBAT material must be authorized in writing by Aero Innovation's Headquarters. Unauthorized reproduction of any kind, for advertisement, scientific articles, journals, brochures, newspapers, magazines, internal documents, company manuals, printed, electronic or photographic, whether the sources are mentioned or not, will be considered a breach of copyright and prosecuted accordingly.

Edition 23, 2011  
© Copyright Aero Innovation Inc. 1991-2011  
**All rights reserved**

# Table of Contents

Foreword .....	4
Candidate Identification .....	5
Instructions Period.....	6
WOMBAT Console .....	7
Right Trigger .....	8
The Overall WOMBAT-CS Test .....	9
The Tracking Task .....	10
Using the Left-Hand Stick.....	11
Velocity control .....	11
Acceleration control .....	11
Using the Right-Hand Stick .....	13
Combined Tracking-Task Performance .....	14
WOMBAT's Autotrack Mode .....	15
Tracking Worth .....	17
The Bonus Pouch.....	18
Figure-Rotation Task .....	19
Quadrant-Location Task .....	20
Digit-Canceling Task.....	21
The Bonus Pouch Menu .....	22
Worth and Performance: A Winning Combination .....	23
Ready for the Instructions?.....	24

WOMBAT-CS is a computerized test that measures your ability to manage a complex system (CS) by presenting you situations and evaluating how you react to those situations.

Before you take the test, you will get to sit down at the WOMBAT computer and learn without any scoring how each of the different parts of the computer and the test will work together as a complex system.



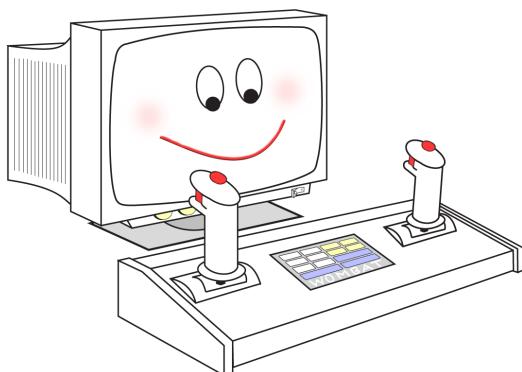
This manual is your introduction to the complete instructions that will precede the WOMBAT-CS test. It does not replace those pretest instructions. Its purpose is to familiarize you with the basic vocabulary, the structure, and the control operations before you sit down at the WOMBAT computer and begin those instructions.

If you ever need more explanation about WOMBAT, be sure to ask your supervisor **before the test begins**.

# Candidate Identification

The first thing WOMBAT will ask you to do is to enter your reference number.

Your supervisor will guide you in these steps, giving you the reference number and other information you have to provide. WOMBAT needs this information because it keeps track of everyone who has taken the test before. Your supervisor will also be able to retrieve your score from WOMBAT's database for further evaluating.



The WOMBAT console and display.

## Instructions Period

After identifying yourself to WOMBAT, you will go through some instruction pages that are reviews of what you will read in this manual. You will alternate between instruction pages and practice sessions. Each practice session will cover one aspect of WOMBAT at a time.

No scores will be recorded during the instructions period. Only in the test will all the different tasks be simultaneously available and scored.

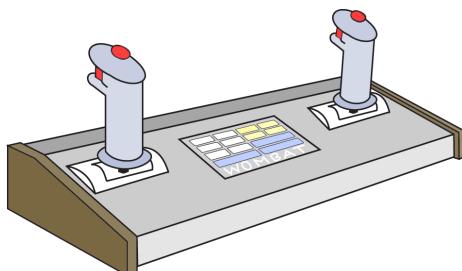


Your test administrator will tell you about the maximum time allowed for the instructions period. On the last page of instructions, you will see a clock showing how much time you have left before the test begins. As long as there is some time remaining, you can go back to any instructions page you wish to review. Once the instructions period is over, you will be committed to go through the complete test. You will not be able to go back to the instructions during the test, so you should use the time allowed in the exercise/instruction phases wisely.

If you need to use the washroom, make sure you come back **before** the instructions period is over, otherwise the test will begin without you. Once started, the test cannot be stopped.

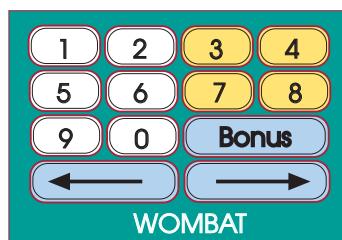
# WOMBAT Console

The WOMBAT console includes two joysticks and a special keypad.



The WOMBAT console

The keypad is very sensitive. To indicate it has received a signal from the candidate, the computer will produce a sound ("click") each time a button is depressed on the console, and again when the button is released. On the WOMBAT's display, each functional button will be indicated by its legend within a colored rectangular box.



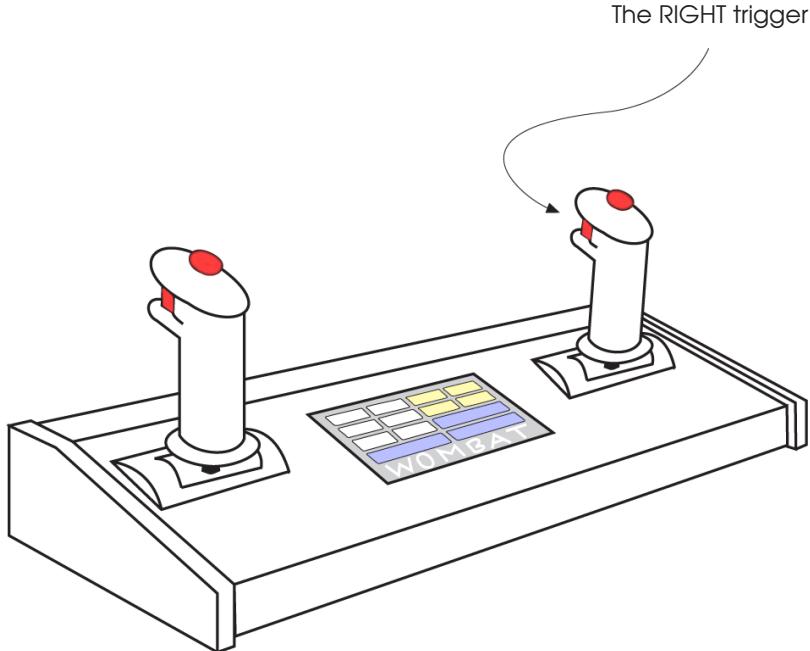
The WOMBAT keypad

## WOMBAT Console: Right Trigger

On the WOMBAT console, each joystick includes a spring-loaded red trigger switch. Only the **RIGHT** trigger switch is used in WOMBAT. Its function is indicated on the graphics display screen by the word Trigger surrounded by a rectangle. You will learn the function of the Trigger and when to use it later.

### Trigger

In the practice sessions, you will be given opportunities to use each of the control devices by itself to control part of the WOMBAT test.



# The Overall WOMBAT-CS Test

The WOMBAT test measures your ability to recognize situations and react to them (your situational awareness) as you manage a complex system. The more situational awareness you have and use, the more points you can score.

The complex system you will have to manage has four different tasks (the Tracking Task and three Bonus Tasks: Figure Rotation, Quadrant Location, and Digit Canceling) that contribute to the total score. Your performance will be measured on each of these tasks: the better your performance the more points you can earn from that task. In addition, each task has a value (or "worth"), which changes during the test: the higher the worth the more points you can earn from that task with the same performance. Throughout the test, watch the indicators that tell you the present worth of each task.

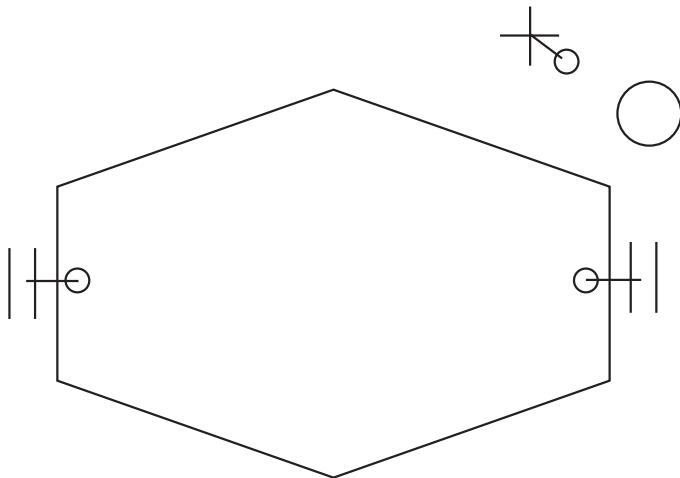
Earning many points requires good performance on each of the tasks and good choices about which task to perform at any given time, because those choices can have effects (good or bad) on the worths of tasks to come. **This is the secret of the test.**

The first task you will learn about is the Tracking Task. Later, you will learn about the three Bonus Tasks.

# The Tracking Task

The Tracking Task is the primary task for the entire WOMBAT test in the sense that it must be monitored at all times and attended to frequently. In this task, you will use both control sticks to move yellow cursors on the WOMBAT screen and attempt to follow moving blue targets in two different modes.

The figure below represents the Tracking Task. The following pages will describe each function you have to perform.



The illustration above represents the Tracking Task as it appears on the WOMBAT display. The left-hand Tracking Task deals with an expanding/contracting hexagon and two bar pairs with their associated predictor circles. The right-hand Tracking Task deals with a moving circle and across with its associated predictor circle. You will perform the Tracking Task with both hands after having learned each hand's function separately.

# Using the Left-Hand Stick

The left stick controls the left/right separation of two pairs of short vertical lines (as shown below) in two different modes: **velocity control** and **acceleration control**.



There is a small circle that is shifted away from the center of each pair of vertical lines by a distance that is proportional to and in the direction of the stick displacement (shown above for left stick pushed forward.) Each small circle is connected by a line to the center of the pair of vertical lines.

## Velocity control

In **velocity control**, the vertical lines are stationary until the stick is moved. Pushing the stick forward from spring center makes the two pairs of lines move away from the display center, and the farther the stick is pushed, the faster the movement is. Pulling the stick backward from spring center reverses the direction of motion, causing the pairs of lines to move inward.

## Acceleration control

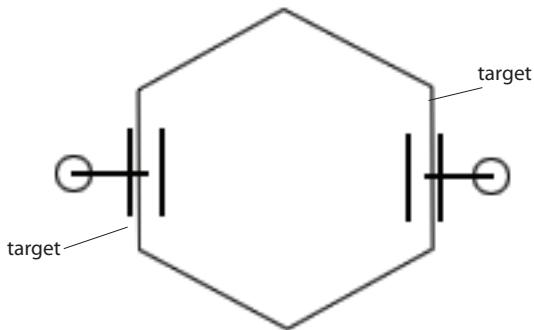
In **acceleration control**, the stick determines the rate at which the velocity changes. At spring center, the velocity remains fixed, so the pairs of lines move toward or away from the display center at a steady rate.

## Using the Left-Hand Stick (continued)

Pushing the stick forward from spring center causes the velocity away from display center to increase (or velocity toward the display center to decrease), while pulling the stick the other way causes the velocity away from the display center to decrease (or velocity toward the display center to increase). The farther the stick is displaced from spring center, the faster the velocity changes.

Whether in **velocity control** or **acceleration control**, the task is to keep the two pairs of vertical bars over the two vertical sides of a hexagon that expands and contracts in size around the center of the display. By keeping the bar pairs (the cursors) over the left and right sides of the hexagon (the targets), you will maximize your left-hand tracking score. When the targets are outside the bar pairs, the rate of scoring will drop with increasing tracking error to a minimum of zero.

There will be practice sessions of the left-hand tracking where the left stick will be in **velocity-control mode** and others with it in **acceleration-control mode**, with and without the targets.



The illustration above represents the blue expanding/contracting hexagon in the center and the two yellow bar pairs you will control with the console's left stick. The two small predictor circles show the left stick being pushed forward. This action will make the bar pairs move away (if in velocity-control mode) or accelerate away (if in acceleration-control mode) from the center of the display, in the direction of the predictor circles.

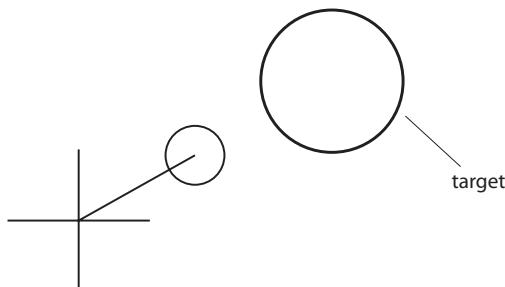
## Using the Right-Hand Stick

The right-hand stick controls the position of a small cross on the screen using the same modes (velocity or acceleration) as the left-hand stick. Both sticks will always be in the same control mode at any given time. Left and right movement of the right stick controls left and right position of the cross, and forward and backward movement controls the up and down position.

There is a small circle that is shifted away from the center of the cross by an amount proportional to and in the direction of the stick displacement (shown below for right stick pushed forward and to the right). A line connects the center of the circle to the center of the cross.

Your right-hand tracking task is to maintain the position of the cross within the boundaries of the same size target circle. This will produce the maximum right-stick Tracking-Performance score. The score will decline to 0 as the error between the cross and the target edge increases.

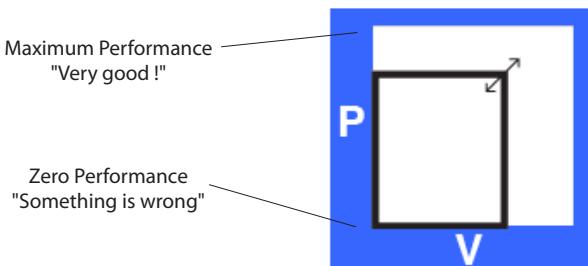
There will be a practice sessions of the right-hand tracking where the right stick will be in **velocity-control** mode and others with it in **acceleration-control** mode, with and without the target.



The illustration above represents the yellow cross you will control with the console's right stick. The small predictor circle (connected by a line to the center of the cross) indicates that the right stick is pushed forward and to the right. This action will help move the cross toward the moving blue target circle, reducing the tracking error. The goal is to keep the center of the cross within the boundaries of the moving target circle.

# Combined Tracking-Task Performance

When the left and right tracking tasks are performed together, the combined score is displayed on the Tracking Worth-Performance Indicator. This indicator will always be visible in the upper-left corner of the display. It is scaled from "Zero Performance" at the bottom to "Maximum Performance" at the top.



The illustration above shows the Tracking Worth-Performance Indicator always visible in the upper-left corner of the WOMBAT display. Right now it is showing a less than perfect Tracking Performance (P) at reduced Tracking Worth (W). The Tracking Performance depends on the distance (or "error") that separates the two bar pairs from the vertical sides of the hexagon or the center of the cross from the target circle. The Tracking Worth will be explained on Page 17 of this manual.

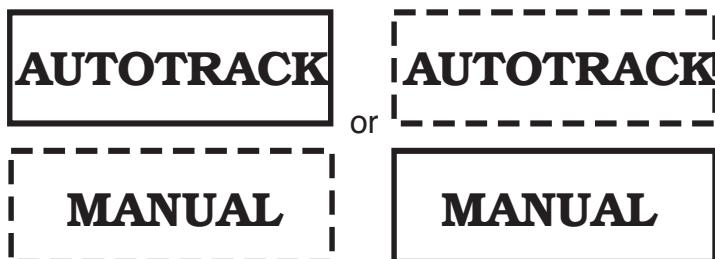
**Your primary task in the WOMBAT test will be to track the left and right targets as well as you can and thus achieve the highest combined tracking score that you can.**

When the tracking is perfect, the Tracking Performance will be at its highest. When the tracking is less than perfect, the Tracking Performance will decrease in proportion to the distance between the blue targets and the yellow cursors you are controlling. Remember that the higher your performance is, the more points you will accumulate. Good tracking techniques are therefore essential for maximum Tracking Performance.

There will be a practice session where you will see the two bar pairs, the variable hexagon, the cursor cross, the target circle, and the performance indicator, and the sticks will be in **velocity-control** mode, followed by a similar session in **acceleration-control** mode.

## WOMBAT's Autotrack Mode

An automatic tracking mode called "Autotrack" is available for you to delegate the Tracking Task to the computer. It will be engaged or disengaged with the trigger on the right-hand control. The active mode will be indicated by solid lines around one of the display legends, MANUAL or AUTOTRACK, and dashed lines around the other.



To engage the Autotrack mode, you must first track the targets with the left and right control sticks within the indicated error limits to produce the maximum Tracking-Performance score and then pull the trigger. When either the vertical lines (left-stick targets) are not between the pairs of bars (left-stick cursors) or the cross (right-stick cursor) is not within the circle (right-stick target), pulling the trigger in the manual mode will have no effect.

In the Autotrack mode, the sticks become inactive and the stick-position indicators return to the spring-center locations. Pulling the trigger on the right stick will immediately disengage the Autotrack mode and return the sticks to the active state.

You will have two practice sessions for engaging and disengaging WOMBAT's Autotrack mode in velocity-control and acceleration-control mode.

## WOMBAT's Autotrack Mode (continued)

To complicate the WOMBAT Complex System test, the Autotrack mode has been designed to fail frequently and these failures can be detected at any time by keeping an eye on the Tracking Performance indicator. When Autotrack mode fails, it does not disengage, it continues in Autotrack mode with its ability to track the target motions decreased.

To restore the Autotrack mode function, you must first disengage the failed Autotrack mode with the right-stick trigger and track manually. For some period of time following Autotrack mode failure, the Autotrack mode is under repair and unavailable. This state is indicated by the trigger symbol filled in RED on the display.



# Trigger

The "Trigger" box is filled with RED

Even if you manually track to achieve a perfect Tracking-Performance score and pull the trigger while this symbol is displayed, the Autotrack mode will not engage.

You will have practice sessions in velocity-control and acceleration-control that will begin with the Autotrack mode active and engaged. It will soon fail so you can practice disengaging the Autotrack mode, tracking manually, and then re-engaging it when it becomes available again.

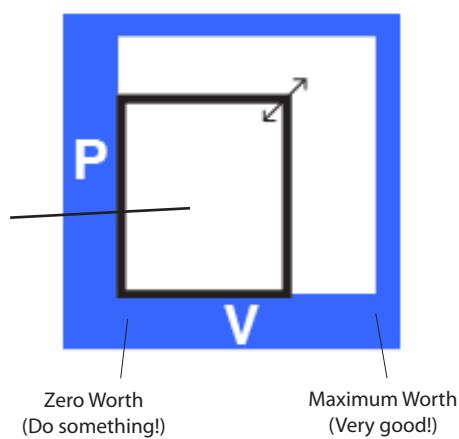
# Tracking Worth

As was stated on Page 9, each task in the WOMBAT test has its own worth, which changes many times during the test. The secret of taking the WOMBAT test is making choices that lead to high worths for each of the tasks and that score many points when a task is performed well.

The Tracking Worth is influenced by the Tracking mode (velocity or acceleration), your performance in detecting and managing Autotrack failures, and when you last executed a Bonus Task.

During an Autotrack failure, if you allow Tracking Performance to drop below a certain level, a penalty will be applied in the form of a reduction in the Tracking Worth. However, if you keep the Tracking Performance above another, higher level, the Tracking Worth may actually be increased. **If you never play Bonus Tasks, but track targets all the time, the Tracking Worth will decline slowly until it reaches zero.** Each time you complete a Bonus Task, the Tracking Worth will be reset to its full value for the current Tracking mode and penalty situation.

NOTE: The area of this rectangle represents your current scoring rate. The greater the area, the greater the number of points being earned.

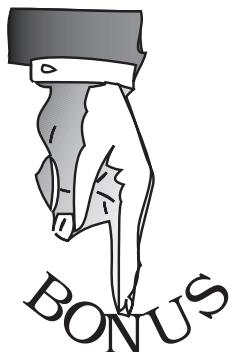


The illustration above shows the Tracking Worth-Performance indicator always visible in the upper left corner of the WOMBAT display. The letter "W" indicates the Tracking Worth for the current Tracking mode and penalty situation. You can influence the Tracking Worth by frequently playing Bonus Tasks and managing well the Autotrack failures. Keep an eye on this indicator.

## The Bonus Pouch

The designers of WOMBAT expect that each of you should achieve a high tracking score and manage the Autotrack mode so easily that everyone would earn about the same score based on the Tracking Task alone.

So, to distinguish those with higher and lower situational awareness, three additional tasks, called **Figure Rotation**, **Quadrant Location**, and **Digit Canceling**, are available for you to earn "Bonus points" in 60-second trials.



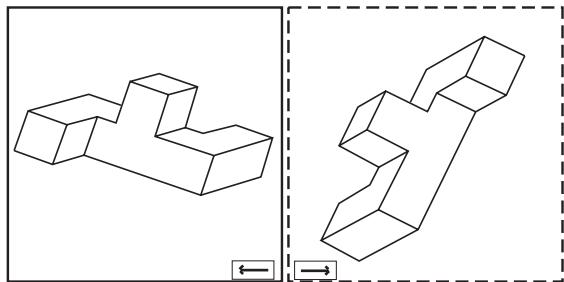
When the tracking task is under AUTOTRACK's control and you wish to earn some bonus points, press the **Bonus** button on the keypad. This will switch you to the Bonus Pouch and remove the Tracking Task from the screen. Only the Tracking Worth-Performance Indicator will remain so that you can continue to monitor that task. Pressing the **Bonus** button again at any time will suspend the Bonus Task for later resumption and return WOMBAT to the Tracking Task.

You will be given practice periods that start with the Tracking Task where you can press the Bonus button to switch to the Bonus Pouch to practice each of the three Bonus Tasks.

## The Bonus Pouch, Figure-Rotation Task

This bonus task will display two 3-D figures side-by-side. One figure will be inside a solid square and the other figure will be inside a dashed square. The solid square means that you can rotate the figure using the two sticks; it is the **active figure**. The dashed square means this figure is **standing by** and can be **made active by pressing the corresponding arrow on the console**.

Using both sticks, you can rotate the active figure until you know all the details of its construction. Press the appropriate arrow to make the other figure active, so you can rotate it also.



This task will display two 3-D figures. You can rotate each figure, one at a time, using the joy sticks.

The goal of this exercise is to find out, as fast as you can, whether the two figures are:

- identical,
- mirror symmetric (mirror images of each other), or
- different in some obvious way.

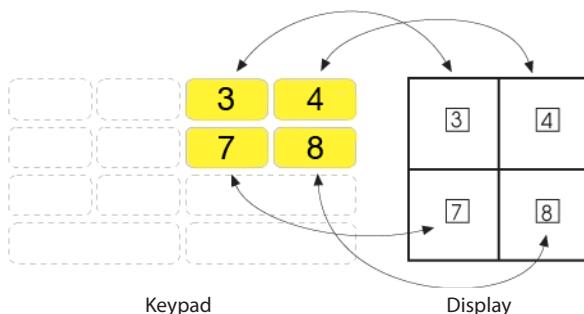
You earn points by giving the computer the correct answer. As soon as you answer, the Performance and Worth are fixed and scoring takes place until the end of the 60 seconds. If you haven't answered, the Worth starts decreasing 15 seconds after the start of the problem, so don't waste any time!

If your answer is correct, you may press the **4** button on the console keypad and continue with a new 3-D problem while you still have some time left. Try to solve as many 3-D problems as you can during the 60 seconds to earn more points. If your answer is incorrect, you can use the rest of the 60 seconds to find out why your answer was wrong.

## The Bonus Pouch, Quadrant-Location Task

This Bonus task displays four quadrants. As shown in the illustration below, each quadrant is identified by a number corresponding to a button on the keypad. The **3** button corresponds to the upper-left quadrant, the **4** button to the upper-right quadrant, the **7** button to the lower-left quadrant, and the **8** button to the lower-right quadrant.

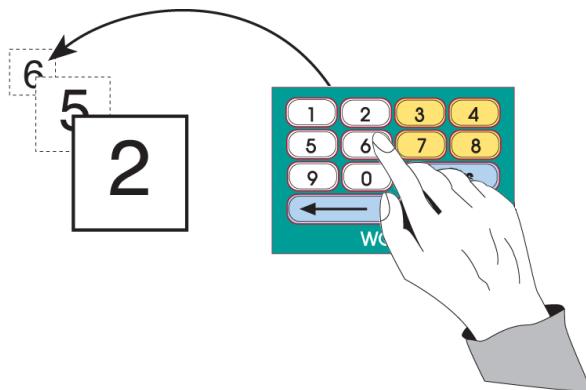
Consecutive numbers from 1 to 32 are placed 8 each and visible in the four quadrants on the display. The task is to find each number in **ascending order** beginning with 1 and press the button on the keypad that corresponds to the quadrant in which it lies, thereby canceling the numbers in sequence, 1 through 32.



Your score increases for each correct quadrant button pressed and decreases for each incorrect button. You must press the correct quadrant button for each number before going on to the next.

If all 32 numbers are found and correctly located within the 60 seconds allotted, then the rate of scoring continues for the remaining time. If you make few errors, you will be offered the chance to press the **4** button on the keypad to play another sequence and earn even more points during the time remaining.

## The Bonus Pouch, Digit-Canceling Task



In this task, single digits (1 to 8) will be displayed briefly at set time intervals in the square at the center of the display. Starting with the third digit displayed, as soon as each new digit appears, you should press the button on the keypad matching the digit displayed two back in the sequence.

For example, in the figure above, the digit "2" has just been shown on the WOMBAT display, so the candidate is about to cancel the "two-back" digit "6". Once this action has been completed, another digit will be shown on the display, and then the candidate should cancel digit "5" which is next in sequence. **You must press a digit button, correct or incorrect, or you will not see the next digit in the sequence.**

The interval between the digits is constant throughout the 60 seconds. Each time you start a new Digit-Canceling task, the interval is adjusted according to how fast and how accurate you were during your last attempt at the task. The better you were, the shorter the interval will become and the higher the Bonus-Task Worth will be made.

You will win points for each correct response and lose points for each incorrect response or delay in making a response.

# Bonus: The Bonus Pouch Menu

When the WOMBAT test is in the Tracking Task with no suspended Bonus Task, pressing the Bonus button on the keypad will display the Bonus-Pouch menu (see figure below). The same menu will also appear each time a Bonus Task ends.

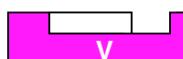
On the menu, each variable Bonus Worth is displayed by a small horizontal indicator similar to the Worth indicators shown on Page 17 of this manual. The longer the horizontal indicator is, the greater the Worth of the respective Bonus Task.

You can choose any Bonus Task regardless of its worth by pressing the keys **1**, **5** or **9** on the WOMBAT keypad. Remember, however, that the higher the Worth, the more points are available for you to earn. After you choose a Bonus Task, its worth will be decreased while the worths of the other Bonus Tasks will be increased. The worths of all Bonus Tasks will be reduced when the Autotrack mode fails, and they increase after you re-engage Autotrack.

## Bonus Pouch Options



Figure  
Rotation



Quadrant  
Location

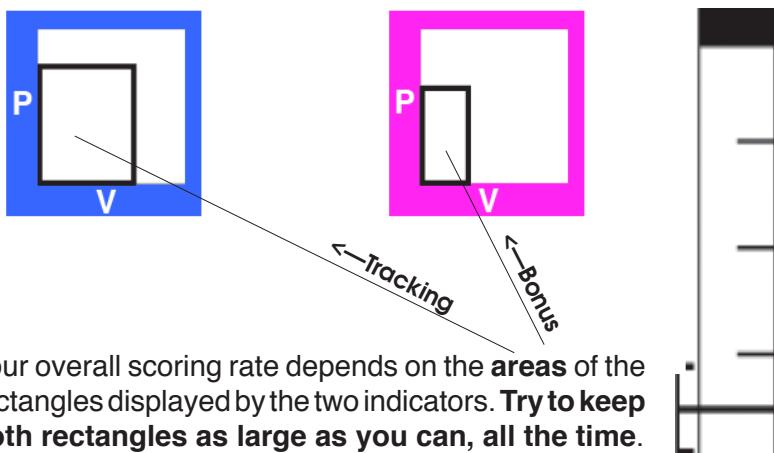


Digit  
Canceling

This represents the Bonus-Pouch menu. In this example, the Figure-Rotation task is worth less than the other tasks. If the candidate selects the Digit-Canceling task by pressing on the 9 key, the Worth of that task will be decreased slightly the next time the Bonus menu appears, while the two other Worths will be increased.

# Worth and Performance: A Winning Combination

The Tracking and Bonus-Pouch Worths are displayed at the top of the display. Each indicator has a **W** at the bottom.



Your overall scoring rate depends on the **areas** of the rectangles displayed by the two indicators. **Try to keep both rectangles as large as you can, all the time.**

The areas of the two rectangles are added and the sum determines how fast the base of the thermometer triangle (which shows your overall score) rises on the scale at right throughout the test.

The "sharpness" or **height of the triangle** shows how fast your overall score is accumulating: a tall triangle means you are doing well, and a short triangle means that something is wrong and you should change strategy.

The "predicted" final score is continually extrapolated from the present overall score, the overall scoring rate, and the time remaining. This extrapolated final score is displayed on the scale as a line that has an **E** (for END) on the left.

**You should attempt to maximize your final score by skillful performance during the WOMBAT test.**

## Ready for the Instructions?

When you have read through this manual up to this page you should be ready to sit down at the WOMBAT computer and begin the instructions period. You will have some idea how the different parts of the WOMBAT console control the WOMBAT-CS test, and you will have been introduced to many of the terms that will be used in the instruction phases. Much of the text in this book will be repeated or restated there, but the practice sessions will give you the chance to actually try the different actions that can only be described in words or shown in static pictures in this manual.

Remember, your overall goal is to come to the end of the test with as many points as possible. To achieve this goal you will have to learn what is going on, remain alert to changing conditions, and exercise good judgment.

Good luck !