Manual Testing Guide - RTS Multi-Agent Training Game

This guide provides structured test case scenarios for manually verifying game functionality. Each test case includes preconditions, steps, and expected results that can be checked off during testing.

Contents

Manual Testing Guide - RTS Multi-Agent Training Game 1

Test Environment Setup 2

1. Game Startup & Initialization 2

2. Camera & Viewport Controls 4

3. Unit Selection & Info Panel 6

4. Unit Movement 9

5. Combat System 12

6. Base Mechanics 16

7. Victory & Defeat Conditions 18

8. AI Integration 19

9. Policy System 21

10. Visual & Debug Features 23

11. Edge Cases & Error Handling 25

Test Execution Summary 27

Tester Information 27

Appendix: Quick Reference 28

Test Environment Setup

Prerequisites:

- Godot 4.4.1+ installed
- Game project loaded in Godot
- For AI tests: Python environment with `ai/.venv/` configured

Starting the Game:

1. Open project in Godot
2. Click "Play" or press F5
    3. Verify console shows: `AiServer listening on 127.0.0.1:5555`

1. Game Startup & Initialization

TC-1.1: Game Launches Successfully

Field	Value
Precondition	Godot project is open
Steps	1. Press F5 or click Play
Expected Result	Game window opens, map renders, units visible
Status	[ ] Pass [ ] Fail

TC-1.2: AI Server Starts

Field	Value
Precondition	Game launched
Steps	1. Check Godot console output
Expected Result	Console shows "AiServer listening on 127.0.0.1:5555"
Status	[ ] Pass [ ] Fail

TC-1.3: Units Spawn Correctly

Field	Value
Precondition	Game launched
Steps	1. Count units on each side 2. Verify unit types present
Expected Result	50 ally units (blue) on left, 50 enemy units (red) on right. Mix of Infantry and Snipers visible.
Status	[ ] Pass [ ] Fail

TC-1.4: Bases Spawn Correctly

Field	Value
Precondition	Game launched
Steps	1. Locate both bases on map
Expected Result	Blue ally base in bottom-left area, red enemy base in top-right area. Both have health bars showing 5000 HP.
Status	[ ] Pass [ ] Fail

TC-1.5: Buildings Spawn Near Bases

Field	Value
Precondition	Game launched
Steps	1. Look for shop and coin house near each base
Expected Result	Each base has a shop (closer) and coin house (farther) with matching team color tint
Status	[ ] Pass [ ] Fail

2. Camera & Viewport Controls

TC-2.1: Camera Pan with Arrow Keys

Field	Value
Precondition	Game running
Steps	1. Press Up arrow 2. Press Down arrow 3. Press Left arrow 4. Press Right arrow
Expected Result	Camera smoothly pans in corresponding direction for each key press
Status	[ ] Pass [ ] Fail

TC-2.2: Zoom In with Mouse Wheel

Field	Value
Precondition	Game running
Steps	1. Scroll mouse wheel up
Expected Result	Camera zooms in smoothly (units appear larger). Minimum zoom: 0.25x
Status	[ ] Pass [ ] Fail

TC-2.3: Zoom Out with Mouse Wheel

Field	Value
Precondition	Game running
Steps	1. Scroll mouse wheel down
Expected Result	Camera zooms out smoothly (more map visible). Maximum zoom: 3.0x
Status	[ ] Pass [ ] Fail

TC-2.4: Zoom Limits Enforced

Field	Value
Precondition	Game running
Steps	1. Scroll wheel up repeatedly (zoom in max) 2. Scroll wheel down repeatedly (zoom out max)
Expected Result	Zoom stops at limits (0.25x min, 3.0x max) and doesn't break visuals
Status	[ ] Pass [ ] Fail

3. Unit Selection & Info Panel

TC-3.1: Single Unit Selection

Field	Value
Precondition	Game running, manual control mode (press M)
Steps	1. Left-click and drag a small box around one ally unit 2. Release mouse button
Expected Result	Unit shows selection highlight (blue box). Info panel appears in bottom-left showing unit stats.
Status	[ ] Pass [ ] Fail

TC-3.2: Multi-Unit Selection

Field	Value
Precondition	Game running
Steps	1. Left-click and drag a large box around multiple ally units 2. Release mouse button
Expected Result	Multiple units highlighted. Info panel shows unit count and aggregated stats (or "-" for mixed types).
Status	[ ] Pass [ ] Fail

TC-3.3: Selection Box Visual

Field	Value
Precondition	Game running
Steps	1. Left-click and hold 2. Drag mouse to create selection area 3. Observe before releasing

Field	Value
Expected Result	Semi-transparent rectangle visible showing selection area while dragging
Status	[ ] Pass [ ] Fail

TC-3.4: Selection Clears on Empty Click

Field	Value
Precondition	One or more units selected
Steps	1. Click on empty area of map
Expected Result	All units deselected, info panel hides
Status	[ ] Pass [ ] Fail

TC-3.5: Info Panel Shows Correct Infantry Stats

Field	Value
Precondition	Game running
Steps	1. Select a single Infantry unit (larger, balanced unit)
Expected Result	Info panel shows: HP=150, Damage=5, Range=80, Speed=150
Status	[ ] Pass [ ] Fail

TC-3.6: Info Panel Shows Correct Sniper Stats

Field	Value
Precondition	Game running
Steps	1. Select a single Sniper unit (smaller, long-range)
Expected Result	Info panel shows: HP=80, Damage=25, Range=150, Speed=80

Field	Value
Status	[ ] Pass [ ] Fail

TC-3.7: Ally Selection Priority

Field	Value
Precondition	Game running, can see both ally and enemy units
Steps	1. Drag selection box that overlaps both ally and enemy units
Expected Result	Only ally (blue) units get selected when both are in selection area
Status	[ ] Pass [ ] Fail

TC-3.8: Enemy Selection When No Allies

Field	Value
Precondition	Game running
Steps	1. Pan camera to area with only enemy units 2. Drag selection around enemy units
Expected Result	Enemy units can be selected and info panel shows their stats
Status	[ ] Pass [ ] Fail

4. Unit Movement

TC-4.1: Enable Manual Control

Field	Value
Precondition	Game running
Steps	1. Press M key
Expected Result	Console shows "Manual control enabled". Ally units stop AI movement.
Status	[ ] Pass [ ] Fail

TC-4.2: Enable AI Control

Field	Value
Precondition	Game running in manual mode
Steps	1. Press N key
Expected Result	Console shows "AI now controls ally units"
Status	[ ] Pass [ ] Fail

TC-4.3: Manual Movement with Right-Click

Field	Value
Precondition	Manual control enabled (M), one unit selected
Steps	1. Hold right-click on a location away from unit 2. Move mouse while holding
Expected Result	Selected unit follows mouse cursor position in real-time
Status	[ ] Pass [ ] Fail

TC-4.4: Movement Stops on Release

Field	Value
Precondition	Unit following mouse cursor
Steps	1. Release right-click
Expected Result	Unit stops moving and stays at current position
Status	[ ] Pass [ ] Fail

TC-4.5: Walk Animation During Movement

Field	Value
Precondition	Unit moving (manual or AI)
Steps	1. Observe unit while it moves
Expected Result	Unit plays walking animation during movement
Status	[ ] Pass [ ] Fail

TC-4.6: Idle Animation When Stopped

Field	Value
Precondition	Unit was moving, now stopped
Steps	1. Observe unit after movement stops
Expected Result	Unit switches to idle animation
Status	[ ] Pass [ ] Fail

TC-4.7: Map Boundary - Left Edge

Field	Value
Precondition	Manual control, unit selected

Field	Value
Steps	1. Move unit toward left edge of map
Expected Result	Unit stops at map boundary, cannot move off-screen
Status	[ ] Pass [ ] Fail

TC-4.8: Map Boundary - All Edges

Field	Value
Precondition	Manual control, unit selected
Steps	1. Move unit to right edge 2. Move unit to top edge 3. Move unit to bottom edge
Expected Result	Unit stops at all map boundaries (2560x1440 px area)
Status	[ ] Pass [ ] Fail

5. Combat System

TC-5.1: Auto-Attack Enemy in Range

Field	Value
Precondition	Manual control mode
Steps	1. Move an ally unit within attack range of an enemy unit 2. Wait briefly
Expected Result	Ally unit automatically attacks enemy, enemy HP decreases
Status	[ ] Pass [ ] Fail

TC-5.2: Attack Animation Plays

Field	Value
Precondition	Unit attacking
Steps	1. Observe attacking unit
Expected Result	Unit plays attack animation during combat
Status	[ ] Pass [ ] Fail

TC-5.3: Health Bar Updates

Field	Value
Precondition	Combat in progress
Steps	1. Observe health bar of unit receiving damage
Expected Result	Health bar visually decreases as unit takes damage
Status	[ ] Pass [ ] Fail

TC-5.4: Unit Death and Removal

Field	Value
Precondition	Unit with low HP
Steps	1. Continue attacking until HP reaches 0
Expected Result	Unit dies and is removed from game. Death may trigger animation/effect.
Status	[ ] Pass [ ] Fail

TC-5.5: Infantry Damage Output

Field	Value
Precondition	Combat between units
Steps	1. Watch Infantry unit attack 2. Verify damage dealt (5 per hit)
Expected Result	Infantry deals 5 damage per attack with 0.2s cooldown (fast attacks)
Status	[ ] Pass [ ] Fail

TC-5.6: Sniper Damage Output

Field	Value
Precondition	Combat between units
Steps	1. Watch Sniper unit attack 2. Verify damage dealt (25 per hit)
Expected Result	Sniper deals 25 damage per attack with 1.0s cooldown (slow but powerful)
Status	[ ] Pass [ ] Fail

TC-5.7: Attack Range Verification - Infantry

Field	Value
Precondition	Infantry unit selected
Steps	1. Position Infantry at exactly 80px from enemy 2. Position Infantry at 90px from enemy
Expected Result	At 80px: attacks. At 90px: does not attack (out of range)
Status	[ ] Pass [ ] Fail

TC-5.8: Attack Range Verification - Sniper

Field	Value
Precondition	Sniper unit selected
Steps	1. Position Sniper at 150px from enemy 2. Position Sniper at 160px from enemy
Expected Result	At 150px: attacks. At 160px: does not attack (out of range)
Status	[ ] Pass [ ] Fail

TC-5.9: No Auto-Chase Enemies

Field	Value
Precondition	AI control disabled, no movement input
Steps	1. Position ally unit outside attack range of nearby enemy 2. Wait 5 seconds
Expected Result	Unit does NOT move toward enemy to attack - only attacks enemies already in range
Status	[ ] Pass [ ] Fail

TC-5.10: Priority Target Selection

Field	Value
Precondition	Multiple enemies in range of one ally unit
Steps	1. Observe which enemy gets attacked
Expected Result	Closest enemy is targeted first
Status	[ ] Pass [ ] Fail

6. Base Mechanics

TC-6.1: Base Health Display

Field	Value
Precondition	Game running
Steps	1. Locate ally base 2. Observe health bar
Expected Result	Base shows health bar with 5000/5000 HP at start
Status	[ ] Pass [ ] Fail

TC-6.2: Base Takes Damage from Units

Field	Value
Precondition	Manual control
Steps	1. Move enemy unit close to ally base (or vice versa) 2. Wait for attacks
Expected Result	Base HP decreases when enemy units attack it
Status	[ ] Pass [ ] Fail

TC-6.3: Base Team Colors

Field	Value
Precondition	Game running
Steps	1. Compare ally and enemy base colors
Expected Result	Ally base has blue tint, enemy base has red tint
Status	[ ] Pass [ ] Fail

TC-6.4: Units Can Attack Base

Field	Value
Precondition	Unit near enemy base
Steps	1. Move ally unit into attack range of enemy base
Expected Result	Unit attacks base when in range, dealing damage
Status	[ ] Pass [ ] Fail

7. Victory & Defeat Conditions

TC-7.1: Victory on Enemy Base Destruction

Field	Value
Precondition	Game running
Steps	1. Destroy enemy base (reduce HP to 0)
Expected Result	Game ends immediately. Victory condition triggered for ally team. Console logs victory.
Status	[ ] Pass [ ] Fail

TC-7.2: Defeat on Ally Base Destruction

Field	Value
Precondition	Game running
Steps	1. Allow enemy to destroy ally base
Expected Result	Game ends immediately. Defeat condition triggered. Console logs defeat.
Status	[ ] Pass [ ] Fail

TC-7.3: Episode Timeout (AI Training)

Field	Value
Precondition	Game running with AI connected
Steps	1. Let game run for 500 AI steps without base destruction
Expected Result	Episode ends at step 500, game resets for new episode
Status	[ ] Pass [ ] Fail

8. AI Integration

TC-8.1: Python Connection Established

Field	Value
Precondition	Game running
Steps	1. Start Python training: `cd ai && .venv/Scripts/python.exe training_server.py`
Expected Result	Godot console shows "client CONNECTED". Python starts receiving observations.
Status	[ ] Pass [ ] Fail

TC-8.2: Units Move Under AI Control

Field	Value
Precondition	Python training connected, AI control enabled (N)
Steps	1. Observe ally units
Expected Result	Units move based on AI actions (not random, purposeful movement toward objectives)
Status	[ ] Pass [ ] Fail

TC-8.3: Episode Reset from Python

Field	Value
Precondition	Python training connected
Steps	1. Wait for episode to end (victory/defeat/timeout) 2. Observe reset
Expected Result	Game resets: all units respawn, bases reset to full HP, new episode begins

Field	Value
Status	[ ] Pass [ ] Fail

TC-8.4: Disconnection Handling

Field	Value
Precondition	Python training connected
Steps	1. Stop Python script (Ctrl+C)
Expected Result	Godot console shows "client DISCONNECTED". Game continues running (units stop AI movement).
Status	[ ] Pass [ ] Fail

TC-8.6: Reconnection After Disconnect

Field	Value
Precondition	Python was disconnected
Steps	1. Restart Python training script
Expected Result	New connection established. Training resumes.
Status	[ ] Pass [ ] Fail

9. Policy System

TC-9.1: Policy Dropdown Display

Field	Value
Precondition	Unit selected
Steps	1. Look for policy dropdown in info panel
Expected Result	Dropdown shows available policies (e.g., Aggressive Alpha, Defensive Alpha, Baseline)
Status	[ ] Pass [ ] Fail

TC-9.2: Policy Change via UI

Field	Value
Precondition	Unit selected, AI training connected
Steps	1. Click policy dropdown 2. Select different policy
Expected Result	Policy changes, episode resets to apply new policy assignment
Status	[ ] Pass [ ] Fail

TC-9.3: Aggressive Policy Behavior

Field	Value
Precondition	Units using aggressive policy
Steps	1. Observe unit movement patterns over episode
Expected Result	Aggressive units tend to move toward enemy base and engage enemies
Status	[ ] Pass [ ] Fail

TC-9.4: Defensive Policy Behavior

Field	Value
Precondition	Units using defensive policy
Steps	1. Observe unit movement patterns over episode
Expected Result	Defensive units tend to stay near ally base and protect it
Status	[ ] Pass [ ] Fail

TC-9.5: Multiple Policies in Same Team

Field	Value
Precondition	AI training configured with multiple policies
Steps	1. Observe different ally units 2. Compare behavior patterns
Expected Result	Different units may exhibit different strategies based on assigned policy
Status	[ ] Pass [ ] Fail

10. Visual & Debug Features

TC-10.1: Debug Lines to Points of Interest

Field	Value
Precondition	Single unit selected
Steps	1. Observe debug lines from unit
Expected Result	Yellow lines point to both ally and enemy bases
Status	[ ] Pass [ ] Fail

TC-10.2: Debug Lines to Allies

Field	Value
Precondition	Single unit selected
Steps	1. Observe blue debug lines
Expected Result	Blue lines connect to 10 closest ally units
Status	[ ] Pass [ ] Fail

TC-10.3: Debug Lines to Enemies

Field	Value
Precondition	Single unit selected
Steps	1. Observe red debug lines
Expected Result	Red lines connect to 10 closest enemy units
Status	[ ] Pass [ ] Fail

TC-10.4: Attack Range Circle

Field	Value
Precondition	Single unit selected
Steps	1. Look for white circle around unit
Expected Result	White circle shows attack range radius
Status	[ ] Pass [ ] Fail

TC-10.5: Resource Display (UI)

Field	Value
Precondition	Game running
Steps	1. Look at top of screen for resource counters
Expected Result	Uranium and Metal counters visible (both show 0)
Status	[ ] Pass [ ] Fail

TC-10.6: Mini-Map Display

Field	Value
Precondition	Game running
Steps	1. Locate mini-map on screen
Expected Result	Mini-map shows overview with unit markers and building markers
Status	[ ] Pass [ ] Fail

11. Edge Cases & Error Handling

TC-11.1: Game Without AI Connection

Field	Value
Precondition	Start game without running Python
Steps	1. Launch game 2. Enable manual control (M) 3. Play manually
Expected Result	Game runs normally. Units controllable manually. No crashes.
Status	[ ] Pass [ ] Fail

TC-11.2: All Ally Units Destroyed

Field	Value
Precondition	Game running
Steps	1. Allow all ally units to be killed (base still standing)
Expected Result	Game continues until base is destroyed or episode times out
Status	[ ] Pass [ ] Fail

TC-11.3: All Enemy Units Destroyed

Field	Value
Precondition	Game running
Steps	1. Kill all enemy units (base still standing)
Expected Result	Game continues until enemy base is destroyed or episode times out
Status	[ ] Pass [ ] Fail

TC-11.4: Rapid Unit Selection Changes

Field	Value
Precondition	Game running
Steps	1. Rapidly click and drag select different unit groups 2. Switch selections quickly 10+ times
Expected Result	No crashes or visual glitches. Info panel updates correctly each time.
Status	[ ] Pass [ ] Fail

TC-11.5: Extreme Zoom + Pan

Field	Value
Precondition	Game running
Steps	1. Zoom to max in 2. Pan rapidly 3. Zoom to max out 4. Pan rapidly
Expected Result	No visual glitches, units remain visible and selectable
Status	[ ] Pass [ ] Fail

TC-11.6: Combat with Many Units

Field	Value
Precondition	Game running with full 100 units
Steps	1. Move all units to center for massive battle 2. Observe performance
Expected Result	Game maintains playable framerate during large-scale combat
Status	[ ] Pass [ ] Fail

Test Execution Summary

Category	Total Tests	Passed	Failed	Blocked
1. Startup & Init	5			
2. Camera & Viewport	4			
3. Selection & Panel	8			
4. Unit Movement	8			
5. Combat System	10			
6. Base Mechanics	4			
7. Victory/Defeat	3			
8. AI Integration	5			
9. Policy System	5			
10. Visual/Debug	6			
11. Edge Cases	6			
TOTAL	**65**			

Tester Information

Field	Value
Tester Name	
Test Date	
Game Version	
Godot Version	
Notes	

Appendix: Quick Reference

Keyboard Controls

Key	Action
Arrow Keys	Pan camera
Mouse Wheel	Zoom in/out
M	Enable manual control
N	Enable AI control
Left Click + Drag	Select units
Right Click + Hold	Move selected unit (manual mode)

Unit Stats Reference

Unit Type	HP	Damage	Range	Speed	Cooldown
Infantry	150	5	80px	150	0.2s
Sniper	80	25	150px	80	1.0s
Heavy	300	10	100px	50	0.5s

Map Specifications

- **Dimensions**: 2560 x 1440 pixels
- **Base HP**: 5000
- **Units per team**: 50
- **Max episode steps**: 500 AI steps