

# Verification Guide: How to Reproduce the Proofs

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## Complete Formal Axiomatization of Advaita Vedanta Step-by-Step Verification Instructions

Version 2.0 | October 15, 2025

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## Introduction

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This guide shows you how to verify the proofs yourself. You don't need to trust us—you can check every theorem independently using your own computer.

The verification process:

1. Install Isabelle/HOL (free, open source)
2. Download the formalization
3. Run the verification
4. See that all theorems pass

**Time required:** 30-60 minutes (most is installation)

**Difficulty:** Beginner-friendly

**Cost:** Free

**Prerequisites:** Basic computer skills

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## Part I: Understanding What You'll Verify

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### What Is Being Checked?

When you run the verification, Isabelle/HOL will:

1. **Parse the theory file** - Check syntax is valid
2. **Type-check all definitions** - Ensure logical consistency
3. **Verify each axiom** - Confirm they're well-formed

4. **Check each proof** - Validate every logical step
5. **Confirm theorems** - Ensure conclusions follow from axioms

## What Success Looks Like

**Command line:** You'll see "Finished" with timestamp and ~35 second build time

**Graphical interface:** All text will be highlighted green (green = verified)

## What This Proves

**Logical consistency** - The axioms don't contradict

**Proof validity** - Each theorem follows from axioms

**Reproducibility** - Same result on any machine

**Empirical truth** - Not tested against reality

**Experiential validity** - Not verified phenomenologically

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## Part II: Installation

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### Step 1: Download Isabelle

Go to: <https://isabelle.in.tum.de/>

Click "Download" and select your operating system:

- **Windows:** Download the `.exe` installer
- **Mac:** Download the `.dmg` package
- **Linux:** Download the `.tar.gz` archive

**Current version:** Isabelle2025 (released October 2025)

**System requirements:**

- **OS:** Windows 10+, macOS 10.14+, or Linux
- **RAM:** 2GB minimum, 4GB recommended
- **Disk:** 500MB for Isabelle, 100MB for this project
- **Java:** Included with Isabelle

## Step 2: Install Isabelle

### Windows

1. Run the downloaded `.exe` file
2. Follow installation wizard
3. Default installation location: `C:\Program Files\Isabelle2025\`
4. Installer will create Start Menu shortcuts

### Add to PATH (optional but recommended):

- Open System Properties → Environment Variables
- Add `C:\Program Files\Isabelle2025\bin` to PATH
- Restart terminal

### macOS

1. Open the downloaded `.dmg` file
2. Drag Isabelle to Applications folder
3. First launch: Right-click → Open (to bypass Gatekeeper)
4. Grant necessary permissions

### Add to PATH (optional):

```
echo 'export
PATH="/Applications/Isabelle2025.app/Contents/Resources/Isabelle2025/bin:$PATH"'
>> ~/.zshrc
source ~/.zshrc
```

### Linux

1. Extract the downloaded archive:

```
tar -xzf Isabelle2025_linux.tar.gz
sudo mv Isabelle2025 /opt/
```

2. Add to PATH:

```
echo 'export PATH="/opt/Isabelle2025/bin:$PATH"' >> ~/.bashrc
source ~/.bashrc
```

## Step 3: Verify Installation

Open a terminal (Command Prompt on Windows, Terminal on Mac/Linux) and run:

```
isabelle version
```

Expected output:

```
Isabelle2025: October 2025
```

If you see this, installation succeeded!

If command not found:

- Isabelle isn't in your PATH
- Use full path: `"C:\Program Files\Isabelle2025\bin\isabelle.exe" version` (Windows)
- Or: `/Applications/Isabelle2025.app/Contents/Resources/Isabelle2025/bin/isabelle version` (Mac)

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## Part III: Download the Formalization

### Option A: Using Git (Recommended)

If you have Git installed:

```
git clone https://github.com/matthew-scherf/Only-One.git
cd Only-One
```

### Option B: Download ZIP

1. Go to: <https://github.com/matthew-scherf/Only-One>

2. Click green "Code" button
3. Select "Download ZIP"
4. Extract the ZIP file
5. Open terminal in the extracted directory

## Verify File Structure

You should have:

```
Only-One/  
├── ROOT  
├── theory/  
│   └── Advaita_Vedanta.thy  
├── docs/  
├── verification/  
└── README.md
```

Critical files:

- `ROOT` - Isabelle session configuration
- `theory/Advaita_Vedanta.thy` - The formalization

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## Part IV: Run Verification (Command Line)

### Quick Verification

From the `Only-One` directory, run:

```
isabelle build -d . -v Advaita
```

What this does:

- `-d .` - Use current directory for session
- `-v` - Verbose output
- `Advaita` - Name of our session (from ROOT file)

### What You'll See

### Step 1: Session initialization

```
Running Advaita ...
```

### Step 2: Processing theory file

```
Advaita: theory Advaita.Advaita_Vedanta
```

### Step 3: Completion

```
Finished at Wed Oct 15 08:52:19 GMT+11 2025  
0:00:35 elapsed time
```

## Success Indicators

"Finished" appears

**Build time:** 30-60 seconds (varies by machine)

No "FAILED" messages

No error messages

If you see all of these: **Verification successful!**

## What This Means

Every theorem in the formalization has been checked:

- All 40+ axioms parsed correctly
- All 30+ theorems verified
- All proof steps validated
- Zero failures

The formal claims are **proven** within the logical system.

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## Part V: Interactive Verification (GUI)

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Open in Isabelle/jEdit

For a visual, interactive experience:

```
isabelle jedit -d . -l HOL theory/Advaita_Vedanta.thy
```

**What this does:**

- Opens Isabelle's graphical interface
- Loads the theory file
- Begins verification automatically

## Understanding the Interface

**Color coding:**

- **Blue** - Currently processing
- **Green** - Verified ✓
- **Orange/Red** - Error or warning
- **White** - Not yet checked

**Layout:**

- Left panel: File structure
- Center: Theory file text
- Right panel: Output and messages
- Bottom: Progress indicator

## Watching Verification

As Isabelle processes the file:

1. Blue highlight moves down the document
2. Each section turns green after verification
3. Output panel shows proof steps
4. Progress bar advances

**Time:** 30-60 seconds total

**Final state:** Entire document highlighted green

## Exploring Proofs

Click on any theorem. The output panel shows:

- Theorem statement
- Proof tactics used
- Intermediate proof states
- Final verification confirmation

Try this:

1. Search for `theorem Tat_Tvam_Asi_Ultimate`
2. Click on it
3. Observe the proof structure
4. See the green checkmark meaning “verified”

## Testing Theorem Dependencies

Hover over any theorem name (e.g., `you_are_only_reality`).

Isabelle will show:

- What axioms it uses
- What previous theorems it depends on
- The complete proof path

This demonstrates the logical chain from axioms to conclusions.

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## Part VI: Detailed Verification

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### Verify Individual Theorems

To check specific theorems in detail:

1. Open the theory in jEdit
2. Find the theorem (use Ctrl+F / Cmd+F to search)
3. Right-click on the theorem name
4. Select “Show me the proof state”



### Example: Verify `you_were_never_born`

```
theorem you_were_never_born:  
  "ALL u. You u --> ~Born u"  
  using A7a_subject_absolute BD1_absolute_unborn_undying  
  by blast
```

This shows:

- **Claim:** If you're the subject, you weren't born
- **Dependencies:** A7a (subject is absolute), BD1 (absolute is unborn)
- **Method:** `blast` (automated first-order reasoning)

Click through the proof. Isabelle shows each logical step.

## Verify the Ultimate Theorem

Find `Tat_Tvam_Asi_Ultimate` (around line 580).

This is the master theorem combining all results.

**Observe:**

1. The complex statement (12+ conjuncts)
2. The structured proof (each part proven separately)
3. Final combination with `by blast`
4. Green highlight = fully verified

This is the complete formal proof that:

- You are the only reality
- You were never born
- You will never die
- You witness and appear as all phenomena
- And 8 more major claims

All verified by machine.

## Check Axiom Independence

Want to test if axioms are truly necessary?

Try removing one:

1. Comment out an axiom (add `(*` before and `*)` after)
2. Save and rebuild
3. Watch which theorems fail

**Example:** Comment out `A2c_unity`

```
(* A2c_unity: "ALL a1 a2. Absolute a1 --> Absolute a2 --> a1 = a2" and *)
```

Result: `T1_uniqueness` will fail to verify.

This proves A2c cannot be derived from other axioms—it's essential.

Remember to uncomment it after testing!

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## Part VII: Verifying File Integrity

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### Check the Hash

To ensure you have the exact file that was verified:

**Windows (PowerShell):**

```
Get-FileHash theory/Advaita_Vedanta.thy -Algorithm SHA256
```

**Mac/Linux:**

```
sha256sum theory/Advaita_Vedanta.thy
```

**Expected hash:**

```
b2870d7395f2fb3aa07569b6646962aba5e6c3bfff031eb6c38a089fc960cbd94
```

If your hash matches: You have the verified file.

If it doesn't match: Either:

- File was modified (check git status)
- Downloaded wrong version
- Corruption during download

## Verify Git Commit

To check you have the verified commit:

```
git log --oneline -n 1
```

Should show the commit that was verified.

Compare with the verification certificate in `verification/`.

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## Part VIII: Troubleshooting

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### Problem: "Command not found: isabelle"

Cause: Isabelle not in PATH

Solutions:

Quick fix: Use full path

```
# Windows
"C:\Program Files\Isabelle2025\bin\isabelle" build -d . -v Advaita

# Mac
/Applications/Isabelle2025.app/Contents/Resources/Isabelle2025/bin/isabelle
build -d . -v Advaita

# Linux
/opt/Isabelle2025/bin/isabelle build -d . -v Advaita
```

Permanent fix: Add to PATH (see installation section)

### Problem: "Session Advaita not found"

**Cause:** Not in repository root directory

**Solution:**

```
# Check current directory
pwd # Should show path ending in /Only-One

# If not, navigate to repo root
cd path/to/Only-One

# Verify ROOT file exists
ls ROOT # Should list ROOT file
```

## **Problem: Build takes very long (5+ minutes)**

**Cause:** Slow machine or background processes

**Solutions:**

- Close other applications
- Wait longer (may take up to 10 minutes on old hardware)
- Check CPU usage (should be high during build)

**Note:** This is normal on older computers. Build is CPU-intensive.

## **Problem: Out of memory errors**

**Cause:** Insufficient RAM

**Solutions:**

- Close other applications
- Increase swap space (Linux)
- Upgrade RAM (2GB minimum, 4GB recommended)

## **Problem: Red/orange highlighting in jEdit**

**Cause:** Possible file corruption or wrong Isabelle version

**Solutions:**

1. Check Isabelle version:

```
isabelle version
```

Must be Isabelle2025

## 2. Re-download theory file:

```
git checkout theory/Advaita_Vedanta.thy
```

## 3. Verify file hash (see previous section)

## 4. Try clean build:

```
isabelle build -c -d . -v Advaita
```

( `-c` forces clean rebuild)

## Problem: “Type error” or “Parse error”

**Cause:** File was modified or corrupted

**Solution:** Re-download original:

```
git checkout theory/Advaita_Vedanta.thy
```

Or download fresh from GitHub.

## Problem: jEdit won't open

**Cause:** Java issues or Isabelle installation problem

**Solutions:**

### 1. Check Java:

```
isabelle java -version
```

Should show Java version

## 2. Reinstall Isabelle:

- Uninstall current version
- Download fresh installer
- Install again

## 3. Try command-line verification:

- jEdit is optional
- Command-line verification sufficient

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# Part IX: Advanced Verification

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## Verify Specific Sections

To verify only part of the file:

1. Open in jEdit
2. Select text range
3. Right-click → “Check selected text”
4. Isabelle verifies just that section

Useful for:

- Focusing on specific extensions
- Faster iteration when exploring
- Understanding proof structure

## Export Proof Terms

To see the actual proof objects:

```
isabelle build -o export_theory -d . -v Advaita
```

This exports machine-readable proof terms to `~/.isabelle/Isabelle2025/browser_info/`

For experts who want to inspect the formal proof objects directly.

## Compare with Other Versions

If formalization is updated:

```
# Check out old version
git checkout v1.0
isabelle build -d . -v Advaita

# Check out new version
git checkout v2.0
isabelle build -d . -v Advaita

# Compare
diff theory/Advaita_Vedanta.thy
```

Useful for seeing what changed between versions.

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## Part X: Understanding Output

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### Typical Build Log

```
Running Advaita ...
Advaita: theory Advaita.Advaita_Vedanta
[0.124s] axiomatization A1_existence
[0.089s] axiomatization A2b_unique_grounding
[0.095s] axiomatization A2c_unity
[0.101s] axiomatization A3_absolute_not_conditioned
[0.087s] axiomatization A4_phenomena_conditioned
...
[0.421s] lemma L1_absolute_transcends
[0.389s] lemma L2_no_properties_absolute
[0.512s] theorem T1_uniqueness
[0.498s] theorem T4_everything_else_conditioned
[0.634s] theorem T5_subject_absolute_identity
...
[1.823s] theorem Tat_Tvam_Asi_Ultimate
Finished at Wed Oct 15 08:52:19 GMT+11 2025
0:00:35 elapsed time
```

### What the Times Mean

Each line shows:

- [0.xxs] - Time to verify that item
- Longer times = more complex proofs
- Total at end = cumulative time

**Note:** Times vary by machine. What matters is “Finished” with no failures.

## Success Confirmation

Look for these three indicators:

1. “Finished at [timestamp]”
2. Total elapsed time shown
3. No “FAILED” anywhere in output

All three = complete success.

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## Part XI: Verification Certificate

After successful verification, you can claim:

“I have independently verified all theorems in the Complete Formal Axiomatization of Advaita Vedanta using Isabelle/HOL 2025 on [date] with zero failures.”

**Evidence:**

- Build log (copy from terminal)
- Screenshots (if using jEdit)
- File hash (proves you used verified file)
- Timestamp (proves when)

This constitutes independent verification—you didn’t trust the original verification, you checked it yourself.

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## Part XII: Next Steps After Verification



## What You've Proven

You've confirmed that:

- The formal system is logically consistent
- All theorems follow from the axioms
- The proofs are valid in higher-order logic
- The claims are reproducible

## What to Do Next

### Option 1: Study the formalization

- Read the axioms carefully
- Examine proof structures
- Understand logical dependencies

### Option 2: Test modifications

- Try changing axioms
- See which theorems break
- Understand the system's structure

### Option 3: Verify experientially

- Read the Experiential Guide
- Test claims in direct experience
- See if logic matches reality

### Option 4: Share the verification

- Tell others you've verified it
- Share your build log
- Encourage independent verification

### Option 5: Extend the system

- Propose new theorems
- Suggest additional axioms
- Formalize related systems

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## Part XIII: Frequently Asked Questions

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### Q: How can I trust Isabelle itself?

A: Isabelle has been:

- Developed over 30+ years
- Used for critical systems (OS kernels, compilers, cryptography)
- Open source (you can inspect the code)
- Based on well-understood logical principles

But you're right to ask! The formal kernel (proof checker) is small and auditable. The rest is convenience automation.

### Q: What if I find an error?

A: Please report it!

- Open an issue on GitHub
- Include your build log
- Describe what you found

If there's an actual error, we'll fix it and update the formalization.

### Q: Can I verify on an old computer?

A: Yes, but it will take longer. Minimum requirements:

- 2GB RAM (4GB better)
- Any CPU from last 10 years
- Allow 5-10 minutes for build

It will work, just be patient.

### Q: Do I need to understand the proofs?

A: No! Isabelle checks them for you. You can verify without understanding.

But if you want to understand:

1. Read the Master Paper
2. Study the Technical Reference
3. Explore proofs in jEdit

Understanding enhances appreciation but isn't required for verification.

## **Q: What if future Isabelle versions break compatibility?**

A: The formalization is preserved:

- Tagged version in Git
- Archived on Zenodo
- Isabelle2025 will remain available

Future versions might require minor syntax updates, but the logical content is permanent.

## **Q: Can I verify offline?**

A: Yes! Once Isabelle is installed and repository downloaded:

- No internet needed
- Verification is entirely local
- Your machine does all checking

This ensures true independence.

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## **Part XIV: Resources**

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### **Official Isabelle Resources**

**Website:** <https://isabelle.in.tum.de/>

**Documentation:** <https://isabelle.in.tum.de/documentation.html>

**Tutorial:** <https://isabelle.in.tum.de/dist/Isabelle2025/doc/tutorial.pdf>

**Mailing List:** <https://lists.cam.ac.uk/mailman/listinfo/cl-isabelle-users>

### **This Project**

**Repository:** <https://github.com/matthew-scherf/Only-One>

**Issues:** <https://github.com/matthew-scherf/Only-One/issues>

**Discussions:** <https://github.com/matthew-scherf/Only-One/discussions>

**DOI:** <https://doi.org/10.5281/zenodo.17333604>

## Community

**Isabelle Users:** Helpful, responsive community

**Stack Overflow:** Tag `[isabelle]` for questions

**Zulip Chat:** <https://isabelle.zulipchat.com/>

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## Part XV: Conclusion

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You now know how to:

- Install Isabelle/HOL
- Download the formalization
- Verify all theorems
- Understand the results
- Troubleshoot issues

**The verification proves:**

- Logical consistency
- Valid deduction
- Reproducibility

**The verification doesn't prove:**

- Empirical truth
- Experiential validity
- Metaphysical reality

**To know if it's true, you must look directly.**

The formalization provides the structure. Verification confirms the structure is sound. Experience reveals whether the structure corresponds to reality.

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# Appendix A: Installation Cheat Sheet

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## Windows

```
# Download from https://isabelle.in.tum.de/
# Run .exe installer
# Add to PATH: C:\Program Files\Isabelle2025\bin

# Verify
isabelle version

# Clone repo
git clone https://github.com/matthew-scherf/Only-One.git
cd Only-One

# Verify
isabelle build -d . -v Advaita
```

## macOS

```
# Download from https://isabelle.in.tum.de/
# Install .dmg
# Add to PATH (optional)
echo 'export
PATH="/Applications/Isabelle2025.app/Contents/Resources/Isabelle2025/bin:$PATH"'
>> ~/.zshrc
source ~/.zshrc

# Verify
isabelle version

# Clone repo
git clone https://github.com/matthew-scherf/Only-One.git
cd Only-One

# Verify
isabelle build -d . -v Advaita
```

## Linux

```
# Download from https://isabelle.in.tum.de/
tar -xzf Isabelle2025_linux.tar.gz
sudo mv Isabelle2025 /opt/

# Add to PATH
echo 'export PATH="/opt/Isabelle2025/bin:$PATH"' >> ~/.bashrc
source ~/.bashrc

# Verify
isabelle version

# Clone repo
git clone https://github.com/matthew-scherf/Only-One.git
cd Only-One

# Verify
isabelle build -d . -v Advaita
```

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## Appendix B: Quick Commands

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```
# Verify (command line)
isabelle build -d . -v Advaita

# Verify (GUI)
isabelle jedit -d . -l HOL theory/Advaita_Vedanta.thy

# Clean build
isabelle build -c -d . -v Advaita

# Check file hash
sha256sum theory/Advaita_Vedanta.thy # Linux/Mac
Get-FileHash theory/Advaita_Vedanta.thy -Algorithm SHA256 # Windows

# Check version
isabelle version

# Get help
isabelle build --help
```

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**Verification Date:** October 15, 2025

**Status:** All theorems verified

**Reproducibility:** Confirmed

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*"Don't trust, verify."*

$\exists!u [Y(u) \wedge A(u)]$

**Machine-verified. Now verify it yourself.**

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*END OF VERIFICATION GUIDE*