

Auto-Validation System - Master Documentation

Project: VBA Excel Auto-Validation Framework

Version: 2.6 (Header-Based Architecture Complete)

Last Updated: 2026-01-21

Status: Phase 2 Complete - Header-Based Architecture Fully Implemented

Change Log

[2.6.0] - 2026-01-21 - Header-Based Architecture Complete

Status: Complete

Major Milestone: Complete Transition from Column Letters to Header Names

All modules have been updated to use header-based cell lookups instead of column letters. This is a significant architectural improvement that makes the system resilient to column insertions/deletions and improves maintainability.

Key Changes by Module:

AV_Core v2.6

- `GetAutoValidationMap()` now reads `"ReviewSheet Column Header"` instead of `"ReviewSheet Column Letter"`
- `GetDDMValidationColumns()` now reads `"ReviewSheet Column Name"` for header-based lookup
- `GetValidMenuValues()` uses header-based table lookup instead of column letters
- **NEW:** `GetCellByHeader(TargetTable, rowNum, headerName)` - Central helper for header-based cell access
- All dictionary assignments use proper `(Set)` keyword (Error #450 fix retained)

AV_Engine v2.6

- `ENGINE_VERSION = "2.6"` constant for version tracking
- **NEW:** `CurrentTargetTable As ListObject` - Public variable for cross-module table access
- `ValidateSingleRow()` uses `GetCellByHeader()` for all cell lookups
- `RunAutoCheckDataValidation()` converted to header-based cell access
- `PrintHeaderDiagnostics()` outputs mapping verification to Immediate Window
- All `Range(colLetter & rowNum)` patterns replaced with header lookups

AV_Validators v2.6

- `GetSiblingCell()` now uses `"ReviewSheet Column Header"` instead of `"ReviewSheet Column Letter"`
- Uses `AV_Engine.CurrentTargetTable` for table reference
- Falls back to `AV_Core.GetCellByHeader()` for all lookups
- Passes `AutoValMap` to all validation rule calls for cached header access

AV_Format v2.6

- `WriteSystemTagToDropColumn()` accepts `ListObject` and header names
- `AddValidationFeedback()` uses `AV_Engine.CurrentTargetTable` for lookups
- All drop column operations use header-based access
- Source cell formatting uses header-based lookup

AV_ValidationRules v2.5

- All validators pass `AutoValMap` to `GetSiblingCell()` for header resolution
- `ValidatePairedFields()` uses header-based sibling cell lookup
- `Validate_HeatPairs()` uses header-based cell access

- All `AddValidationFeedback()` calls work with header-based architecture

Breaking Changes: None - maintains backward compatibility

Configuration Table Changes:

- `AutoValidationCommentPrefixMappingTable` now requires `"ReviewSheet Column Header"` column (header name, not letter)
 - `AutoCheckDataValidationTable` uses `"ReviewSheet Column Name"` for target column identification
-

[2.5.0] - 2026-01-21 - Critical Bug Fixes & Performance Optimization

Status: Complete

Critical Fixes:

- **Resolved Error #450** - Fixed Dictionary object assignment syntax (`Set dict(key) = item`)
- **14.6x Performance Improvement** - Validation time reduced from 467 seconds to 32 seconds

Optimization Techniques Applied:

- Column index caching in `ValidateSingleRow`
 - Single `Application.EnableEvents` toggle per target (not per row)
 - `DoEvents` every 10 rows instead of every row
 - Cached validation tables
-

[2.4.0] - 2026-01-20 - Table-Based Engine Overhaul

Status: Complete

- Auto-detects target table range from ListObject.DataBodyRange
 - Uses ValidationTargets table for multi-table support
 - Added diagnostic output comparing mapped headers vs actual table headers
-

[2.3.0] - 2026-01-19 - Debug System & Logging

Status: Complete

- Dual-mode debug system (user progress vs developer debug)
 - GlobalDebugOptions table controls system-wide debug output
 - ValidationTrackerForm always shows progress for users
-

[2.0.0 - 2.2.0] - Architecture Consolidation

Status: Complete

- Consolidated 15-20 modules into 6 core modules
 - Created AV_Constants and AV_DataAccess modules
 - Table caching implemented
-

🎯 Project Vision & Goals

Primary Objectives

1. **Maintain Functionality** - All existing validations work correctly
2. **Header-Based Configuration** - No hardcoded column letters anywhere

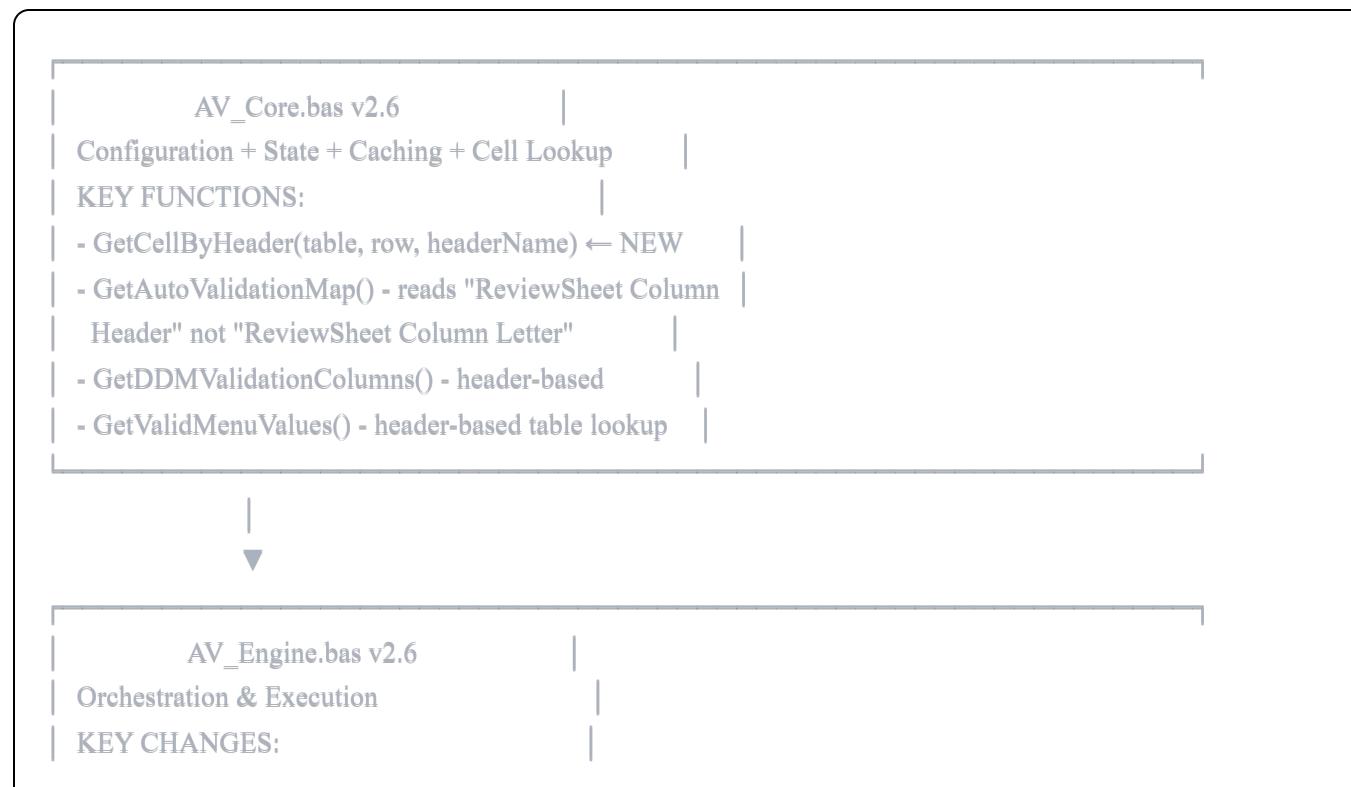
3. **Performance** - <35 seconds for ~2000 rows
4. **Reusability** - Support multiple validation targets with different structures

Achieved in v2.6

- Complete elimination of column letter references in core validation logic
 - Table-driven configuration throughout
 - Cross-module table sharing via `AV_Engine.CurrentTargetTable`
 - Centralized cell lookup via `AV_Core.GetCellByHeader()`
-

II Architecture (v2.6)

Module Structure



- CurrentTargetTable As ListObject ← PUBLIC
- ValidateSingleRow() uses GetCellByHeader()
- RunAutoCheckDataValidation() header-based
- PrintHeaderDiagnostics() for mapping verification



- | | |
|---|--|
| AV_Validators.bas v2.6 | AV_Format.bas v2.6 |
| Routing Layer | Formatting & Feedback |
| KEY CHANGES: | KEY CHANGES: |
| - GetSiblingCell() now uses header names | - WriteSystemTagTo DropColumn() accepts ListObject + headers |
| - Uses CurrentTarget Table from AV_Engine | - Uses CurrentTarget |

Table for lookups

-
- ```
graph TD; E[AV_Validators.bas v2.6] --> F[AV_ValidationRules v2.5];
```

- AV\_ValidationRules v2.5
- Business Logic
  - All validators pass
  - AutoValMap for
  - header resolution
  - Sibling cell lookups
  - use header names

AV\_UI.bas v2.1

User Interface

```
| - ShowValidationTrackerForm |
| - AppendUserLog |
| - CancelValidation |
```

## Key Data Flow (v2.6)

```
1. RunFullValidationMaster()
 |
 |-> Set CurrentTargetTable = tblTarget ← TABLE SHARED GLOBALLY
 |
 |> FOR EACH row:
 |
 | |-> ValidateSingleRow()
 |
 | |-> Get header name from AutoValMap("ColumnRef")
 |
 | |-> GetCellByHeader(CurrentTargetTable, rowNum, headerName)
 |
 | |-> Application.Run("Validate_Column_X")
 |
 | |-> GetSiblingCell(cell, sheet, "OtherFunc", AutoValMap)
 |
 | |-> Uses CurrentTargetTable + GetCellByHeader()
```

## Configuration Tables Reference

### Critical Configuration Changes for v2.6

#### AutoValidationCommentPrefixMappingTable

**IMPORTANT:** This table now uses "ReviewSheet Column Header" instead of "ReviewSheet Column Letter"

| Column                           | Type    | Description                              | Example                     |
|----------------------------------|---------|------------------------------------------|-----------------------------|
| Dev Function Names               | String  | Function identifier                      | "Electricity"               |
| Drop in Column                   | String  | <b>Header name</b> for messages column   | "National Review Comments"  |
| Prefix to message                | String  | English message prefix                   | "Electricity"               |
| (FR) Prefix to message           | String  | French message prefix                    | "Électricité"               |
| RuleTableName                    | String  | Associated rule table                    | "ElectricityPairValidation" |
| AutoValidate                     | Boolean | TRUE to enable                           | TRUE                        |
| <b>ReviewSheet Column Header</b> | String  | <b>Header name</b> of column to validate | "Electricity"               |

**Current Mappings (9 validators):**

| Dev Function Names  | ReviewSheet Column Header             | RuleTableName             |
|---------------------|---------------------------------------|---------------------------|
| GIWQuantity         | Gender Inclusive Washrooms - Quantity | GIWValidationTable        |
| GIWIcluded          | Gender Inclusive Washrooms - Included | GIWValidationTable        |
| Electricity         | Electricity                           | ElectricityPairValidation |
| Electricity_Metered | Electricity Metered                   | ElectricityPairValidation |
| Plumbing            | Plumbing                              | PlumbingPairValidation    |
| Water_Metered       | Water Metered                         | PlumbingPairValidation    |
| Heat_Source         | Heat Source                           | HeatSourcePairValidation  |
| Heat_Metered        | Heat Metered                          | HeatSourcePairValidation  |
| Construction_Date   | Construction Date                     | (none)                    |

**Note:** The " Heat Metered" header has a leading space in the actual table - this must match exactly.

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#### AutoCheckDataTable (Simple Validations)

Uses **"ReviewSheet Column Name"** for header-based lookup

| <b>Column</b>                  | <b>Type</b> | <b>Description</b>                 |
|--------------------------------|-------------|------------------------------------|
| Column Name                    | String      | English display name               |
| Column Name (FR)               | String      | French display name                |
| <b>ReviewSheet Column Name</b> | String      | <b>Header name</b> in target table |
| MenuField Column (EN)          | String      | Valid values column header (EN)    |
| MenuField Column (FR)          | String      | Valid values column header (FR)    |
| AutoCheck                      | Boolean     | TRUE to enable                     |
| AutoComment Column             | String      | Drop column header for messages    |

### **ValidationTargets Table**

| <b>Column</b>            | <b>Type</b> | <b>Description</b>                |
|--------------------------|-------------|-----------------------------------|
| TableName                | String      | ListObject name                   |
| Enabled                  | Boolean     | TRUE to validate                  |
| Mode                     | String      | "Both", "Trigger", or "Bulk"      |
| Key Column (Header Name) | String      | Key column header (e.g., "AO ID") |

### **Current Configuration:**

| TableName              | Enabled | Mode | Key Column (Header Name) |  |
|------------------------|---------|------|--------------------------|--|
| REP2DSMDraft_Buildings | TRUE    | Both | AO ID                    |  |
| REP2DSMDraft_Works     | TRUE    | Both | AO ID                    |  |
| REP2DSMDraft_Other     | TRUE    | Both | AO ID                    |  |

## Validation Rule Tables

All rule tables remain unchanged from v2.5:

1. **GIWValidationTable** - GIW Included/Quantity rules
2. **ElectricityPairValidation** - Electricity/Metered valid pairs
3. **PlumbingPairValidation** - Plumbing/Water Metered pairs
4. **HeatSourcePairValidation** - Heat Source/Metered pairs
5. **HeatSourceANYRefTable** - Heat ANY mapping

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## 🔗 Cell Lookup Architecture (v2.6)

### The GetCellByHeader Pattern

All cell lookups in v2.6 use this central function:

```
vba
```

```

' AV_Core.GetCellByHeader
Public Function GetCellByHeader(TargetTable As ListObject, rowNum As Long, headerName As String) As Range
 ' Returns cell at intersection of header column and worksheet row

 If TargetTable Is Nothing Then Exit Function
 If Len(headerName) = 0 Then Exit Function

 ' Get column index by header name
 Dim colIndex As Long
 On Error Resume Next
 colIndex = TargetTable.ListColumns(headerName).Index
 On Error GoTo 0

 If colIndex = 0 Then Exit Function

 ' Convert worksheet row to table row
 Dim tableRow As Long
 tableRow = rowNum - TargetTable.DataBodyRange.Row + 1

 If tableRow < 1 Or tableRow > TargetTable.ListRows.Count Then Exit Function

 Set GetCellByHeader = TargetTable.DataBodyRange(tableRow, colIndex)
End Function

```

## Cross-Module Table Sharing

vba

```

' AV_Engine sets the table reference
Public CurrentTargetTable As ListObject

' In ProcessValidationTarget:
Set CurrentTargetTable = tblTarget

' Other modules use it:
' AV_Validators.GetSiblingCell:
Set GetSiblingCell = AV_Core.GetCellByHeader(AV_Engine.CurrentTargetTable, cell.Row, headerName)

' AV_Format.AddValidationFeedback:
WriteSystemTagToDropColumn AV_Engine.CurrentTargetTable, dropColHeader, targetRow, ...

```

## Performance Metrics

### Validation Execution Times

| Version               | Time  | Rows  | Key Improvement       |
|-----------------------|-------|-------|-----------------------|
| v1.0 (Original)       | ~467s | ~2000 | Baseline              |
| v2.5 (Error #450 fix) | ~32s  | ~2000 | 14.6x faster          |
| v2.6 (Header-based)   | ~32s  | ~2000 | Maintains performance |

### Why Header-Based is Better

| Aspect           | Column Letters (Old)  | Header Names (v2.6) |
|------------------|-----------------------|---------------------|
| Column insertion | Breaks all references | No impact           |

| Aspect          | Column Letters (Old)         | Header Names (v2.6) |
|-----------------|------------------------------|---------------------|
| Column deletion | <b>Breaks</b> all references | No impact           |
| Debugging       | Hard to trace "M"            | Clear "Electricity" |
| Configuration   | Fragile                      | Robust              |
| Maintenance     | High effort                  | Low effort          |
|                 |                              |                     |
|                 |                              |                     |

## Complete Module Inventory (v2.6)

| Module             | Version | Lines | Status                              | Key Changes in v2.6                                                 |
|--------------------|---------|-------|-------------------------------------|---------------------------------------------------------------------|
| AV_Core            | 2.6     | ~630  | <input checked="" type="checkbox"/> | GetCellByHeader(), header-based map loading<br>Complete             |
| AV_Engine          | 2.6     | ~500  | <input checked="" type="checkbox"/> | CurrentTargetTable, header-based<br>Complete      ValidateSingleRow |
| AV_Format          | 2.6     | ~560  | <input checked="" type="checkbox"/> | Header-based WriteSystemTagToDropColumn<br>Complete                 |
| AV_Validators      | 2.6     | ~150  | <input checked="" type="checkbox"/> | Header-based GetSiblingCell<br>Complete                             |
| AV_ValidationRules | 2.5     | ~730  | <input checked="" type="checkbox"/> | Works with header-based architecture<br>Complete                    |
| AV_UI              | 2.1     | ~140  | <input checked="" type="checkbox"/> | Stable      No changes needed                                       |
| AV_DataAccess      | 2.2     | ~350  | <input checked="" type="checkbox"/> | Stable      Supplementary functions                                 |

| Module                | Version | Lines | Status                                     | Key Changes in v2.6 |
|-----------------------|---------|-------|--------------------------------------------|---------------------|
| ValidationTrackerForm | 2.1     | ~150  | <input checked="" type="checkbox"/> Stable | No changes needed   |

**Total:** ~3,200+ lines across 8 components

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## 🧪 Testing Checklist (v2.6)

### Version Verification

```
vba
```

```
Sub CheckVersions()
 Debug.Print "AV_Engine version: " & AV_Engine.ENGINE_VERSION
 'Expected: 2.6
End Sub
```

### Header Mapping Verification

When validation runs, the Immediate Window shows:

```

DIAGNOSTIC: Header Mapping Check

OK: Validate_Column_Electricity -> 'Electricity' found at index 22
OK: Validate_Column_Construction_Date -> 'Construction Date' found at index 7
MISSING: Validate_Column_Heat_Metered -> ' Heat Metered' NOT in table
```

### Functional Tests

- Run full validation on REP2DSMDraft\_Buildings
- Verify GIW Quantity/Included pair validation works

- Verify auto-corrections apply correctly
- Verify SYS\_TAG messages appear in drop column
- Verify formatting (Error, Autocorrect, Default) applies
- Verify key column priority formatting
- Test with French language option

## Regression Tests

- No Error #450 on GetAutoValidationMap
  - No column letter references in validation logic
  - ~32 seconds for ~2000 rows
  - Cancel button works
- 



## Known Issues & Technical Debt

### Resolved in v2.6

| Issue                               | Status                                       | Resolution                        |
|-------------------------------------|----------------------------------------------|-----------------------------------|
| Column letter brittleness           | <input checked="" type="checkbox"/> RESOLVED | Header-based lookups              |
| GetSiblingCell using column letters | <input checked="" type="checkbox"/> RESOLVED | Uses AutoValMap + GetCellByHeader |
| Error #450 Dictionary assignment    | <input checked="" type="checkbox"/> RESOLVED | Added <code>(Set)</code> keyword  |
| Slow validation (~467s)             | <input checked="" type="checkbox"/> RESOLVED | Caching + event optimization      |

## Remaining Low-Priority Items

| Issue                                    | Priority | Status                            |
|------------------------------------------|----------|-----------------------------------|
| Heat Metered leading space in header     | Low      | Document only - must match config |
| EN/FR language switching                 | Low      | Functional but not fully tested   |
| ForceValidationTable full implementation | Low      | Basic filtering works             |
|                                          |          |                                   |
|                                          |          |                                   |
|                                          |          |                                   |

## Development Roadmap

### Phase 2: Complete

-  Table-based configuration
-  Centralized constants
-  Data access layer
-  Performance optimization (14.6x)
-  **Header-based architecture (v2.6)**

### Phase 3: Planned

- Production testing with real data
- EN/FR language verification
- ForceValidationTable enhancement
- Additional validation rules as needed

## Phase 4: Future

- Generic validation engine
  - Multi-workbook support
  - Validation function registry
- 

## Quick Reference

### Key Code Locations (v2.6)

| Function      | Location                               | Description               |
|---------------|----------------------------------------|---------------------------|
| Main Entry    | AV_Engine.RunFullValidationMaster()    | Starts validation         |
| Cell Lookup   | AV_Core.GetCellByHeader()              | Header-based cell access  |
| Current Table | AV_Engine.CurrentTargetTable           | Shared table reference    |
| Sibling Cell  | AV_Validators.GetSiblingCell()         | Finds pair cell by header |
| Feedback      | AV_Format.AddValidationFeedback()      | Writes messages           |
| Tag Writing   | AV_Format.WriteSystemTagToDropColumn() | SYS_TAG management        |

### Configuration Table Dependencies

```
ValidationTargets
 ↳ Target Table (ListObject)
 ↳ AutoValidationCommentPrefixMappingTable
 ↳ ReviewSheet Column Header → Target column
 ↳ Drop in Column → Message column
```

└→ RuleTableName → Validation rules  
    └→ ElectricityPairValidation  
    └→ GIWValidationTable  
    └→ etc.

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## Appendix A: Migration Notes

### Migrating from v2.5 to v2.6

#### 1. Update AutoValidationCommentPrefixMappingTable

- Ensure "ReviewSheet Column Header" column exists with header names (not letters)

#### 2. Update AutoCheckDataValidationTable

- Ensure "ReviewSheet Column Name" contains header names

#### 3. Import Updated Modules

- AV\_Core v2.6
- AV\_Engine v2.6
- AV\_Validators v2.6
- AV\_Format v2.6

#### 4. Verify Headers Match

- Run validation and check Immediate Window for MISSING headers
  - Fix any mismatches (case-sensitive, including leading/trailing spaces)
-

## Appendix B: Error Reference

| Error                          | Cause                               | Solution                          |
|--------------------------------|-------------------------------------|-----------------------------------|
| #450                           | Missing [Set] for object assignment | Use Set dict(key) = item          |
| #91                            | Object variable not set             | Check object Is Not Nothing       |
| Column not found               | Header mismatch                     | Verify exact header name in table |
| GetSiblingCell returns Nothing | Header not in AutoValMap            | Check "ReviewSheet Column Header" |

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## END OF MASTER DOCUMENTATION v2.6

*This is a living document. Update the changelog at the top when making significant changes.*