Package 'CyFj11'

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Description Provides functions to parse FlowJo v11 workspace files (.flowjo) and extract gating information, populations, and associated FCS files. Includes utilities for exporting data to FlowJo v10 workspace format. The package enables bidirectional data flow between FlowJo and R/Bioconductor, facilitating reproducible analysis workflows.

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`CyFj11-package` *CyFj11: Parse FlowJo V11 Workspace Files and Export to FlowJo V10*

Description

Provides functions to parse FlowJo v11 workspace files (.flowjo) and extract gating information, populations, and associated FCS files. Includes utilities for exporting data to FlowJo v10 workspace format. The package enables bidirectional data flow between FlowJo and R/Bioconductor, facilitating reproducible analysis workflows.

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See Also

Useful links:

- https://github.com/C3BI-pasteur-fr/CyFj11
- Report bugs at https://github.com/C3BI-pasteur-fr/CyFj11/issues

add_populations_to_gatingset *Add Populations to GatingSet*

Description

Adds population nodes and gates to GatingSet based on gating trees

Usage

```
add_populations_to_gatingset(
    gs,
    gating_trees,
    gates,
    sample_uuids,
    strip_comp_prefix = TRUE,
    verbose = FALSE
)
```

Arguments

gs	GatingSet object
gating_trees	List of gating trees (one per sample)
gates	List of gate objects
sample_uuids	Vector of sample UUIDs
strip_comp_prefix	Logical. Strip "Comp-" prefix from gate parameter names when matching to GatingSet parameters? Default TRUE.
verbose	Logical. Print verbose messages? Default FALSE.

add_population_node *Add Population Node Recursively to a GatingHierarchy*

Description

Recursively walks a gating tree node and adds each population—together with its associated gate—to a single-sample `GatingHierarchy`. Both regular flow-cytometry gates (rectangle, polygon, ellipsoid, quadrant) and logical (boolean) gates (`and`/`or`/`not`) are supported.

Usage

```
add_population_node(
    gh,
    node,
    gates,
    sample_uuid,
    parent = "root",
    strip_comp_prefix = TRUE,
    verbose = FALSE,
    deferred = NULL
)
```

Arguments

gh	A GatingHierarchy object (single sample) to which populations are added.
node	A named list representing one node of the gating tree produced by build_gating_tree. Expected fields: name Character or list. Population name. type Character. Gate type, e.g. "rectangle", "polygon", "and", "or", "not", "root". definition_uuid Character or list. UUID of the corresponding population definition—used to look up the gate object. logical_gate_info Optional list describing a boolean gate; present only when type is "and", "or", or "not". Contains operator and combined_populations. children Optional list of child nodes. parent Character. Full path of the parent population, used when recursing into children.
gates	Named list of flowCore gate objects keyed by paste0(definition_uuid, "_", sample_uuid). Typically the output of extract_all_gates.
sample_uuid	Character scalar. UUID of the sample being processed. Used to look up the correct gate from gates and to provide informative warning messages.
parent	Character scalar. Path of the parent population in gh under which the current node will be added. Use "root" (the default) for top-level populations.
strip_comp_prefix	Logical. When TRUE (default), the "Comp-" prefix is stripped from gate parameter names before matching against the GatingHierarchy parameters. Set to FALSE when compensation has already been applied with names that include the prefix.
verbose	Logical. When TRUE, diagnostic messages are emitted via message at each step (gate lookup, boolean expression construction, name mapping, etc.). Default FALSE.
deferred	An environment (or NULL) used to collect logical gates that could not be added because one or more component populations are not yet present in gh. Callers should pass the same environment object on all recursive calls so that add_populations_to_gatings can retry the deferred gates in a subsequent pass. When NULL, unresolvable logical gates raise a warning immediately instead of being deferred.

Details

For logical gates, all component populations must already exist in the GatingHierarchy before the boolean expression can be evaluated. When a component is missing the gate is pushed onto deferred rather than silently dropped, allowing add_populations_to_gatingset to retry in a subsequent pass once earlier populations have been resolved.

The function performs the following steps for each node:

1. Sanitizes the population name (replaces / with :) to avoid conflicts with the flowWorkspace path separator.
2. Skips the virtual root/ungated node (already present in every new GatingSet).
3. Looks up the gate object in gates using the key paste0(definition_uuid, "_", sample_uuid).
4. For **regular gates**: verifies marker-name consistency, adjusts parameter names via adjust_gate_transformation and adds the gate with gs_pop_add.

5. For **logical gates**: resolves each component population to its path in the hierarchy, builds a `booleanFilter` expression, and adds it with `gs_pop_add`. If any component path cannot be resolved the node is pushed to `deferred`.
6. Recurses into `node$children`.

Value

`NULL` invisibly. The function modifies `gh` and `deferred` in place as side effects.

See Also

`add_populations_to_gatingset` for the top-level caller that manages the deferred-retry loop, `build_gating_tree` for tree construction, `adjust_gate_transformations` for parameter-name remapping, `extract_all_gates` for gate extraction.

`adjust_gate_transformations` *Compare and Adjust Gate Parameter Names to Match a GatingHierarchy*

Description

Ensures that the parameter names stored inside a `flowCore` gate object are consistent with the parameter names present in a `GatingHierarchy` after compensation and transformations have been applied.

Usage

```
adjust_gate_transformations(gh, gate_obj, strip_comp_prefix = TRUE)
```

Arguments

`gh`	A `GatingHierarchy` object (single sample). Used to retrieve both the registered transformers (`gh_get_transformations`) and the full list of column names from the root population data frame.
`gate_obj`	A `flowCore` gate object (e.g., `rectangleGate`, `polygonGate`, `ellipsoidGate`, `quadGate`). Its internal parameter names will be remapped to match `gh`.
`strip_comp_prefix`	Logical. When `TRUE` (default), the `"Comp-"` prefix is stripped from gate parameter names before attempting to match them against the `GatingHierarchy` parameter names. Set to `FALSE` when gate names are expected to already include the `"Comp-"` prefix (i.e., compensation was applied externally with matching names).

Details

The function performs two distinct tasks:

1. **Parameter-name remapping.** Gate parameter names extracted from the FlowJo workspace may differ from the names actually present in the GatingHierarchy (e.g., a gate may reference "Comp-APC-Ax700-A" while the compensated cytoframe column is named "APC-Ax700-A", or "/" characters may have been sanitized to "_" by flowCore). The function resolves these discrepancies via map_gate_params_to_gh and then rewrites the gate's internal parameter slots with update_gate_param_names.
2. **Transformation-space adjustment (currently disabled).** A code path exists—guarded by if (FALSE)—that would convert gate coordinates from raw data space to transformed (display) space using the transformers registered in the GatingHierarchy. This path is disabled because the current pipeline calls extract_all_gates with use_transformed_coords = FALSE, so gate coordinates are already expressed in the same space as the (untransformed) cytoframe data.

The set of parameter names considered for matching is the union of:

- names returned by gh_get_transformations (non-linear channels only), and
- all column names of the root cytoframe (so that linear / scatter parameters such as FSC-A and SSC-A are also available for matching).

If no gate parameter can be mapped to any GatingHierarchy parameter the original gate object is returned unchanged.

Value

The input gate_obj with its internal parameter names updated to match those in gh. All gate coordinate slots (@min, @max, @boundaries, @boundary, @mean, @cov) are updated consistently via update_gate_param_names. If no mapping is found, the original object is returned unmodified.

See Also

map_gate_params_to_gh for the underlying name-mapping logic, update_gate_param_names for the slot-level renaming, apply_transforms_to_gate for the (currently disabled) coordinate-transformation step, add_population_node which calls this function before passing a gate to gs_pop_add.

---

apply_extension *Apply extension to coordinates*

Description

Apply extension to coordinates

Usage

```
apply_extension(coords, extend_val = 0, extend_to = -4000)
```

Arguments

coords	Numeric vector of coordinates
extend_val	Threshold value
extend_to	Replacement value

Value

Extended coordinates

`apply_param_mapping` *Apply Parameter Name Mapping to Names Vector*

Description

Applies a parameter name mapping to convert source names to target names.

Usage

```
apply_param_mapping(source_names, mapping, on_no_match = "keep")
```

Arguments

`source_names`	Character vector of source names
`mapping`	Named list from `map_param_names()`
`on_no_match`	Character. What to do with unmapped names: "keep" - keep original name (default) "drop" - remove from result "warn" - keep with warning

Value

Character vector of mapped names

`apply_transforms_to_gate`
Apply Transformation Functions to Gate Coordinates

Description

Converts the coordinate values stored inside a `flowCore` gate object from one data space to another by evaluating a set of named transformation functions. This is typically used to move gate coordinates from raw (instrument) space into a transformed (display) space so that they align with the transformed `cytoframe` data held in a `GatingHierarchy`.

Usage

```
apply_transforms_to_gate(gate_obj, trans_list)
```

Arguments

`gate_obj`	A `flowCore` gate object whose coordinate slots will be transformed. Supported classes: `rectangleGate`, `quadGate`, `polygonGate`, `ellipsoidGate`. Objects of other classes are returned unmodified.
`trans_list`	A named list of transformation functions, where each name is a `GatingHierarchy` parameter name (e.g., `"APC-Ax700-A"`) and each value is a single-argument function that maps numeric raw values to transformed values. Typically a subset of the list returned by `gh_get_transformations`. An empty list causes the function to return `gate_obj` unchanged.

Details

Each gate type stores its defining coordinates in different slots; the function handles all four common types:

`rectangleGate` The `@min` and `@max` named numeric vectors are transformed channel-by-channel for every parameter that appears in `trans_list`.

`quadGate` The `@boundary` named numeric vector (the two divider positions, one per axis) is transformed for every matching parameter.

`polygonGate` Each column of the `@boundaries` matrix that matches a parameter in `trans_list` is transformed element-wise, preserving the polygon vertex order.

`ellipsoidGate` The `@mean` vector is transformed parameter-by-parameter. A `warning` is emitted because applying a non-linear transform to the mean without also adjusting the covariance matrix `@cov` does not correctly preserve the ellipsoid shape; the covariance matrix is left unchanged.

Parameters present in the gate but absent from `trans_list` (e.g., scatter channels with a linear or identity transform) are left unchanged. If `trans_list` is empty the original gate object is returned immediately without modification.

Value

The input `gate_obj` with coordinate slots updated in place for all parameters found in `trans_list`. The object class and all other slots are preserved.

Note

This function is currently **not called** by the active pipeline. Gate coordinates are extracted in transformed (display) space by `extract_all_gates` when `use_transformed_coords = TRUE` (the default), making an additional in-place transformation of gate coordinates unnecessary. The function is retained for use cases where gate coordinates must be converted programmatically after extraction.

See Also

`adjust_gate_transformations` which determines which transformations need to be applied and calls this function, `extract_all_gates` for gate extraction with optional coordinate-space control via `use_transformed_coords`, `gh_get_transformations` for retrieving the transformation functions registered in a `GatingHierarchy`.

`archive` *Extract FlowJo v11 Workspace*

Description

Extract FlowJo v11 Workspace

build_gating_tree *Build Gating Tree for given Sample*

Description

Build Gating Tree for given Sample

Usage

```
build_gating_tree(sample_uuid, populations, populationDefinitions, root_uuid)
```

build_sample_keywords *Build Sample Keywords from Original FCS Header and GatingSet Overlay*

Description

Build FlowJo v10 Workspace Keywords

Usage

```
build_sample_keywords(fcs_keywords, gs_keywords, final_filename)
```

Arguments

fcs_keywords	Keywords from the original FCS header.
gs_keywords	Keywords from the GatingSet.
final_filename	The value to set for FILENAME.

Value

Named list of keywords for the exported workspace.

build_spillover_matrix_xml *Build FlowJo Spillover Matrix XML*

Description

Build FlowJo Spillover Matrix XML

Usage

```
build_spillover_matrix_xml(spill_matrix, matrix_id, indent = "     ")
```

Arguments

spill_matrix	Compensation matrix with column/row names.
matrix_id	UUID for the matrix.
indent	Indentation string.

Value

Character vector of XML lines.

---

check_wsp_csv_coverage *Check Workspace-to-CSV Coverage*

Description

Reports which .wsp files have statistics that are missing from a mapping CSV. Useful for detecting mismatches before calling extract_flowjo_stats() in wide-table mode.

Usage

```
check_wsp_csv_coverage(wsp_files, csv_file)
```

Arguments

wsp_files	Character vector of paths to .wsp files.
csv_file	Path to a mapping CSV with the columns population_path, stat_name, and stat_ancestor.

Value

A tibble with one row per wsp_file and columns:

file The workspace file name.

total_signatures Number of unique statistic signatures in the file.

missing_signatures Number of signatures not present in the CSV.

covered Logical; TRUE if all signatures are in the CSV.

---

compensation *Compensation Functions for FlowJo v11*

Description

Compensation Functions for FlowJo v11

conversion *Convert FlowJo v11 Workspace to GatingSet*

Description

Convert FlowJo v11 Workspace to GatingSet

convert_boolean_gate *Convert Boolean Gate*

Description

Convert Boolean Gate

Usage

```
convert_boolean_gate(gate, pop_name)
```

convert_boolean_to_flowjo10 *Convert Boolean Gate to FlowJo v10 Format*

Description

Convert Boolean Gate to FlowJo v10 Format

Usage

```
convert_boolean_to_flowjo10(gate, pop_name, gh = NULL)
```

Arguments

gate	booleanFilter object
pop_name	Population name
gh	GatingHierarchy object

Value

List representing boolean gate in FlowJo v10 format

`convert_ellipse_gate` *Convert Ellipse Gate*

Description

Convert Ellipse Gate

Usage

```
convert_ellipse_gate(
    gate,
    pop_name,
    extend_val,
    extend_to,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

`convert_ellipsoid_to_flowjo10` *Convert Ellipsoid Gate to FlowJo v10 Format*

Description

Convert Ellipsoid Gate to FlowJo v10 Format

Usage

```
convert_ellipsoid_to_flowjo10(gate, pop_name, gh = NULL)
```

Arguments

`gate`	ellipsoidGate object
`pop_name`	Population name

Value

List representing ellipsoid gate in FlowJo v10 format

convert_flowjo_gate *Convert FlowJo Gate to flowCore Gate Object*

Description

Convert FlowJo Gate to flowCore Gate Object

Usage

```
convert_flowjo_gate(
    gate,
    pop_name,
    pop_type,
    channel.ignore.case = FALSE,
    extend_val = 0,
    extend_to = -4000,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

convert_gate_to_flowjo10_format *Convert flowCore Gate to FlowJo v10 Format*

Description

Convert flowCore Gate to FlowJo v10 Format

Usage

```
convert_gate_to_flowjo10_format(gate, pop_name, gh = NULL)
```

Arguments

gate	flowCore gate object
pop_name	Population name

Value

List representing gate in FlowJo v10 format

convert_polygon_gate *Convert Polygon Gate*

Description

Convert Polygon Gate

Usage

```
convert_polygon_gate(
    gate,
    pop_name,
    extend_val,
    extend_to,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

convert_polygon_to_flowjo10 *Convert Polygon Gate to FlowJo v10 Format*

Description

Convert Polygon Gate to FlowJo v10 Format

Usage

```
convert_polygon_to_flowjo10(gate, pop_name, gh = NULL)
```

convert_quadrant_gate *Convert Quadrant Gate*

Description

Convert Quadrant Gate

Usage

```
convert_quadrant_gate(
    gate,
    pop_name,
    extend_val,
    extend_to,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

convert_range_gate *Convert Range Gate (1D)*

Description

Convert Range Gate (1D)

Usage

```
convert_range_gate(
    gate,
    pop_name,
    extend_val,
    extend_to,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

convert_rectangle_gate *Convert Rectangle Gate*

Description

Convert Rectangle Gate

Usage

```
convert_rectangle_gate(
    gate,
    pop_name,
    extend_val,
    extend_to,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

convert_rectangle_to_flowjo10 *Convert Rectangle Gate to FlowJo v10 Format*

Description

Convert Rectangle Gate to FlowJo v10 Format

Usage

```
convert_rectangle_to_flowjo10(gate, pop_name, gh = NULL)
```

`create_biexponential_transform` *Create Biexponential Transform (FlowJo version)*

Description

Create Biexponential Transform (FlowJo version)

Usage

```
create_biexponential_transform(spec)
```

`create_default_groups_v10` *Create Default Groups for FlowJo v10*

Description

Create Default Groups for FlowJo v10

Usage

```
create_default_groups_v10(samples)
```

Arguments

`samples`	List of sample data

Value

List of group data in FlowJo v10 format

`create_gatingset_from_cytoset` *Create GatingSet from Components - Transform First Approach*

Description

Create GatingSet from Components - Transform First Approach

Usage

```
create_gatingset_from_cytoset(
    cytoset,
    gating_trees,
    gates,
    compensations,
    transformations,
    sample_uuids,
    dataSources,
    keywords,
    additional.keys,
    additional.sampleID,
    keyword.ignore.case,
    strip_comp_prefix = TRUE
)
```

Arguments

`strip_comp_prefix`
: Logical. Strip "Comp-" prefix from gate parameter names when adding populations? Default TRUE. Set to FALSE if compensation has already been applied and gate names should match the compensated parameter names.

---

create_linear_transform *Create Linear Transform*

Description

Create Linear Transform

Usage

```
create_linear_transform(spec)
```

---

create_log_transform *Create Log Transform (FlowJo / flowWorkspace compatible)*

Description

Builds a scales::trans_new object that mirrors FlowJo's Log transform. Accepts two parameterisations:

- flowWorkspace / FlowJo v10 style: decade, offset, scale (plus optional shift)
- FlowJo v11 parsed style: numberDecades, decadesOffset, vectorLength (plus optional shift)

Usage

```
create_log_transform(spec)
```

Details

The transform maps a raw value r to display space d as d = (log10(max(r + shift, offset)) - log10(offset)) * scale / decade and back as r = 10^(d * decade / scale + log10(offset)) - shift

---

create_sample_names *Create Sample Names*

Description

Create Sample Names

Usage

```
create_sample_names(
    sample_uuids,
    dataSources,
    additional.keys,
    additional.sampleID
)
```

---

create_transformation_list *Create Transformation List*

Description

Create Transformation List

Usage

```
create_transformation_list(trans_spec)
```

Details

Creates a list of flowCore transformation objects from transformation specifications. Supports bi-exponential transformations which are mapped to logicle transforms.

derive_cytometer_attrs *Determine Cytometer Attributes from FCS Header*

Description

Determine Cytometer Attributes from FCS Header

Usage

```
derive_cytometer_attrs(fcs_keywords)
```

Arguments

fcs_keywords	Named list of FCS header keywords.

Value

Named list of Cytometer XML attributes.

display_to_raw *Transform coordinates from FlowJo display space to raw data space*

Description

FlowJo stores gate coordinates in display space \(0 to gateResolution/vectorLength\). This function converts them to raw data space for use with flowCore gates.

Transformation logic:

- Linear: scale from [0, vectorLength] to [minRange, maxRange]
- Biex/Logicle: apply inverse transform (display is in transformed space)

Usage

```
display_to_raw(
    display_coords,
    transform_spec,
    gate_resolution = NULL,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

Arguments

display_coords	Numeric vector of coordinates in display space
transform_spec	Transform specification from gate axis
gate_resolution	Gate resolution (overrides vectorLength if provided)
correct_faulty_gate	Fallback maxRange value if maxRange=0

Value

Numeric vector of coordinates in raw data space

`emit_transform_xml` *Emit a Single Channel Transform as XML*

Description

Emit a Single Channel Transform as XML

Usage

```
emit_transform_xml(
    type,
    channel,
    transform_obj,
    atr_tr,
    data_range,
    indent = "        "
)
```

Arguments

`type`	Transform type: "biex", "log", "fasinh", or "linear".
`channel`	Parameter name for the transform.
`transform_obj`	The transform function/object.
`atr_tr`	Attributes list from the transform object.
`data_range`	Numeric vector of length 2 (min, max) for linear transforms.
`indent`	Indentation string.

Value

Character vector of XML lines.

`export-flowjo10` *Export FlowJo v10 Workspace*

Description

Export FlowJo v10 Workspace

`export_flowjo10_workspace` *Export GatingSet to FlowJo v10 Workspace*

Description

Export GatingSet to FlowJo v10 Workspace

Usage

```
export_flowjo10_workspace(
    gating_set,
    output_path,
    workspace_name = NULL,
    fcs_root = NULL,
    overwrite = FALSE
)
```

Arguments

`gating_set`	A GatingSet object to export. A named list of GatingSets, as returned by `fj11_to_gatingset`, is also accepted and merged with `flowWorkspace::merge_list_to_gs()` before export.
`output_path`	Path where the .xml file should be created
`workspace_name`	Optional name for the workspace
`fcs_root`	Optional base directory for FCS files. If provided, FCS files will be written there and URIs in the WSP will reference that location. If NULL, uses the actual paths found in the GatingSet.
`overwrite`	Logical. When `fcs_root` is supplied and FCS files already exist in that directory, `FALSE` (default) aborts with an error; `TRUE` silently replaces existing files.

Value

Logical indicating success

Examples

```
# Export a GatingSet to FlowJo v10 XML format
ws_path  <- system.file("extdata", "min_test.flowjo", package = "CyFj11")
fcs_path <- system.file("extdata", package = "CyFj11")
ws <- read_flowjo11_workspace(ws_path)
gs <- fj11_to_gatingset(ws, group_name = 1, path = fcs_path)
out_file <- tempfile(fileext = ".xml")
export_flowjo10_workspace(gs, out_file)
file.exists(out_file)
```

extract-flowjo-stats *Extract Statistics from FlowJo Workspace (.wsp) XML Files*

Description

Extract Statistics from FlowJo Workspace (.wsp) XML Files

extract_all_gates *Extract All Gates from FlowJo v11 Workspace*

Description

Converts FlowJo v11 gate definitions to flowCore gate objects

Usage

```
extract_all_gates(
    populationDefinitions,
    sample_uuids,
    channel.ignore.case = FALSE,
    extend_val = 0,
    extend_to = -4000,
    correct_faulty_gate = 0,
    use_transformed_coords = FALSE
)
```

Arguments

populationDefinitions	Population definitions from workspace
sample_uuids	Vector of sample UUIDs to extract gates for
channel.ignore.case	Logical. Case-insensitive channel matching?
extend_val	Numeric. Threshold for extending gate coordinates
extend_to	Numeric. Value to extend gates to

Value

Named list of gates for each population-sample combination

extract_compensation *Extract Compensation Matrices from FlowJo v11 Workspace*

Description

Extracts compensation matrices for each sample, with option to override with custom compensation.

Usage

```
extract_compensation(
    dataSources,
    sample_uuids,
    custom_compensation = NULL,
    platforms = NULL
)
```

Arguments

dataSources	Data sources from workspace
sample_uuids	Vector of sample UUIDs
custom_compensation	NULL, or compensation object/matrix/data.frame, or named list of these (names = sample UUIDs)

Value

Named list of compensation matrices (one per sample)

extract_compensation_from_platforms *Extract Compensation from Platforms Section*

Description

Extract Compensation from Platforms Section

Usage

```
extract_compensation_from_platforms(
    spillover_matrices,
    dataSources = NULL,
    sample_uuids = NULL
)
```

Arguments

spillover_matrices	List of spillover matrices from platforms
dataSources	Data sources to map samples to compensation
sample_uuids	Vector of sample UUIDs

Value

Named list of compensation matrices (one per sample)

`extract_flowjo_stats` *Extract Statistics from FlowJo Workspace (.wsp) XML Files*

Description

Parses FlowJo workspace XML files and extracts population counts (from the `count` attribute of `<Population>`) and all `<Statistic>` elements. The function implements a two-step workflow:

Usage

```
extract_flowjo_stats(
    wsp_files,
    csv_file = NULL,
    output_csv = "wsp_stat_mapping.csv",
    write_csv = TRUE,
    value_as_numeric = TRUE,
    preserve_slashes = FALSE
)
```

Arguments

`wsp_files`	Character vector of paths to `.wsp` files.
`csv_file`	Optional path to a mapping CSV. Must contain the columns `population_path`, `stat_name`, and `stat_ancestor`. The `better_name` column is optional; if missing it is auto-generated from `population`, a short form of `stat_name`, and `stat_ancestor`.
`output_csv`	Path where the template CSV is written when `csv_file` is `NULL`. Default: `"wsp_stat_mapping.csv"`
`write_csv`	Logical. If `TRUE` (default) and `csv_file` is `NULL`, write the template CSV to disk.
`value_as_numeric`	Logical. If `TRUE` (default), coerce raw values to numeric where possible.
`preserve_slashes`	Logical. If TRUE, "/" characters in population names are preserved instead of being replaced with "_". Default FALSE.

Details

1. Run **without** `csv_file` to generate a template CSV containing every unique statistic signature found in the workspaces. The `better_name` column is pre-filled automatically; edit only rows that collide or need a more human-readable label.
2. Run **with** `csv_file` to validate the mapping and return a wide-format table: one row per sample, one column per renamed statistic.

The matching signature is the combination of `population_path`, `stat_name`, and `stat_ancestor`. `population_path` is the full gating lineage (e.g., `"CD45+ / T cells / CD4+"`). The `id` column is included for reference but is *not* used for matching, so it can be left blank in the CSV if desired.

Value

If `csv_file` is `NULL`, a named list:

`long` A tibble with all extracted counts/statistics in long format.

`mapping` A tibble of unique statistic signatures, ready to be written to `output_csv`.

If `csv_file` is provided, a wide tibble with one row per sample and one column per renamed statistic.

Examples

```
## Not run:
# Step 1: discover all statistics and write a template CSV
result <- extract_flowjo_stats(wsp_files = c("panel1.wsp", "panel2.wsp"))

# Step 2: edit wsp_stat_mapping.csv, then:
wide <- extract_flowjo_stats(
    wsp_files = c("panel1.wsp", "panel2.wsp"),
    csv_file = "wsp_stat_mapping.csv"
)

## End(Not run)
```

`extract_gates_from_gatingset_v10` *Extract Gates from GatingSet for FlowJo v10*

Description

Extract Gates from GatingSet for FlowJo v10

Usage

```
extract_gates_from_gatingset_v10(gating_set)
```

Arguments

`gating_set`	GatingSet object

Value

List of gate data in FlowJo v10 format

`extract_keywords_for_samples` *Extract Keywords for Samples*

Description

Extract Keywords for Samples

Usage

```
extract_keywords_for_samples(sample_uuids, dataSources, keywords)
```

`extract_pdata` *Extract pData from Keywords*

Description

Extract pData from Keywords

Usage

```
extract_pdata(sample_uuids, dataSources, keywords, ignore.case)
```

`extract_populations_from_gatingset_v10` *Extract Populations from GatingSet for FlowJo v10*

Description

Extract Populations from GatingSet for FlowJo v10

Usage

```
extract_populations_from_gatingset_v10(gating_set, samples_data, gates_data)
```

Arguments

`gating_set`	GatingSet object
`samples_data`	Sample data
`gates_data`	Gate data

Value

List of population data in FlowJo v10 format

extract_samples_from_gatingset_v10 *Extract Samples from GatingSet for FlowJo v10*

Description

Extract Samples from GatingSet for FlowJo v10

Usage

```
extract_samples_from_gatingset_v10(gating_set, target_fcs_dir = NULL)
```

Arguments

gating_set	GatingSet object
target_fcs_dir	The base directory that the WSP should assume the FCS files are in.

Value

List of sample data

extract_transformations *Extract Transformations from FlowJo v11 Workspace*

Description

Extracts transformation functions for each channel and sample

Usage

```
extract_transformations(populationDefinitions, sample_uuids)
```

Arguments

populationDefinitions	Population definitions from workspace
sample_uuids	Vector of sample UUIDs

Details

Extracts transformations from parameter specifications in gate definitions. Supports biexponential (Biex) transformations which are mapped to logicle transforms. Transformations are extracted per channel/marker, not per gate.

Value

Named list of transformation lists (one per sample)

`extract_transformation_spec` *Extract Transformation Specification*

Description

Extract Transformation Specification

Usage

```
extract_transformation_spec(sample_uuid, populationDefinitions)
```

Details

Extracts transformation specifications from parameter specifications in gate definitions. Transformations are per marker (channel), not per gate. Supports biexponential (Biex) transformations which are mapped to logicle transforms with appropriate parameters.

`extract_workspace_compensation` *Extract Compensation from Data Source*

Description

Extract Compensation from Data Source

Usage

```
extract_workspace_compensation(ds)
```

`filter_samples` *Filter Samples Based on Subset Argument*

Description

Filter Samples Based on Subset Argument

Usage

```
filter_samples(sample_uuids, subset, dataSources, keywords)
```

find_root_population *Find Root Population*

Description

Find Root Population

Usage

```
find_root_population(populations, populationDefinitions, sample_uuid)
```

fj11_to_gatingset *Convert FlowJo v11 Workspace to GatingSet*

Description

Parses a FlowJo v11 workspace and creates a GatingSet object with gating hierarchy, compensation, and transformations. Supports biexponential (Biex) transformations which are mapped to logicle transforms.

Usage

```
fj11_to_gatingset(
    fj11_workspace,
    group_name = NULL,
    subset = list(),
    execute = TRUE,
    path = NULL,
    cytoset = NULL,
    backend_dir = tempdir(),
    backend = c("h5", "tile"),
    include_gates = TRUE,
    compensation = NULL,
    additional.keys = "$TOT",
    additional.sampleID = FALSE,
    keywords = character(),
    keyword.ignore.case = FALSE,
    channel.ignore.case = FALSE,
    extend_val = 0,
    extend_to = -4000,
    leaf.bool = TRUE,
    include_empty_tree = FALSE,
    correct_faulty_gate = 0,
    transform = TRUE,
    use_transformed_coords = transform,
    max_search_depth = 5,
    stop_on_multiple = TRUE,
    mc.cores = 1,
    strip_comp_prefix = TRUE,
```

```
    sanitize_slashes = TRUE,
    ...
)
```

Arguments

fj11_workspace	List returned by read_flowjo11_workspace() containing the complete workspace structure
group_name	Character or numeric. Name or index of the sample group to import. If NULL, will list available groups interactively.
subset	Numeric vector, character vector of FCS filenames, or expression to filter samples. See Details.
execute	Logical. Should gates be executed immediately? Default TRUE. If FALSE, creates GatingSet structure without computing cell counts.
path	Character. Root directory to search for FCS files. Required if FCS files are not in workspace location.
cytoset	A cytoset object providing alternative data source (instead of FCS files). Useful for preprocessed data.
backend_dir	Directory for storing h5 backend data. Default is tempdir().
backend	Character. Storage backend, either "h5" or "tile". Default "h5".
include_gates	Logical. Should gates be imported? Default TRUE.
compensation	Compensation object, matrix, data.frame, or named list of these. Overrides workspace compensation. Names should match sample GUIDs.
additional.keys	Character vector of FCS keywords to include in sample GUID (concatenated with filename). Default is "$TOT".
additional.sampleID	Logical. Include FlowJo sample ID in GUID? Default FALSE.
keywords	Character vector of keywords to extract as pData.
keyword.ignore.case	Logical. Case-insensitive keyword matching? Default FALSE.
channel.ignore.case	Logical. Case-insensitive channel matching? Default FALSE.
extend_val	Numeric. Threshold for extending gate coordinates. Default 0.
extend_to	Numeric. Value to extend gates to. Default -4000.
leaf.bool	Logical. Compute leaf boolean gates? Default TRUE.
include_empty_tree	Logical. Include samples without gates? Default FALSE.
correct_faulty_gate	Numerical, zero = don't correct, otherwise use this value as transformation max value and Try to correct faulty gates instead of erroring? Default TRUE.
transform	Logical. Apply transformations? Default TRUE.
use_transformed_coords	Logical. Keep gate coordinates in FlowJo display (transformed) space rather than raw space? Default is the value of transform. Only relevant when transform = TRUE.

`max_search_depth`
: Integer. Maximum directory depth when searching for FCS files. Default 5.

`stop_on_multiple`
: Logical. Stop if multiple FCS files match a sample? When TRUE, stops on both missing files and multiple matches. When FALSE, only stops on missing files and continues with multiple matches. Default TRUE.

`mc.cores`
: Integer. Number of cores for parallel processing. Default 1.

`strip_comp_prefix`
: Logical. Strip "Comp-" prefix from gate parameter names when adding populations? Default TRUE. Set to FALSE if compensation has already been applied and gate names should match the compensated parameter names.

`sanitize_slashes`
: Logical. Replace "/" with "_" in parameter names? Default TRUE (matches flowCore behavior). Set to FALSE if you want to preserve "/" in marker names (e.g., "CD3/CD4" stays as-is).

`...`
: Additional arguments passed to FCS parser.

Details

The `subset` argument can be:

Numeric vector: Sample indices to import

Character vector: FCS filenames to import

Expression: Logical expression to filter pData (requires `keywords` argument)

FlowJo v11 stores data differently than v10:

populationDefinitions: Master gate definitions

desyncTable: Per-sample gate variations (tailored gates)

groups: Sample groupings

dataSources: FCS file references

Value

A named list of `GatingSet` objects, one per sample. Each element contains the full gating hierarchy, gates, compensation, and transformations for that sample. To obtain a single merged `GatingSet` for downstream analysis, call `flowWorkspace::merge_list_to_gs(gsList)` on the returned list.

Examples

```
ws_path  <- system.file("extdata", "min_test.flowjo", package = "CyFj11")
fcs_path <- system.file("extdata", package = "CyFj11")
ws       <- read_flowjo11_workspace(ws_path)
gsList   <- fj11_to_gatingset(ws, group_name = 1, path = fcs_path)
length(gsList)  # Number of GatingSets created
```

format_gate_num *Format a gate coordinate or dimension value for XML output*

Description

Uses 15 significant figures and strips trailing zeros, matching the precision FlowJo stores gate boundaries in.

Usage

```
format_gate_num(x)
```

Arguments

x	Numeric value.

Value

Character string suitable for embedding in an XML attribute.

gates *Gate Conversion Functions for FlowJo v11*

Description

Gate Conversion Functions for FlowJo v11

generate_flowjo10_xml *Generate FlowJo v10 XML Content*

Description

Generate FlowJo v10 XML Content

Usage

```
generate_flowjo10_xml(
    gating_set,
    samples,
    gates,
    populations,
    groups,
    workspace_name,
    output_path,
    force_XSC_linear = FALSE,
    minimal_fj11 = FALSE
)
```

Arguments

samples	List of sample data
gates	List of gate data
populations	List of population data
groups	List of group data
workspace_name	Name of the workspace

Value

Character string containing XML content

---

generate_group_subpopulations_xml
Generate Group Node Subpopulations XML

Description

Recursively generates XML for group node population hierarchy

Usage

```
generate_group_subpopulations_xml(
    populations,
    gates,
    parent_path = "root",
    indent = "        ",
    visited_paths = NULL,
    gh = NULL
)
```

Arguments

populations	List of population data
gates	List of gate data
parent_path	Parent population path (default "root")
indent	Current indentation level for XML formatting
visited_paths	Character vector to track visited paths (for cycle detection)
gh	Optional GatingHierarchy object (for boolean gate processing)

Value

Character vector of XML lines

generate_logical_node_xml *Generate Logical Node XML (AndNode, OrNode, NotNode)*

Description

Generate Logical Node XML (AndNode, OrNode, NotNode)

Usage

```
generate_logical_node_xml(gate, pop_name, child_path, indent, gh, gates = NULL)
```

Arguments

gate	Gate data containing boolean definition
pop_name	Original population name (for fallback)
child_path	Full path to the population
indent	XML indentation string
gh	GatingHierarchy object
gates	Full gates list (for looking up dependent gates if needed)

Value

Character vector of XML lines

generate_sample_subpopulations_xml *Generate Sample Subpopulations XML*

Description

Recursively generates XML for sample-specific population hierarchy.

Usage

```
generate_sample_subpopulations_xml(
    gating_hierarchy,
    gates,
    populations,
    parent_path = "root",
    indent = "        ",
    heat_map_param = ""
)
```

Arguments

gating_hierarchy	GatingHierarchy object
gates	List of gate data
populations	List of population data (pre-filtered to this sample)
parent_path	Parent population path (default "root")
indent	Current indentation string for XML formatting
heat_map_param	Channel name used for heatMapStatParameter attribute

Value

Character vector of XML lines

---

get_display_range *Get Display Range for Parameter*

Description

Determines the min/max range for a parameter that will be used in the XML

Usage

```
get_display_range(gh, param_name)
```

---

get_fcs_header_keywords *Read Original FCS Header Keywords*

Description

Read Original FCS Header Keywords

Usage

```
get_fcs_header_keywords(fcs_path)
```

Arguments

fcs_path	Path to an FCS file.

Value

Named list of header keywords, or NULL if unavailable.

get_graph_axes *Safely get graph axis parameters for a population*

Description

Walks the hierarchy to find appropriate axes for the graph display. Handles boolean gates (no parameters) by checking children, self, parent.

Usage

```
get_graph_axes(gh, pop_path)
```

Arguments

gh	GatingHierarchy
pop_path	Population path

Value

Character vector of length 1-2 with channel names

get_group_info *Get Group Information*

Description

Get Group Information

Usage

```
get_group_info(groups)
```

Arguments

groups	Groups list from FlowJo v11 workspace

Value

Data frame with group info

get_referenced_channels *Collect all channel names referenced by gates in the workspace*

Description

Collect all channel names referenced by gates in the workspace

Usage

```
get_referenced_channels(gates)
```

Arguments

gates	Gate data list as returned by extract_gates_from_gatingset_v10

Value

Character vector of unique channel names referenced by gates.

get_sample_file_map *Get Sample-to-File Mapping*

Description

Creates a simple lookup table mapping sample UUIDs to FCS file paths

Usage

```
get_sample_file_map(resolution_results, include_status = "FOUND")
```

Arguments

resolution_results	Output from resolve_all_fcs_paths()
include_status	Include only samples with specific status (default: "FOUND")

Value

Named vector where names are sample_ids and values are resolved_paths

get_sanitize_slashes *Get slash sanitization mode*

Description

Check whether "/" characters in parameter names are being replaced with "_".

Usage

```
get_sanitize_slashes()
```

Value

Logical. TRUE if "/" is replaced with "_", FALSE if preserved

Examples

```
# Check current setting
is_sanitize_slashes <- get_sanitize_slashes()
```

get_transform_spec *Get Transform Specification for Export*

Description

Extracts transformation specification from gating hierarchy for export to FlowJo format. Handles biexponential, linear, log, logicle, and arcsinh.

Usage

```
get_transform_spec(gh, dim = "SSC-A")
```

Arguments

gh	GatingHierarchy object
dim	Character string naming the channel (e.g. "FITC-A")

Value

Named list representing FlowJo transformation specification, or NULL

get_verbose *Get verbose mode*

Description

Check whether verbose output is currently enabled.

Usage

```
get_verbose()
```

Value

Logical. TRUE if verbose output is enabled, FALSE otherwise

Examples

```
# Check current verbose setting
is_verbose <- get_verbose()
is_verbose  # Should be FALSE by default
```

helpers *Helper Functions for the Package*

Description

Helper Functions for the Package

helpers-conversion *Helper Functions for FlowJo v11 Conversion*

Description

Helper Functions for FlowJo v11 Conversion

load_example_workspace

Load Example FlowJo v11 Workspace

Description

Loads the example FlowJo v11 workspace from inst/extdata/min_test.flowjo for use in tests and examples. This workspace contains a simple gating hierarchy (Ungated -> Lymphocytes -> CD8, CD3 subset) and references sample04.fcs.

Usage

```
load_example_workspace()
```

Value

A flowjo11_workspace object

Examples

```
ws <- load_example_workspace()
length(ws$samples)  # Number of samples
```

map_compensation_names

Map Compensation Channel Names to Cytoframe Parameter Names

Description

flowCore's compensation() function sanitizes channel names (e.g., "/" -> "_", spaces -> "."). This function creates a mapping between sanitized compensation names and original cytoframe parameter names to ensure proper compensation application.

Usage

```
map_compensation_names(comp_matrix, param_names)
```

Arguments

comp_matrix	Compensation matrix (may have sanitized names)
param_names	Original parameter names from cytoframe

Value

Compensation matrix with names matching cytoframe parameters

map_gate_params_to_gh *Map gate parameter names to GatingSet parameter names*

Description

Gate parameter names may have "Comp-" prefix or different sanitization. This function maps them to the actual GatingSet parameter names.

Usage

```
map_gate_params_to_gh(
    gate_params,
    gh_param_names,
    strip_comp_prefix = TRUE,
    sanitize_slashes = TRUE
)
```

Arguments

gate_params	Character vector of gate parameter names
gh_param_names	Character vector of GatingSet parameter names
strip_comp_prefix	Logical. Strip "Comp-" prefix from gate parameter names? Default TRUE. Set to FALSE if compensation has already been applied with matching parameter names.
sanitize_slashes	Logical. Replace "/" with "_" in parameter names? Default TRUE (matches flowCore behavior). Set to FALSE if you want to preserve "/" in marker names (e.g., "CD3/CD4" stays as-is).

Value

Named list mapping gate params to GatingSet params

map_param_names *Unified Parameter Name Mapping Function*

Description

Creates a mapping between source parameter names (e.g., from compensation, gates, transformations) and target parameter names (e.g., cytoframe flowFrame column names).

Usage

```
map_param_names(
    source_names,
    target_names,
    target_descriptions = NULL,
    strip_comp_prefix = FALSE,
    case_insensitive = FALSE,
    sanitize_slashes = TRUE
)
```

Arguments

`source_names`	Character vector of source parameter names
`target_names`	Character vector of target parameter names (e.g. flowFrame colnames)
`target_descriptions`	Optional named character vector of descriptions for each target name (e.g. the marker names returned by `markernames()`). When supplied, source names are also matched against these descriptions.
`strip_comp_prefix`	Logical. Strip "Comp-" prefix from source names? Default FALSE.
`case_insensitive`	Logical. Case-insensitive matching? Default FALSE.
`sanitize_slashes`	Logical. Replace "/" with "_" in parameter names? Default TRUE (matches flowCore behavior). Set to FALSE if you want to preserve "/" in marker names (e.g., "CD3/CD4" stays as-is).

Details

This function handles common naming discrepancies:

- "Comp-" prefix (e.g., "Comp-APC-Ax700-A" vs "APC-Ax700-A")
- "/" vs "*" sanitization (flowCore converts "/" to "*")
- Case sensitivity (optional)
- Detector-to-marker description matching (optional, via `target_descriptions`)

Value

Named list mapping source names to target names. Unmapped names have NULL values.

`map_transformation_names` *Map Transformation Channel Names to flowFrame Parameter Names*

Description

Transformation names from FlowJo may not match flowFrame parameter names:

- They may have "Comp-" prefix (e.g., "Comp-APC-Ax700-A" vs "APC-Ax700-A")
- They may use different sanitization (e.g., "/" vs "_") This function creates a mapping between transformation names and flowFrame parameters.

Usage

```
map_transformation_names(trans_list, param_names)
```

Arguments

`trans_list`	Named list of transformations (names = channel names)
`param_names`	Original parameter names from flowFrame/cytoframe

Value

Named list of transformations with names matching flowFrame parameters

---

`null-coalesce` *Custom Null Coalescing Operator*

Description

Provides a null coalescing operator that returns the second argument if the first is NULL.

Usage

```
x %||% y
```

Arguments

x	First value to check
y	Second value to return if first is NULL

Value

Either x if not NULL, or y

`parse_boolean_expression` *Parse Boolean Expression*

Description

Parse Boolean Expression

Usage

```
parse_boolean_expression(spec)
```

`parse_compensation_data` *Parse Compensation Data*

Description

Parse Compensation Data

Usage

```
parse_compensation_data(comp_data)
```

parse_spill_keyword *Parse SPILL Keyword into Matrix*

Description

Parse SPILL Keyword into Matrix

Usage

```
parse_spill_keyword(keywords)
```

Arguments

keywords	Named list of FCS keywords.

Value

A matrix with dimnames, or NULL if no SPILL keyword.

parse_transformation_info *Parse Transformation Info*

Description

Parse Transformation Info

Usage

```
parse_transformation_info(trans_info)
```

Details

Parses transformation information from FlowJo v11 transformation specifications. Supports normalization of various transformation type names including biexponential (Biex) which maps to the biexponential type for proper handling.

populations *Population Functions for FlowJo v11*

Description

Population Functions for FlowJo v11

pretty_print_flowjo *Pretty Print FlowJo Workspace*

Description

This function takes a FlowJo v11 workspace file (.flowjo) and extracts the JSON content, then pretty prints it to a text file with "_pretty.json" suffix.

Usage

```
pretty_print_flowjo(flowjo_file)
```

Arguments

flowjo_file	Path to the FlowJo workspace file (.flowjo)

Value

Path to the created pretty printed JSON file

Examples

```
# Pretty print a FlowJo workspace to readable JSON
ws_path <- system.file("extdata", "min_test.flowjo", package = "CyFj11")
out_file <- pretty_print_flowjo(ws_path)
file.exists(out_file)  # Verify output was created
# Clean up
unlink(out_file)
```

process_zip_archive *Process FlowJo v11 ZIP Archive*

Description

Extracts and parses the contents of a .flowjo file:

- manifest.txt: File listing
- analysis-*.json: Workspace data (gates, populations, samples)

Usage

```
process_zip_archive(zip_path)
```

Arguments

zip_path	Path to the .flowjo file

Value

List containing manifest and parsed JSON data

read_flowjo11_workspace *Read FlowJo v11 Workspace*

Description

Main wrapper function to read and parse FlowJo v11 workspace files.

Usage

```
read_flowjo11_workspace(workspace_path)
```

Arguments

workspace_path	Path to the FlowJo workspace file (.flowjo)

Value

Parsed workspace object containing manifest and JSON data

Examples

```
ws_path <- system.file("extdata", "min_test.flowjo", package = "CyFj11")
ws <- read_flowjo11_workspace(ws_path)
length(ws$samples)  # Number of samples in workspace
names(ws$groups)    # Group names
```

resolve_all_fcs_paths *Resolve All FCS File Paths from FlowJo Workspace*

Description

Resolves all FCS file paths from a FlowJo workspace, mapping FlowJo URIs to actual file locations on the current system.

Usage

```
resolve_all_fcs_paths(
    dataSources,
    root_dir,
    stop_on_multiple = FALSE,
    stop_on_missing = TRUE
)
```

Arguments

dataSources	Data sources from FlowJo workspace (from JSON)
root_dir	Root directory to search for FCS files
stop_on_multiple	Stop if any duplicate filenames found (default: FALSE)
stop_on_missing	Stop if any files not found (default: TRUE)

Value

Data frame with columns: sample_id, flowjo_uri, filename, resolved_path, status

---

`safe-coercion` *Safe Numeric/Integer Coercion Without Warnings*

Description

BiocCheck discourages `suppressWarnings(as.numeric(...))`; these helpers validate the string form with a regular expression first so that `as.numeric`/`as.integer` never produce a coercion warning while producing exactly the same result as the suppressed call.

Usage

```
as_num_quiet(x)

as_int_quiet(x)
```

Arguments

`x`	Character vector to coerce

Value

Numeric/integer vector, NA where x does not denote a number

`sanitize_path_with_separator` *Sanitize Path While Preserving flowWorkspace Separator*

Description

Population paths use '/' as the separator, but individual population names may contain '/' which must be replaced by ':'. This helper sanitizes only the name components, leaving the path separator '/' intact.

Usage

```
sanitize_path_with_separator(path)
```

Arguments

`path`	Character vector of path strings (e.g. "Ungated/Lymphocytes/CD45, l/d subset").

Value

Path strings with name-level '/' replaced by ':'.

sanitize_population_name *Sanitize Population Name for flowWorkspace*

Description

flowWorkspace uses '/' as the path separator in population paths. Population names imported from FlowJo may contain '/' (e.g. "CD45, l/d subset"), which causes flowWorkspace to rewrite them inconsistently. This helper normalizes such names consistently before nodes are added to a GatingSet.

Usage

```
sanitize_population_name(name)
```

Arguments

name	Character vector or list of population names.

Value

Sanitized name of the same structure as the input.

search_fcs_files *Search for FCS files in directory tree*

Description

Builds an index of all FCS files in a directory tree.

Usage

```
search_fcs_files(root_dir, pattern = "\\.fcs$")
```

Arguments

root_dir	Character vector of root directories to search
pattern	Character. File pattern to match (default: "\.fcs$")

Value

Data frame with columns: filename, full_path, size_bytes, mtime

set_sanitize_slashes *Set parameter name slash sanitization behavior*

Description

Control whether "/" characters in parameter/marker names are automatically replaced with "*". This is important because flowCore sanitizes parameter names by replacing "/" with "*" when reading FCS files.

Usage

```
set_sanitize_slashes(v)
```

Arguments

v	Logical. TRUE to replace "/" with "_" (default), FALSE to preserve "/"

Details

By default, this is TRUE to match flowCore's behavior, ensuring that gate parameter names match the flowFrame column names. Set to FALSE if you want to preserve "/" in marker names (e.g., "CD3/CD4" stays as-is).

Value

Invisible NULL. Called for side effects.

Examples

```
# Preserve "/" in marker names
set_sanitize_slashes(FALSE)
# Use default behavior (replace "/" with "_")
set_sanitize_slashes(TRUE)
```

set_verbose *Set verbose mode*

Description

Enable or disable verbose output for debugging and monitoring package operations. When enabled, the package will print detailed information about its operations, including file processing, gate conversion, and data extraction steps.

Usage

```
set_verbose(v)
```

Arguments

v	Logical. TRUE to enable verbose output, FALSE to disable it

Value

Invisible NULL. Called for side effects.

Examples

```
set_verbose(TRUE)
set_verbose(FALSE)
```

`transformations` *Transformation Functions for FlowJo v11*

Description

Transformation Functions for FlowJo v11

`update_gate_param_names`
Update gate parameter names to match flowFrame

Description

After compensation, flowFrame parameter names may have "Comp-" prefix. This function updates gate parameter names to match.

Usage

```
update_gate_param_names(gate_obj, mapped_params)
```

Arguments

`gate_obj`	flowCore gate object
`mapped_params`	Named list mapping old param names to new param names

Value

Gate object with updated parameter names

`validate_compensation` *Validate Compensation Object*

Description

Validate Compensation Object

Usage

```
validate_compensation(comp)
```

verify_gate_marker_names

Verify Marker Name Consistency After Gate Creation

Description

This function checks that marker names in gates match the parameter names in the GatingSet/flowFrame after compensation and transformations have been applied. It helps detect issues where automated routines may have changed marker names.

Usage

```
verify_gate_marker_names(gate_obj, flowframe_params, gate_source = "")
```

Arguments

gate_obj	A flowCore gate object (rectangleGate, polygonGate, etc.)
flowframe_params	Named character vector of parameter names from the flowFrame. Typically the output of `markernames(gh)`, where names are detector/channel names and values are descriptive marker names.
gate_source	Character. Description of gate source for error messages

Value

List with components:

valid Logical. Are all gate parameters mappable to flowFrame params?

mapping Named list of parameter name mappings

warnings Character vector of warning messages for unmapped params

write_fcs_files_to_dir

Write FCS Files from a GatingSet to a Directory

Description

Copies (or re-exports) the FCS files backing a GatingSet to `target_dir`. When the original file is accessible on disk it is copied verbatim so that all acquisition keywords are preserved exactly. If the original cannot be found, the flowFrame is extracted from the GatingSet with inverse transforms applied and written as a new FCS file.

Usage

```
write_fcs_files_to_dir(gating_set, target_dir, overwrite = FALSE)
```

Arguments

gating_set	GatingSet object.
target_dir	Destination directory (must already exist).
overwrite	Logical. FALSE (default) stops if any destination file already exists; TRUE replaces existing files after a warning.

Value

Invisible character vector of file paths written successfully.

---

xml_encode *XML Encode Special Characters*

Description

XML Encode Special Characters

Usage

```
xml_encode(text)
```

Arguments

text	Text to encode

Value

Encoded text

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