SpecTcl ARIS Modifications

v31.0 to v32.1.1

Generated from _Versions.txt plus source comparison of source-31.0.zip and source_32.100.zip

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Scope note. The source archive named source_32.100.zip identifies itself in CAris_include/CAris.h as Version 32.1.1 merged 6/25/2026. This document therefore treats it as the v32.1.1 source package. The comparison is source-level only; it does not include def/calibration/window files unless reflected in _Versions.txt.

1. Executive summary

- The compared source package reports ARISversion as "Version 32.1.1 merged 6/25/2026".
- The source tree grew from 36 to 38 files: 17 existing files changed and 2 files were added.
- The largest source-level change is the PID revision in CAris_pid.cpp/h and the expanded ToF method logic in CAris_pid_LenToF.cpp.
- The VME branch introduced new run-dependent channel mappings, QDC4 support, DB3 diamond anode timing, and RF2 50 ns folding.
- Detector timing logic was made more robust for diamond/pin parent z handling and for valid negative timing values.

2. Version log summary from v31.0 to v32.1.1

The table below condenses the _Versions.txt entries in the requested range. It keeps the order from v31.0 forward to v32.1.1.

Date	Version	Who	Modification
10/8/2025	v31.0		Moving to version 31
10/9/2025	v31.0.1		Info GUI updates; SiE_flag variable naming; calibrFolder path used in different Tcl places
10/9/2025	v31.0.2		Fixed DB3 diamond to DB5 ToF calibration
10/9/2025	v31.0.3		DB3 diamond resetParam in CAris_rate
10/10/2025	v31.1		ez_method added to calculate Z from calibrated values or channels
10/14/2025	v31.1.1		t_offset for dia.t; corrected tof_offsets_seg35_dia.csv; diamond removed from tke_sci.tcl
10/14/2025	v31.2		ToF length calculation correction for PPAC case; detector TE z inherited from parent; parent handling clarified for pin and diamond
10/14/2025	v31.2.1		Added loadCalibration.tcl intermediate file for single absolute-path handling
10/14/2025	v31.3		New ToF methods with diamond to DB5
10/14/2025	v31.3.1		Updated DB3diaSelect.Calibrate() in ARIS TDC
10/14/2025	v31.3.2		Applied diamond global t_offset to all diamond segments
10/15/2025	v31.3.3	Oleg	Run dia.t, diaSelect.t, pin.t together; ARISpin Initialize uses ARISdetectorTE::Initialize(name, this)
10/15/2025	v31.4	Oleg	Run dia.t/diaSelect.t/pin.t together; diamond segment parent set to this; tof_offsets_seg35_sci.tcl update for diaSelect
10/15/2025	v31.5	Elaine	Variable-server path added in loadCalibration.tcl; reference signals mapped to TDCs; PS PPAC wedge mapping updated
10/22/2025	v31.5.1	O.	New PID parameter dbrho
10/23/2025	v31.5.2	O.	New ToF methods 150 and 151
10/25/2025	v31.6	Daniel, Oleg	LISE library implemented in the source
10/27/2025	v31.6.1	O	New PID parameters dbeta, beta34, beta45, beta_final, AoQ34, AoQ45; dbeta_fix; seg member; A/q calculation based on dbeta_fix
10/28/2025	v31.7	O	New helper functions calcAQ() and calcZ()
10/28/2025	v31.7.1	O	New PID parameter dAoQ345, brho345; new variables dbrho_fix, dbeta_method
10/28/2025	v31.7.2	O	New calc_dbeta() function; dbeta_method 1 and 2 realized
01/13/2026	v31.7.3	O	New ToF case 918 using DB3scin/scis to DB5 pin
2/2/2026	v31.7.4		Comma removed in tdcgate.tcl parameter sequence; QDC added to channel 19 for new MAP
2/7/2026	v31.7.5		New ToF methods 152 and 153
4/2/2026	v31.7.6		New dz_amz variable for Am*Z plots
4/2/2026	v31.7.7		ARIStimingTDC::Calibrate() uses t.isValid(); no t > 0 constraint, so negative valid times are allowed

6/15/2026	v32.1.0	EK	Diamond detector remapping; diamond anode added; rf2 folding changed to reduce intensity variations between RF patterns
6/25/2026	v32.1.1	OT	PID and VME versions merged

3. Source comparison summary

- Files in v31.0 source: 36
- Files in v32.1.1 source package: 38
- Changed existing files: 17
- Added files: 2 (CAris_pid/CAris_pid_Ztke.cpp and Makefile.fixed)
- Removed source files: 0

4. Main technical modifications by subsystem

DAQ / VME channel mapping

- QDC4ID was added and the unpacker recognizes QDC4 for runs above 4051.
- ChannelAssign.cpp contains run-dependent remapping around DB1 PPAC anodes and DB3 diamond anode timing.
- User packet channel 0x040f is conditional: for earlier runs it maps to UserBeamline[0].pin; for later runs it can provide DB3 diamond anode timing.
- Reference signal handling was moved/adjusted for some run ranges.

Diamond detector and detector parent logic

- ARISdiamond now has an anode segment in addition to strip segments.
- Diamond calibration can use anode timing when anode.t is valid.
- Pin and diamond initialization were adjusted so parent/z relationships are handled correctly for timing-length calculations.
- DB3 diamond reset was made explicit in ARIS::resetParamGlobal().

Timing / ToF

- RF2 folding changed from a 200 ns window to a 50 ns window.
- DB3dia and DB3diaSelect calibration calls were added in ARIStdc::Calibrate().
- ARIStimingTDC::Calibrate() no longer requires t > 0; a valid calibrated negative time is allowed.
- Additional ToF methods were added: DB3diaSelect 1081-1089, methods 138-145, 150-153, 918 and 109.

PID / A/q / beta logic

- PID now stores beta34, beta45, beta_final, dbeta, AoQ34, AoQ45, dAoQ345, brho345 and dbrho.
- New dbeta controls support fixed dbeta, dbrho_fix-derived dbeta, and dbeta from two brhos.
- PID A/q calculation was refactored into calcAQ(), calcZ() and calc_dbeta().
- dz_amz was added for Am2Z/Am3Z plot correction.
- ez_method allows Z input from calibrated energy or raw channels.
- Optional LISE library hooks were added for range/energy-loss-related calculations.

Build/source organization

- CAris_pid_Ztke.cpp was added to separate ZTKE and energy-correction helper code from the main PID source.
- Makefile.fixed was added as a safer Makefile variant using additive USERCXXFLAGS and a touch_sources target.
- CAris.h was simplified by removing old inline version comments and pointing to _Versions.txt.

5. Key source indicators

The following short snippets capture the highest-level source changes without reproducing the full diff.

Version string:

```
#define ARISversion  "Version 32.1.1 merged 6/25/2026"
```

Diamond anode member:

```
ARISdiamSegment anode;
```

QDC4 packet ID:

```
#define QDC4ID   0x4013 //qdc on ch 19
```

RF2 folding change:

```
rf2.t = rf1.t - ref + rf2.offset;
shift = rf2.t/50.;
```

Timing validity logic:

```
if(startTE->t.isValid()) t -= startTE->t;
if(stopTE->t.isValid())  t += stopTE->t;
```

PID dbeta controls:

```
CTreeVariable dbeta_fix;
CTreeVariable dbrho_fix;
CTreeVariable dbeta_method;
```

6. File-by-file source changes

Line counts below are approximate source diff counts from the compared zip archives. They are useful for triage, not as a replacement for a formal patch review.

File	Status	+	-	Summary
CAris__main/CAris.cpp	changed	49	0	LISE shared-library hooks: dlopen(), trange/treste function pointers, option setup
CAris__main/CArisCalculator.cpp	changed	0	3	DB3 diamond calibration cleanup; duplicate/commented calibration removed
CAris__main/CArisUnpacker.cpp	changed	2	0	QDC4 recognition for run-dependent QDC mapping
CAris__main/CAris_rate.cpp	changed	3	1	DB3 diamond reset moved into detector reset block
CAris__main/ChannelAssign.cpp	changed	104	88	Run-dependent VME/TDC channel remapping; DB1 PPAC anode remap; DB3 diamond anode timing; reference signal handling
CAris_detectors/CAris_db.cpp	changed	1	0	Minor DB initialization whitespace/comment-level change
CAris_detectors/CAris_detector.cpp	changed	5	1	Detector TE calibration inherits z from parent when z is zero
CAris_detectors/CAris_detector.h	changed	1	1	ARISdiamond gained anode segment
CAris_detectors/CAris_diamond.cpp	changed	20	10	Diamond initialization/calibration revised; anode timing added; segment parent handling and t_offset logic adjusted
CAris_detectors/CAris_pin.cpp	changed	1	1	ARISpin parent handling changed to use this
CAris_include/ArisPackets.h	changed	1	0	QDC4ID added
CAris_include/CAris.h	changed	17	34	Version updated to 32.1.1; LISE library declarations added; old inline version comments removed
CAris_pid/CAris_pid.cpp	changed	331	266	Major PID revision: brho345/dbrho, beta34/beta45/beta_final, dbeta logic, calcAQ/calcZ/calc_dbeta helpers, ez_method, dz_amz, range hook
CAris_pid/CAris_pid.h	changed	47	3	New PID variables, db_seg enum, helper declarations, range variable, dbeta/dbrho controls
CAris_pid/CAris_pid_LenToF.cpp	changed	113	31	Expanded ToF method table, including DB3diaSelect methods, diamond combinations, special ToF methods 150-153, case 918 and 109
CAris_pid/CAris_pid_Ztke.cpp	added	157	0	New source file split out for ZTKE and energy-correction helper code
CAris_tof/CAris_tdc.cpp	changed	6	3	RF2 folding changed from 200 ns to 50 ns; DB3dia and DB3diaSelect calibration added
CAris_tof/CAris_timing.cpp	changed	32	9	Timing length/calibration cleanup; TDC timing accepts valid negative times by relying on isValid()
Makefile.fixed	added	61	0	Alternative corrected Makefile with additive USERCXXFLAGS and touch_sources helper

7. Suggested validation after adopting v32.1.1

- Verify DB3 diamond timing with both strip-selected timing and anode timing, especially because the v32.1.0 log notes that the upgraded larger diamond anode channel may not work reliably.
- Check run-dependent VME channel mapping around run boundaries used in ChannelAssign.cpp, especially near 4051, 4434/4435, and 4484/4485.
- Confirm RF2 folding after the 50 ns change by comparing RF pattern intensity before/after the modification.
- Check PID outputs for brho_method 34, 45 and 345; inspect beta34, beta45, beta_final, dbeta and dAoQ345 distributions.
- Confirm Am2Z/Am3Z plots with dz_amz set to zero and with any intended non-zero correction.
- If the LISE library is enabled, verify the runtime availability of libLISE_excel64.so.3.0.1 and confirm that trange/treste function pointers are loaded.
- Build once with the normal Makefile and optionally compare with Makefile.fixed; use touch_sources after unzipping if Linux reports clock skew.

8. Caveats

- The document combines the human version log and an automated source comparison. The version log may include calibration/Tcl/window changes not present in the attached source-only zips.
- The source archive name source_32.100.zip may refer to the VME/PID merged package; the embedded ARISversion string identifies the compared source as v32.1.1.
- No binary build or physics replay validation was performed for these exact two archives during document generation.

Total approximate source-line delta: +951 / -451

Prepared for SpecTcl ARIS branch documentation.