1.0 DATA DICTIONARY

The following subsections list the data content of ATL22. Each subsection corresponds to a HDF5 group on the data product. The ATLAS Standard Data Products are designed to be self-documenting and contain additional descriptive information not presented here. The descriptive information within the data dictionary is limited to preserve readability.

1.1.1 Attributes

short_name	ATL22
title	SET_BY_META
level	L3B
description	This data set (ATL22) contains mean transect parameters and estimates of mean water body height, maximum slope and aspect, for approximately equilateral triangular planar surfaces.
Conventions	CF-1.6
citation	SET_BY_META
contributor_name	Thomas A Neumann (thomas.neumann@nasa.gov), Thorsten Markus (thorsten.markus@nasa.gov), Suneel Bhardwaj (suneel.bhardwaj@nasa.gov) David W Hancock III (david.w.hancock@nasa.gov)
contributor_role	Instrument Engineer, Investigator, Principle Investigator, Data Producer, Data Producer
creator_name	SET_BY_META
date_created	SET_BY_PGE
date_type	UTC
featureType	trajectory
geospatial_lat_max	0.0
geospatial_lat_min	0.0
geospatial_lat_units	degrees_north
geospatial_lon_max	0.0
geospatial_lon_min	0.0

geospatial_lon_units	degrees_east
granule_type	ATL22
hdfversion	SET_BY_PGE
history	SET_BY_PGE
identifier_file_uuid	SET_BY_PGE
identifier_product_doi	10.5067/ATLAS/ATL22.001
identifier_product_doi_authority	http://dx.doi.org
identifier_product_format_version	SET_BY_PGE
identifier_product_type	ATL22
institution	SET_BY_META
instrument	SET_BY_META
keywords	SET_BY_META
keywords_vocabulary	SET_BY_META
license	Data may not be reproduced or distributed without including the citation for this product included in this metadata. Data may not be distributed in an altered form without the written permission of the ICESat-2 Science Project Office at NASA/GSFC.
naming_authority	http://dx.doi.org
platform	SET_BY_META
processing_level	L3B
project	SET_BY_META
publisher_email	SET_BY_META
publisher_name	SET_BY_META
publisher_url	SET_BY_META
references	SET_BY_META
source	SET_BY_META
spatial_coverage_type	Horizontal
standard_name_vocabulary	CF-1.6

summary	SET_BY_META
time_coverage_duration	SET_BY_PGE
time_coverage_end	SET_BY_PGE
time_coverage_start	SET_BY_PGE
time_type	CCSDS UTC-A

1.2 Group: /ancillary_data

Contains information ancillary to the data product. This may include product characteristics, instrument characteristics and/or processing constants.

1.2.1 Attributes

data_rate	Data within this group pertain to the granule in its entirety.

1.2.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
atlas_sdp_gps_epoch	DOUBLE(1) -	seconds since 1980-01-06T00:00:00.000000Z	Number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS Standard Data Product (SDP) epoch (2018-01-01:T00.00.00.000000 UTC). Add this value to delta time parameters to compute full gps_seconds (relative to the GPS epoch) for each data point. Source: Operations
control	STRING(1) -	1	PGE-specific control file used to generate this granule. To re-use, replace breaks (BR) with linefeeds. Source: Operations
data_end_utc	STRING(1) -	1	UTC (in CCSDS-A format) of the last data point within the granule. Source: Derived
data_start_utc	STRING(1) -	1	UTC (in CCSDS-A format) of the first data point within the granule. Source: Derived
end_cycle	INTEGER(1) -	1	The ending cycle number associated with the data contained within this granule. The cycle number is the counter of the number of 91-day repeat cycles completed by the

Name Standard Name	Type(Dims) FillValue	Units	Description
			mission. Source: Derived
end_delta_time time	DOUBLE(1) -	seconds since 2018-01-01	Number of GPS seconds since the ATLAS SDP epoch at the last data point in the file. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Source: Derived
end_geoseg	INTEGER(1) -	1	The ending geolocation segment number associated with the data contained within this granule. ICESat granule geographic regions are further refined by geolocation segments. During the geolocation process, a geolocation segment is created approximately every 20m from the start of the orbit to the end. The geolocation segments help align the ATLAS strong a weak beams and provide a common segment length for the L2 and higher products. The geolocation segment indices differ slightly from orbit-to-orbit because of the irregular shape of the Earth. The geolocation segment indices on ATL01 and ATL02 are only approximate because beams have not been aligned at the time of their creation. Source: Derived
end_gpssow	DOUBLE(1) -	seconds	GPS seconds-of-week of the last data point in the granule. Source: Derived
end_gpsweek	INTEGER(1) -	weeks from 1980-01-06	GPS week number of the last data point in the granule. Source: Derived
end_orbit	INTEGER(1) -	1	The ending orbit number associated with the data contained within this granule. The orbit number increments each time the spacecraft completes a full orbit of the Earth. Source: Derived
end_region	INTEGER(1) -	1	The ending product-specific region number associated with the data contained within this granule. ICESat-2 data products are separated by geographic regions. The data

Name Standard Name	Type(Dims) FillValue	Units	Description
			contained within a specific region are the same for ATL01 and ATL02. ATL03 regions differ slightly because of different geolocation segment locations caused by the irregular shape of the Earth. The region indices for other products are completely independent. Source: Derived
end_rgt	INTEGER(1) -	1	The ending reference groundtrack (RGT) number associated with the data contained within this granule. There are 1387 reference groundtrack in the ICESat-2 repeat orbit. The reference groundtrack increments each time the spacecraft completes a full orbit of the Earth and resets to 1 each time the spacecraft completes a full cycle. Source: Derived
granule_end_utc	STRING(1) -	1	Requested end time (in UTC CCSDS-A) of this granule. Source: Derived
granule_start_utc	STRING(1) -	1	Requested start time (in UTC CCSDS-A) of this granule. Source: Derived
release	STRING(1) -	1	Release number of the granule. The release number is incremented when the software or ancillary data used to create the granule has been changed. Source: Operations
start_cycle	INTEGER(1) -	1	The starting cycle number associated with the data contained within this granule. The cycle number is the counter of the number of 91-day repeat cycles completed by the mission. Source: Derived
start_delta_time time	DOUBLE(1) -	seconds since 2018-01-01	Number of GPS seconds since the ATLAS SDP epoch at the first data point in the file. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Source: Derived

Name Standard Name	Type(Dims) FillValue	Units	Description
start_geoseg	INTEGER(1) -	1	The starting geolocation segment number associated with the data contained within this granule. ICESat granule geographic regions are further refined by geolocation segments. During the geolocation process, a geolocation segment is created approximately every 20m from the start of the orbit to the end. The geolocation segments help align the ATLAS strong a weak beams and provide a common segment length for the L2 and higher products. The geolocation segment indices differ slightly from orbit-to-orbit because of the irregular shape of the Earth. The geolocation segment indices on ATL01 and ATL02 are only approximate because beams have not been aligned at the time of their creation. Source: Derived
start_gpssow	DOUBLE(1) -	seconds	GPS seconds-of-week of the first data point in the granule. Source: Derived
start_gpsweek	INTEGER(1) -	weeks from 1980-01-06	GPS week number of the first data point in the granule. Source: Derived
start_orbit	INTEGER(1) -	1	The starting orbit number associated with the data contained within this granule. The orbit number increments each time the spacecraft completes a full orbit of the Earth. Source: Derived
start_region	INTEGER(1) -	1	The starting product-specific region number associated with the data contained within this granule. ICESat-2 data products are separated by geographic regions. The data contained within a specific region are the same for ATL01 and ATL02. ATL03 regions differ slightly because of different geolocation segment locations caused by the irregular shape of the Earth. The region indices for other products are completely independent. Source: Derived
start_rgt	INTEGER(1) -	1	The starting reference groundtrack (RGT) number associated with the data contained within this granule. There are 1387 reference groundtrack in the ICESat-2 repeat orbit. The reference groundtrack increments each time the spacecraft completes a full orbit of the Earth and resets to 1 each time the spacecraft

Name Standard Name	Type(Dims) FillValue	Units	Description
			completes a full cycle. Source: Derived
version	STRING(1) -	1	Version number of this granule within the release. It is a sequential number corresponding to the number of times the granule has been reprocessed for the current release. Source: Operations

1.3 Group: /ancillary_data/inland_water

Contains general ancillary parameters.

1.3.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
kurt_calc_min_cnt	UINT_1_LE(1) -	1	Minimum number of filtered short segments that must be available on the transect to proceed with kurtosis calculation. Source: ATBD Table 5-3
mean_slope_trk_bdy_calc	UINT_1_LE(9) -	1	Water body types that are to process a mean along track slope. This parameter is a rank 1 array of extent 9, with the body type digits coinciding with the array subscripts 1 through 9. Array elements are binary values, if 0 then process body type mean slope, 1 otherwise. Water body types are described in ATL22 Table 5-2. Source: ATBD Table 5-3 Flags: 0()=process_mean_slope, 1()=do_not_process_mean_slope
sig_threshold	INTEGER(1) -	1	Minimum signal confidence required for photon to be included in analysis Source: ATBD Table 5-2
skew_calc_min_cnt	UINT_1_LE(1) -	1	Minimum number of filtered short segments that must be available on the transect to proceed with skewness calculation. Source: ATBD Table 5-3
skew_kurt_bdy_calc	UINT_1_LE(9) -	1	Water body types that are to process skewness and kurtosis. This parameter is a rank 1 array of extent 9, with the body type digits coinciding with the array subscripts 1 through 9. Array elements are binary values, if 0 then process skewness and kurtosis, 1 otherwise. Water body types are described in ATL22 Table 5-2. Source: ATBD Table 5-3 Flags: 0()=compute_skewness_kurtosis, 1()=do_not_compute_skewness_kurtosis

Name Standard Name	Type(Dims) FillValue	Units	Description
slope_ssegs_min	UINT_1_LE(1) -	1	Minimum number of filtered ATL13 short segments heights that must be available in order to calculate transect along-track slope. Source: ATBD Table 5-3
transect_slope_calc	UINT_1_LE(9) -	1	Water body types that are to process an observed along track slope for the transect. This parameter is a rank 1 array of extent 9, with the body type digits coinciding with the array subscripts 1 through 9. Array elements are binary values, if 0 then process body type observed slope, 1 otherwise. Water body types are described in ATL22 Table 5-2. Source: ATBD Table 5-3 Flags: 0()=process_transect_slope, 1()=do_not_process_transect_slope

1.4 Group: /gtx

Contains mean transect data product parameters and subgroups pertaining to a specific groundtrack.

1.4.1 Attributes

data_rate	Data within this group are stored at the transect rate.

1.4.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
atl13_gran_ndx	INTEGER(:) INVALID_I4B	1	ATL13 granule index, indicating from which ATL13 granule in /METADATA/Lineage/ATL13/fileName an ATL22 transect product was derived. Source: Section 5.4
atl13refid	INTEGER_8(:) INVALID_I8B	1	Unique aggregate reference number for each shape in the ATL13 Inland Water Body Mask, where digit 1 = type, digit 2 = size, digit 3 = source, and digits 4-10 = shape id Source: Section 5.4
inland_water_body_id	INTEGER(:) INVALID_I4B	1	Identifying signature of an individual inland water body. Each body of water is represented by a unique numeric value. Source: Section 5.4
inland_water_body_region	INTEGER(:) INVALID_I4B	1	ATL13-created shapefile representing relevant bodies of water over which to

Name Standard Name	Type(Dims) FillValue	Units	Description
			implement the ATL13 water surface finding algorithm only within a region of processing interest. Source: Section 5.4
inland_water_body_type	INTEGER_1(:) INVALID_I1B	1	Type of Inland Water Body, where 1=Lake, 2=Known Reservoir, 3=(Reserved for future use), 4=Ephemeral Water, 5=River, 6=Estuary or Bay, 7=Coastal Water, 8=Reserved, 9=Reserved Source: Section 5.4 Flags: 1()=Lake, 2()=Known_Reservoir, 3()=Reserved_for_future_use, 4()=Ephemeral_Water, 5()=River, 6()=Estuary_or_Bay, 7()=Coastal_Water, 8()=Reserved, 9()=Reserved
transect_dist_from_eq Along-track distance	DOUBLE(:) INVALID_R8B	meters	Along-track distance from the equator to the start of the first filtered short segment in the transect. Source: Section 5.3.3
transect_end_lat latitude	DOUBLE(:) -	degrees_north	Latitude of the transect end, determined by the latitude of the last photon in the last filtered short segment in the transect. Source: Section 5.4
transect_end_lon longitude	DOUBLE(:) -	degrees_east	Longitude of the transect end, determined by the longitude of the last photon in the last filtered short segment in the transect. Source: Section 5.4
transect_end_sseg_idx	INTEGER(:) INVALID_I4B	1	Index of final entry in ATL13 short segment rate output data contributing to transect summary. Source: Section 5.4
transect_end_time time	DOUBLE(:) INVALID_R8B	seconds since 2018-01-01	Time of the transect end, determined by the time of the index photon in the last filtered short segment in the transect. Source: Section 5.4
transect_ht_kurtosis	FLOAT(:) INVALID_R4B	unitless	Kurtosis of the distribution of ATL13 orthometric heights across the transect. Source: Section 5.3.3
transect_ht_skew	FLOAT(:) INVALID_R4B	unitless	Skew of the distribution of ATL13 orthometric heights across the transect. Source: Section 5.3.3
transect_id	INTEGER(:) INVALID_I4B	1	Transect within a water body to which the short segment rate output belongs. Source: Section 5.4

Name Standard Name	Type(Dims) FillValue	Units	Description
transect_lat latitude	DOUBLE(:) -	degrees_north	Reporting latitude of transect statistics. Source: Section 5.4
transect_length	DOUBLE(:) INVALID_R8B	meters	Length of the transect, determined as the distance from the first filtered observed reference photon in the water body to the final filtered observed photon in the body. Source: Section 5.4
transect_lon longitude	DOUBLE(:) -	degrees_east	Reporting longitude of transect statistics. Source: Section 5.4
transect_lseg2_cnt	INTEGER(:) INVALID_I4B	1	Number of complete very long segments in the transect. Source: Section 5.4
transect_lseg_cnt	INTEGER(:) INVALID_I4B	1	Number of complete long segments in the transect. Source: Section 5.4
transect_mean_alpha_mle	FLOAT(:) INVALID_R4B	m^-1	Mean maximum likelihood alpha of the transect, determined as the mean of all filtered short segment MLE alphas of the subsurface profile ranges across the transect. Source: Section 5.4
transect_mean_azimuth azimuth	FLOAT(:) INVALID_R4B	radians	Mean azimuth of the transect, determined as the mean of all filtered short segment azimuth values of the subsurface profile ranges across the transect. Source: Section 5.3.3
transect_mean_ht_WGS84	FLOAT(:) INVALID_R4B	meters	Mean geodetic height of the transect with respect to the WGS84 ellipsoid, determined as the mean of all filtered short segment height values in the transect. Source: Section 5.4
transect_mean_ht_ortho	FLOAT(:) INVALID_R4B	meters	Mean orthometric height of the transect with respect to the EGM2008 geoid, determined as the mean of all filtered short segment height values in the transect. Source: Section 5.4
transect_mean_lat latitude	DOUBLE(:) INVALID_R8B	degrees_north	Mean latitude of the transect, calculated as mean of all filtered sseg latitudes in the transect. Source: Section 5.4
transect_mean_lon longitude	DOUBLE(:) -	degrees_east	Mean longitude of the transect, calculated as mean of all filtered sseg longitudes in

Name Standard Name	Type(Dims) FillValue	Units	Description
			the transect. Source: Section 5.4
transect_mean_slope_trk_bdy	FLOAT(:) INVALID_R4B	m/m	Mean ATL13 along track water body surface slope, as reported per short segment ID per water body. Source: Section 5.3.3
transect_mean_stdev_water_surf	FLOAT(:) INVALID_R4B	meters	Mean standard deviation of the transect water surface, determined based on filtered short segments. (Deferred for rivers; populated with invalid values in rel003) Source: Section 5.4
transect_mean_subsurf_atten	FLOAT(:) INVALID_R4B	m^-1	Mean subsurface attenuation (alpha) of the transect, determined as the mean of all filtered alphas along the transect. Source: Section 5.4
transect_mean_time time	DOUBLE(:) INVALID_R8B	seconds since 2018-01-01	Mean time of the transect, calculated as mean of all filtered sseg times in the transect. Source: Section 5.4
transect_mean_time_utc time	STRING(:) -	1	Mean time of the transect in UTC format YYYY-MM-DDTHH:MM:SS.SSSSSSZ. Source: Derived
transect_slope Along-track slope	FLOAT(:) INVALID_R4B	m/m	Along-track slope of the observed transect in the direction of crossing, determined by linear fit of all filtered ATL13 short segment orthometric height values in the transect. Source: Section 5.3.3
transect_slope_rms_err slope rms error	FLOAT(:) INVALID_R4B	m/m	Root mean squared error of the linear fit of filtered orthometric short segment heights along the observed transect. Source: Section 5.3.3
transect_sseg_cnt	INTEGER(:) INVALID_I4B	1	Number of available ATL13 non-anomalous short segments in the transect. Source: Section 5.2.3
transect_sseg_cnt_filtered	INTEGER(:) INVALID_I4B	1	Number of filtered ATL13 non-anomalous short segments in the transect used in ATL22 mean product calculations. Source: Section 5.2.3
transect_start_lat latitude	DOUBLE(:) -	degrees_north	Latitude of the transect start, determined by the latitude of the first photon in the first filtered short segment in the transect. Source: Section 5.4

Name Standard Name	Type(Dims) FillValue	Units	Description
transect_start_lon longitude	DOUBLE(:) -	degrees_east	Longitude of the transect start, determined by the longitude of the first photon in the first filtered short segment in the transect. Source: Section 5.4
transect_start_sseg_idx	INTEGER(:) INVALID_I4B	1	Index of first entry in ATL13 short segment rate output data contributing to transect summary Source: Section 5.4
transect_start_time time	DOUBLE(:) INVALID_R8B	seconds since 2018-01-01	Time of the transect start, determined by the time of the index photon in the first filtered short segment in the transect. Source: Section 5.4
transect_time time	DOUBLE(:) -	seconds since 2018-01-01	Reporting time of transect statistics. Source: Derived

1.5 Group: /multibeam

Contains Multi-Beam Water Height Data Products

1.5.1 Attributes

data_rate	Data within this group are stored per inland water body (where data availability permits).

1.5.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
aspect	FLOAT(:) INVALID_R4B	radians	Direction of slope of planar surface with respect to North between adjacent strong beams. Source: section 5.3.5 (B)
delta_time time	DOUBLE(:) -	seconds since 2018-01-01	Number of GPS seconds since the ATLAS SDP epoch. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Source: ATL03

Name Standard Name	Type(Dims) FillValue	Units	Description
err_aspect	FLOAT(:) INVALID_R4B	radians	Error included in aspect reported. Source: section 5.3.5 (C)
err_slope_bdy	FLOAT(:) INVALID_R4B	1	Error included in segment_slope_trk_bdy. Source: section 5.3.5 (C)
inland_water_body_id	INTEGER(:) INVALID_I4B	1	Identifying signature of an individual inland water body. Each body of water is represented by a unique numeric value. Source: Section 5.3.1 (C)
max_slope	FLOAT(:) INVALID_R4B	1	Maximum slope of planar triangular surface between adjacent strong beams. Source: section 5.3.5 (B)
plan_lat latitude	DOUBLE(:) -	degrees_north	Latitude of reporting location for multi-beam planar statistics Source: section 5.3.5 (B)
plan_lon longitude	DOUBLE(:) -	degrees_east	Longitude of reporting location for multi-beam planar statistics Source: section 5.3.5 (B)

1.6 Group: /orbit_info

Contains orbit information.

1.6.1 Attributes

data_rate	Varies. Data are only provided when one of the stored values (besides time) changes.

1.6.2 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
crossing_time time	DOUBLE(:) -	seconds since 2018-01-01	The time, in seconds since the ATLAS SDP GPS Epoch, at which the ascending node crosses the equator. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Source: POD/PPD

Name Standard Name	Type(Dims) FillValue	Units	Description
cycle_number	INTEGER_1(:) -	1	A count of the number of exact repeats of this reference orbit. Source: Operations
lan	DOUBLE(:) -	degrees_east	Longitude at the ascending node crossing. Source: POD/PPD
orbit_number	UINT_2_LE(:) -	1	Unique identifying number for each planned ICESat-2 orbit. Source: Operations
rgt	INTEGER_2(:) -	1	The reference ground track (RGT) is the track on the earth at which a specified unit vector within the observatory is pointed. Under nominal operating conditions, there will be no data collected along the RGT, as the RGT is spanned by GT3 and GT4. During slews or off-pointing, it is possible that ground tracks may intersect the RGT. The ICESat-2 mission has 1387 RGTs. Source: POD/PPD
sc_orient	INTEGER_1(:) -	1	This parameter tracks the spacecraft orientation between forward, backward and transitional flight modes. ICESat-2 is considered to be flying forward when the weak beams are leading the strong beams; and backward when the strong beams are leading the weak beams. ICESat-2 is considered to be in transition while it is maneuvering between the two orientations. Science quality is potentially degraded while in transition mode. Source: POD/PPD Flags: 0()=backward, 1()=forward, 2()=transition
sc_orient_time time	DOUBLE(:) -	seconds since 2018-01-01	The time of the last spacecraft orientation change between forward, backward and transitional flight modes, expressed in seconds since the ATLAS SDP GPS Epoch. ICESat-2 is considered to be flying forward when the weak beams are leading the strong beams; and backward when the strong beams are leading the weak beams. ICESat-2 is considered to be in transition while it is maneuvering between the two orientations. Science quality is potentially degraded while in transition mode. The ATLAS Standard Data Products (SDP) epoch offset is defined within /ancillary_data/atlas_sdp_gps_epoch as the number of GPS seconds between the GPS epoch (1980-01-06T00:00:00.000000Z UTC) and the ATLAS SDP epoch. By adding the offset contained within atlas_sdp_gps_epoch to delta time parameters, the time in gps_seconds relative to the GPS epoch can be computed. Source: POD/PPD

1.7 Group: /quality_assessment

Contains quality assessment data. This may include QA counters, QA along-track data and/or QA summary data.

1.7.1 Datasets

Name Standard Name	Type(Dims) FillValue	Units	Description
qa_granule_fail_reason	INTEGER(1) -	1	Flag indicating granule failure reason. 0=no failure; 1=processing failure; 2=insufficient data; 3=TBD3; 4=TBD4; 5=TBD5 Source: Operations Flags: 0()=no_failure, 1()=processing_failure, 2()=insufficient_data, 3()=TBD3, 4()=TBD4, 5()=TBD5
qa_granule_pass_fail	INTEGER(1) -	1	Flag indicating granule quality. 0=granule passes automatic QA. 1=granule fails automatic QA. Source: Operations Flags: 0()=PASS, 1()=FAIL