List of Header Columns

I. OVERVIEW

The first table in this document lists the column headers that appear in the `.eep.track`, `.iso`, and `.iso.cmd` files, and a brief description for each. Note that not all column headers appear in each type of file. Also note that the filters in `.iso.cmd` are listed in a separate table, also found in this document. All logarithms that appear in this list are base 10. Surface and central abundances are averaged over the outer and inner $10^{-6}\%$ of the total stellar mass.

Theoretical isochrones are provided in two flavors: basic and full. The basic isochrones contain columns such as age, stellar mass, $\dot{M}$, $\log L$, $\log T_{\rm eff}$, $\log g$, and surface and central abundances of a few elements, whereas the full isochrones are much more comprehensive. Columns that appear in the basic file are marked by an asterisk (*) in the table below.

The second table in this document lists the primary equivalent evolutionary points (EEPs) and their corresponding EEP number.

The third table in this document lists the currently available filters. This is only an initial set and will expand over time. Photometric systems define their magnitude scales according to a flux standard.

TABLE I: EEP Track and Isochrone Column Headers

Column Name	**Description**
Appears in .track.eep *Only*	
star_age	Age in years
Appears in .iso.cmd *Only*	
Zsurf	Surface metal mass fraction
Appears in .iso *and* .iso.cmd *Only*	
EEP*	Equivalent Evolutionary Point number
initial_mass*	Initial mass in $M_\odot$
log10_isochrone_age_yr*	Age of the isochrone in log years
OR	
isochrone_age_yr*	Age of the isochrone in years
Appears in .track.eep, .iso, *and* .iso.cmd	
star_mass*	Current mass in $M_\odot$
star_mdot*	Mass loss rate in $M_\odot$/year
he_core_mass*	Mass of the helium-rich core in $M_\odot$
c_core_mass*	Mass of the carbon-rich core in $M_\odot$
o_core_mass	Mass of the oxygen-rich core in $M_\odot$
log_L*	Log bolometric luminosity in $L_\odot$
log_L_div_Ledd	Log ratio of bolometric luminosity and Eddington luminosity, where the Eddington luminosity is a mass-weighted average over the optical depth τ between 1 and 100
log_LH*	Log hydrogen-burning luminosity in $L_\odot$
log_LHe*	Log helium-burning luminosity in $L_\odot$
log_LZ	Log total burning luminosity excluding H-burn, He-burn, and photodisintegrations in $L_\odot$
log_Teff*	Log effective temperature in K
log_abs_Lgrav	Log gravitational potential luminosity in $L_\odot$
log_R*	Log radius in $R_\odot$
log_g*	Log surface gravity in cm s^{-2}
log_surf_z	Log surface mass fraction in metals
surf_avg_omega	Surface angular rotation speed
surf_avg_v_rot	Surface rotation speed
surf_num_c12_div_num_o16	Ratio of surface number densities of ^{12}C and ^{16}O
v_wind_Km_per_s	Wind speed $v_w \equiv \kappa \dot{M}/4\pi R\tau$, where $\kappa \equiv$ opacity and $\tau = 2/3$, in km/s
surf_avg_omega_crit	Surface (mass-averaged down to $\tau = 100$) critical angular rotation speed
surf_avg_omega_div_omega_crit	Ratio of surface and critical angular rotation speeds
surf_avg_v_crit	Surface critical/breakup rotation speed
surf_avg_v_div_v_crit	Ratio of surface and critical rotation speeds
surf_avg_Lrad_div_Ledd	Ratio of surface radiative luminosity and Eddington luminosity
v_div_csound_surf	Ratio of velocity and sound speed at the surface
surface_h1*	Surface mass fraction in ^{1}H
surface_he3*	Surface mass fraction in ^{3}He
surface_he4*	Surface mass fraction in ^{4}He
surface_li7	Surface mass fraction in ^{7}Li

surface_be9	Surface mass fraction in ^{9}Be
surface_b11	Surface mass fraction in ^{11}B
surface_c12*	Surface mass fraction in ^{12}C
surface_c13	Surface mass fraction in ^{13}C
surface_n14	Surface mass fraction in ^{14}N
surface_o16*	Surface mass fraction in ^{16}O
surface_f19	Surface mass fraction in ^{19}F
surface_ne20	Surface mass fraction in ^{20}Ne
surface_na23	Surface mass fraction in ^{23}Na
surface_mg24	Surface mass fraction in ^{24}Mg
surface_si28	Surface mass fraction in ^{28}Si
surface_s32	Surface mass fraction in ^{32}S
surface_ca40	Surface mass fraction in ^{40}Ca
surface_ti48	Surface mass fraction in ^{48}Ti
surface_fe56	Surface mass fraction in ^{56}Fe
log_center_T*	Log central temperature in K
log_center_Rho*	Log central density in g cm^{-3}
center_degeneracy	Central electron chemical potential in $k_{\rm b}T$, where $k_b \equiv$ Boltzmann constant and $T \equiv$ temperature
center_omega	Central angular rotation speed
center_gamma*	Central plasma interaction parameter $\bar{Z}^2 e^2/a_i k_b T$, where $\bar{Z} \equiv$ average ion charge, $e \equiv$ electron charge, and $a_i \equiv$ mean ion spacing
mass_conv_core	Mass of the convective core in $M_\odot$
center_h1*	Center mass fraction in ^{1}H
center_he4*	Center mass fraction in ^{4}He
center_c12*	Center mass fraction in ^{12}C
center_n14	Center mass fraction in ^{14}N
center_o16	Center mass fraction in ^{16}O
center_ne20	Center mass fraction in ^{20}Ne
center_mg24	Center mass fraction in ^{24}Mg
center_si28	Center mass fraction in ^{28}Si
pp	Log luminosity from pp-chain
cno	Log luminosity from CNO-cycle
tri_alfa	Log luminosity from triple α
burn_c	Log luminosity from carbon-burning
burn_n	Log luminosity from nitrogen-burning
burn_o	Log luminosity from oxygen-burning
c12_c12	Log luminosity from carbon-carbon burning
delta_nu	Large frequency separation for p-modes in μHz
delta_Pg	Period spacing for $l = 1$ g-mode in seconds
nu_max	Frequency of maximum power in μHz as estimated from scaling relations
acoustic_cutoff	Maximum frequency for p-modes at surface
max_conv_vel_div_csound	Maximum ratio of convective velocity and sound speed in the stellar interior
max_gradT_div_grada	Maximum ratio of ∇_T and $\nabla_{\rm ad}$ in the stellar interior
gradT_excess_alpha	Denoted by α_∇ and referred to as the "Smoothing parameter for MLT$_{++}$" in Paxton et al. 2013. Number between 0 and 1 describing the effectiveness with which the MLT$_{++}$ prescription is used to aid the evolution calculations by reducing the superadiabaticity
min_Pgas_div_P	Minimum ratio of gas pressure to the total pressure in the stellar interior
max_L_rad_div_Ledd	Maximum ratio of radiative luminosity and

	Eddington luminosity in the interior
e_thermal	Total thermal energy in the stellar interior in ergs
phase*	FSPS phase type defined as follows: -1=PMS, 0=MS, 2=RGB, 3=CHeB, 4=EAGB, 5=TPAGB, 6=postAGB, 9=WR Caution: There may be overlap between MS and WR for very massive stars. Always double-check!

TABLE II: Primary EEPs

Primary EEP	EEP Number[a]	Phase
1	1	pre-main sequence (PMS)
2	202	zero age main sequence (ZAMS)
3	353	intermediate age main sequence (IAMS)
4	454	terminal age main sequence (TAMS)
5	605	tip of the red giant branch (RGBTip)
6	631	zero age core helium burning (ZACHeB)[b]
7	707	terminal age core helium burning (TACHeB)[c]
Low Mass Type		
8	808	thermally pulsating asymptotic giant branch (TPAGB)
9	1409	post asymptotic giant branch (post-AGB)
10	1710	white dwarf cooling sequence (WDCS)
High Mass Type		
8	808	carbon burning (C-burn)

[a]Also equivalent to $i+1$ where i is the index of the array (zero-based) containing the evolutionary track.
[b]i.e., zero age horizontal branch; ZAHB for low-mass stars.
[c]terminal age horizontal branch; TAHB.

TABLE III: Currently Available Filters

Name	**Reference**
Bessell_U	[1]
Bessell_B	
Bessell_V	
Bessell_R	
Bessell_I	
2MASS_J	[2]
2MASS_H	
2MASS_Ks	
SDSS_u	[3]
SDSS_g	
SDSS_r	
SDSS_i	
SDSS_z	
WFPC2_F218W	[4]
WFPC2_F255W	
WFPC2_F300W	
WFPC2_F336W	
WFPC2_F439W	
WFPC2_F450W	
WFPC2_F555W	
WFPC2_F606W	
WFPC2_F622W	
WFPC2_F675W	

WFPC2_F791W	
WFPC2_F814W	
WFPC2_F850LP	
ACS_HRC_F220W	[5]
ACS_HRC_F250W	
ACS_HRC_F330W	
ACS_HRC_F344N	
ACS_HRC_F435W	
ACS_HRC_F475W	
ACS_HRC_F502N	
ACS_HRC_F550M	
ACS_HRC_F555W	
ACS_HRC_F606W	
ACS_HRC_F625W	
ACS_HRC_F658N	
ACS_HRC_F660N	
ACS_HRC_F775W	
ACS_HRC_F814W	
ACS_HRC_F850LP	
ACS_HRC_F892N	
ACS_WFC_F435W	
ACS_WFC_F475W	
ACS_WFC_F502N	
ACS_WFC_F550M	
ACS_WFC_F555W	
ACS_WFC_F606W	
ACS_WFC_F625W	
ACS_WFC_F658N	
ACS_WFC_F660N	
ACS_WFC_F775W	
ACS_WFC_F814W	
ACS_WFC_F850LP	
ACS_WFC_F892N	
WFC3_UVIS_F200LP	[6]
WFC3_UVIS_F218W	
WFC3_UVIS_F225W	
WFC3_UVIS_F275W	
WFC3_UVIS_F280N	
WFC3_UVIS_F300X	
WFC3_UVIS_F336W	
WFC3_UVIS_F343N	
WFC3_UVIS_F350LP	
WFC3_UVIS_F373N	
WFC3_UVIS_F390M	
WFC3_UVIS_F390W	
WFC3_UVIS_F395N	
WFC3_UVIS_F410M	
WFC3_UVIS_F438W	
WFC3_UVIS_F467M	
WFC3_UVIS_F469N	
WFC3_UVIS_F475W	
WFC3_UVIS_F475X	
WFC3_UVIS_F487N	
WFC3_UVIS_F502N	
WFC3_UVIS_F547M	

WFC3_UVIS_F555W	
WFC3_UVIS_F600LP	
WFC3_UVIS_F606W	
WFC3_UVIS_F621M	
WFC3_UVIS_F625W	
WFC3_UVIS_F631N	
WFC3_UVIS_F645N	
WFC3_UVIS_F656N	
WFC3_UVIS_F657N	
WFC3_UVIS_F658N	
WFC3_UVIS_F665N	
WFC3_UVIS_F673N	
WFC3_UVIS_F680N	
WFC3_UVIS_F689M	
WFC3_UVIS_F763M	
WFC3_UVIS_F775W	
WFC3_UVIS_F814W	
WFC3_UVIS_F845M	
WFC3_UVIS_F850LP	
WFC3_UVIS_F953N	
WFC3_IR_F098M	
WFC3_IR_F105W	
WFC3_IR_F110W	
WFC3_IR_F125W	
WFC3_IR_F126N	
WFC3_IR_F127M	
WFC3_IR_F128N	
WFC3_IR_F130N	
WFC3_IR_F132N	
WFC3_IR_F139M	
WFC3_IR_F140W	
WFC3_IR_F153M	
WFC3_IR_F160W	
WFC3_IR_F164N	
WFC3_IR_F167N	
IRAC_3.6	[7]
IRAC_4.5	
IRAC_5.8	
IRAC_8.0	
UKIDSS_Z	[8]
UKIDSS_Y	
UKIDSS_J	
UKIDSS_H	
UKIDSS_K	
CFHT_u	[9]
CFHT_g	
CFHT_r	
CFHT_i_new	
CFHT_i_old	
CFHT_z	
WISE_W1	[10]
WISE_W2	
WISE_W3	
WISE_W4	

Strömgren_u Strömgren_v Strömgren_b Strömgren_y	[11]
PS_g PS_r PS_i PS_z PS_y PS_w PS_open	[12]
GALEX_FUV GALEX_NUV	[13]
DECam_u DECam_g DECam_r DECam_i DECam_z DECam_Y	[14]
SkyMapper_u SkyMapper_v SkyMapper_g SkyMapper_r SkyMapper_i SkyMapper_z	[15]
Washington_C Washington_M Washington_T1 Washington_T2	[16]
DDO51_vac DDO51_f31	[17]
Kepler_Kp Kepler_D51	[18]
LSST_u LSST_g LSST_r LSST_i LSST_z LSST_y	[19]
JWST_F070W JWST_F090W JWST_F115W JWST_F140M JWST_F150W2 JWST_F150W JWST_F162M JWST_F164N JWST_F182M JWST_F187N JWST_F200W JWST_F210M JWST_F212N	[20]

JWST_F250M	
JWST_F277W	
JWST_F300M	
JWST_F322W2	
JWST_F323N	
JWST_F335M	
JWST_F356W	
JWST_F360M	
JWST_F405N	
JWST_F410M	
JWST_F430M	
JWST_F444W	
JWST_F460M	
JWST_F466N	
JWST_F470N	
JWST_F480M	
Swift_UVW2	[21]
Swift_UVM2	
Swift_UVW1	
Swift_U	
Swift_B	
Swift_V	
Hipparcos_Hp	[22]
Tycho_B	[23]
Tycho_V	
Gaia_G	[24]
Gaia_BP	
Gaia_RP	

[1] Bessell & Murphy (2012); Bessell & Brett (1988)
[2] Cohen et al. (2003)
[3] classic.sdss.org/dr7/instruments/imager/index.html
[4] Holtzman et al. (1995)
[5] www.stsci.edu/hst/acs/analysis/throughputs
[6] www.stsci.edu/hst/wfc3/ins_performance/filters/
[7] Fazio et al. (2004)
[8] Hewett et al. (2006)
[9] www.cfht.hawaii.edu/Instruments/Imaging/Megacam/specsinformation.html
[10] Wright et al. (2010)
[11] Bessell (2011)
[12] Tonry et al. (2012)
[13] http://asd.gsfc.nasa.gov/archive/galex/Documents/PostLaunchResponseCurveData.html
[14] www.ctio.noao.edu/noao/sites/default/files/DECam/DECam_filters.xlsx
[15] Bessell et al. (2011)
[16] Bessell et al. (2001)
[17] www.noao.edu/kpno/mosaic/filters/
[18] keplergo.arc.nasa.gov/CalibrationResponse.shtml
[19] https://github.com/lsst/throughputs
[20] http://www.stsci.edu/jwst/instruments/nircam/instrumentdesign/filters
[21] http://swift.gsfc.nasa.gov/proposals/swift_responses.html

[22] Bessell & Murphy (2012)
[23] Bessell & Murphy (2012)
[24] https://www.cosmos.esa.int/web/gaia/transmissionwithoriginal