# Initialisation of sfit4

The program convert_rdrv_394 converts the input files for the versions 394 and 393 to the the new input format:

1. Rdrv.ctl and cinput (actual name read from rdrv.ctl) are converged to rdrv_4.0.ctl
2. T15asc is converted to the new spectra format, latitude and radius of earth should be checked and corrected
3. Station.layers is created from fasc.pt (name read from rdrv.ctl)

In order to upgrade from sfit2 v 3.94 it should suffice to include a line convert_rdrv_394 in your batch just before calling sfit4 (was rdrv39 before)

**NOTE:** Other versions of sfit2 may work too, increasingly less, the older your version is

Check the examples provided in x.SPECIES directories. Especially for the retrieval using the LM, emission and beam parameters are examples provided

For most cases the new input file should work out of the box.

In case of persisting problems contact the developer group of sfit2:

sfit2@ucar.edu

and send the sfit4.ctl file together with one spectrum, station.layer file and reference.prf.

The general format is

Keyword1.keyword2.keyword3 = value

First keyword:

**file** defines in and output files. All output files are also set to default values by the code. The option to rename them is discouraged may be removed in later version.

**gas** defines parameters for the retrieval gases

**fw** all parameters for the forward model are defined in this section

**rt** in this section the retrieval parameters are defined, except for the SA matrices for the gases which are defined in the gas section.

In the section **band** the parameters for all MW bvands are defined.

**Spectrum** contains additional noise information for the spectra

```
 file.spectrum              File containing the spectrum in ASCII
 file.statlayer             File containing the layering
 file.masspath              3 OUTPUT files from fascod
 file.pt                    can be used to run former versions of sfit
 file.mix
 file.eap_dat               empirical apodization (measured), if fw.ieap = 4
 file.ephs_dat              empirical phase error (measured), if fw.iephs = 4
 file.sa_matrix             file contining a full sa matrix if gas.x.ifoff = 4 or the full inverse matrix
                            if gas.x.ifoff = 5
 file.isotope               containg the isotope description, if gas.isotope = T
 file.solarlines            containg solar lines if fw.solar = T
 file.linelist              directory containing the cfgl files

 gas                        (= x x2) gases which are retrieved
 gas.x.ifprf                profile retrieval
 gas.x.ifoff                definition of off diagonal correlation in the sa-matrix,
                            if 4 or 5 the sa matrix or the inverse SA matrix is read in from
                            file.sa_matrix

if gas.x.ifoff = 1,2,3
    gas.x.zwid              width of the correlation
```

```
   gas.x.zmin              correlation calculation starts at
   gas.x.zmax              correlation calculation ends at
end

 gas.x.logstate            T if the statevector contains ln(VMR)
 gas.x.sigma               if gas.GAS.ifoff is not 4 or 5
                           Nr of entries must correspond to the number of
                           layers defined in the statlayers
                           if if.prf = F, contains a priori and sa for profile scaling

 fw.delnu                  Half width of integration interval
 fw.lshapemodel            Lineshape model 0 – Voigt, 1 - Galatry
 fw.solar                  if T inclusion of solar lines (files.solarlines)
 fw.solar.shift            shift of solar lines
 fw.ifps                   Pressure induced line shift
                                0 read from linelist
                                1 no shift
 fw.ieap                   Empirical apodiziation
                                0 no empirical apodiziation
                                1 tabular function is read in
                                2 polynomial of order neap
                                3 fourier series of order neap
                                4 linfit output is read in
 fw.neap                   Order of polynomial/fourier series if fw.ieap = 3 or 4
 fw.iephs                  Empirical phase error
                                0 no empirical phase
                                1 tabular function is read in
                                2 polynomial of order nephs
                                4 linefit output
 fw.nephs                  Order of polynomial if fw.iephs = 2
 fw.emission               if T emitted radiation from the atmosphere is  calculated
 fw.emission.T_infinity    Temperatur (in K) of the radiating object outside the atmosphere
                                Moon = 370.0
                                Sun  = 6000.0
                                None = 2.7
 fw.emission.object        Reflexion of solar light off object
                                .e. only emission is calculated, no reflection
                                .m. reflection of solar ligh of the moon (pre-     alpha)
 fw.emission.normalized    spectra are normalized to one (T) or not  normalized  (F)
 fw.write_K                K-matrices written in file K.out
 fw.write_gasfiles         Gasfiles written
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```
 fw.write_gasfiles.type       Type of GASFILE

 rt                          Switch on (T) or off (F) Retrieval
 rt.write_Sa                 write Sa matrix
 rt.lm                       Switch on (T) or off (F) LM iteration scheme
if rf.lm = T
      rf.lm.gamma_start       Start value for gamma
      rf.gamma_inc            Increase gamma by value if step was succesful
      rf.gamma_dec            decrease gamma if step failed
end if
 rt.convergence              convergence is reached if changein cost function is smaller than value
 rt.tolerance                only if rt.convergence is not given
                                  convergence is reached if change in spectrum is amller than
                                  value * noise on spectrum
 rt.max_iteration            maximal number of iterations
 rt.wshift                   type of wavenumber shift
                                  0 no shift for any bandpass
                                  1 single shift for each bandpass
                                  2 independent shift for each bandpass
                                  3 idependent shift for each fit
 rt.wshift.apriori           apriori of all types of wavenumber shift
 rt.wshift.sa                its sa
 rt.slope                    slpoe is retrieved if T
 rt.slope.apriori            a priori of slope
 rt.slope.sa                 sa of slope
 rt.curvature                curvature on spectrum is retrieved if T
 rt.curvature.apriori        a priori of curvature
 rt.curvature.sa             sa of curvature
 rt.phase                    simple phase correction retrieved if T
 rt.phase.apriori
 rt.phase.sa
 rt.solar.is_fix             retrieve shift in solar lines
 rt.solar.apriori            apriori and sa for the Minaert parameter of the
 rt.solar.sa                 solar lines


 band                      =   1  2                    MWs that are included in the calculation
 band.1.nu_start           =         782.560           smallest frequency of MW
 band.1.nu_stop            =         782.860           largest frequency of MW
 band.1.dn                 =            1e-3           spacing for spectrum calculation
 band.1.wavfac             =           1.000           scaling of wave factor in this band
```

```
band.1.pmax                  =         257.143          maximal OPD for this band
band.1.omega                 =           3.864          FOV for this band
band.1.iap                   =               0          Imposed apodization code
                                                             1 – Boxcar
                                                             2 -4 Norton Beer
                                                             5 – Triangle
                                                             6 - Happ – Genzel
                                                             7 – KPNO Atmospheric Spectra
                                                             8 – Hamming function
band.1.zshift                =           0.000          shift of the zero line
band.1.izero                 =               0          shift of zero level in this band
                                                            0 use as given
                                                            1 allow to retrieve for each bad
                                                            2 use zero level from first band in list
band.1.szero                 =           0.200          sa of the zero line shift (apriori is zshift)
band.1.beam                  =               1          Beam nr included
    if length(band.1.beam) > 0                          two lines for each band
       band.1.apriori       = 0.1 0.2 867.0 0.0         a priori values of beams
       band.1.sa            = 0.1 0.0   0.1 0.0         sa value of each parameter, if set to 0.0 no
                                                        retrieval takes place
    end
band.1.beam.model         =                             Channel model
                                                        PS phase model
                                                        IP interferogram pertubation model
band.1.snr                   =           140.0          SNR in this band (if negative SNR gets adjusted
                                                        at each step)
band.1.gasb                  = O3     CO2               gases which are retrieved from this band
...

spectrum.snr.1.win.nu_start =         788.9
spectrum.snr.1.win.nu_stop  =         788.91
spectrum.snr.1.win.snr      =         210.0

detail_out.spectrum_by_iteration = T                    if T writes out spectra at each iteration
```