In the following text, I describe the major input and output variables required by the program PRPWDXDL.f, which takes a model produced by the white dwarf evolution code and converts it into a format that the various pulsation analysis programs can read in. The "prep" code requires the file switches.dat and the model file. On Sun workstations, I run the code using:

prpwdxdl ¡pg1159mod

where pg1159mod is the name of the model file in this case.

The variables in switches.dat are:

```
nsswit dif2 ncswit massz

 0      0.17   5      147
```

NSSWIT 0 if evolutionary model; 1 if we select shell spacing.

DIF2 enter in desired value of Δx ranging from 0.30 to 0.10, with 0.20 being a popular choice.

NCSWIT Specifies a prescription for computing the Brunt-Väisälä frequency:

1. Scwarschild A criterion, which ignores chemical composition changes.
2. Numerical Differencing in transition regions away from the core.
3. Numerical Differencing throughout the model. This is dangerous in white dwarf models.
4. Do not include the He/C interface in numerical differencing.
5. Do not include the H/He interface in numerical differencing.
6. Compute Brunt-Väisälä frequency by inclusion of "Modified Ledoux" term. I consider this to be the best way.

MASSZ Begin numerical differencing after this zone number.

Now we turn to the model that gets read in. The first two lines from a typical model look like the following.

```
model     age      pcen    tcen  ucen   rstr  teff    llsun    lnlsun   xtal

  15  3.2416E+07 23.279 7.612 6.565  8.948 4.384  -1.3077  -1.4796  0.000

  np
  399  =   175  +   224
```

MODEL Model number.

AGE Age of the model in years.

PCEN Logarithm of central pressure.

TCEN Logarithm of central temperature.

UCEN Logarithm of central density.

RSTR Logarithm of the total stellar radius.

TEFF Logarithm of the effective temperature.

LLSUN $\log L/\mathrm{L}\odot$.

LNLSUN $\log L_\nu/\mathrm{L}\odot$.

XTAL Mass fraction of model that is a crystalline solid.

NP Total number of points in the model. The other two numbers are not used.

Finally, we get to the model information itself. All of the zones for a given variable are given sequentially, then the values for the next variable follow, and so on. In the mode above, we start with the 399 radius values at each zone, then the 399 mass values, etc..

Table 1: Input Model Variables

elements	var. name	symbol	Quantity (cgs units)
AA(1,n)	r	r	Radius (cm)
AA(2,n)	mr	M	Mass at r. (grams)
AA(3,n)	lr	L	Luminosity at r. (ergs/s)
AA(4,n)	t	T	Temperature at r. (Kelvins)
AA(5,n)	rho	ρ	Density at r. (g/cm^3)
AA(6,n)	p	P	Pressure at r. (dynes/cm^2)
AA(7,n)	eps	ϵ	Neutrino energy loss rate. (ergs/s/g)
AA(8,n)	cv	C_v	Heat capacity at constant volume. (erg/K)
AA(9,n)	chr	χ_ρ	$\equiv (\partial \log P / \partial \log \rho)$
AA(10,n)	cht	χ_T	$\equiv (\partial \log P / \partial \log T)$
AA(11,n)	epsr	ϵ_ρ	$\equiv (\partial \log \epsilon / \partial \log \rho)$
AA(12,n)	epst	ϵ_T	$\equiv (\partial \log \epsilon / \partial \log T)$
AA(13,n)	kapr	κ_ρ	$\equiv (\partial \log \kappa / \partial \log \rho)$
AA(14,n)	kapt	κ_T	$\equiv (\partial \log \kappa / \partial \log T)$
AA(15,n)	del	∇	$\equiv (d \log T / d \log P)$
AA(16,n)	delad	∇_{ad}	$\equiv (\partial \log T / \partial \log P)_{ad}$
AA(17,n)	xhe	He	Helium mass fraction.
AA(18,n)	kap	κ	Opacity. (cm^2/g)
AA(19,n)	bled	B	Modified Ledoux term.
			Accounts for composition change contribution
			to the Brunt-Väisälä frequency.
AA(20,n)	ox	O	Oxygen mass fraction.

The two main output files are TAPE18.DAT and TAPE19.DAT. These output files contain variables suitable for use by the pulsation analysis programs of Saio & Cox (1980, ApJ, 236, 558). TAPE18.DAT is essentially a rehash of the input file, while TAPE19.DAT contains extra quantities required for the nonadiabatic version of the pulsation code.

Table 2: TAPE18.DAT variables

var. name	Quantity (cgs units)
r	Radius (cm)
mr	Mass at r. (grams)
lr	Luminosity at r. (ergs/s)
t	Temperature at r. (Kelvins)
rho	Density at r. (g/cm^3)
p	Pressure at r. (dynes/cm^2)
eps	(Neutrino) energy generation (or loss) rate. (ergs/s/g)
kap	Opacity. (cm^2/g)
cv	Heat capacity at constant volume. (erg/K)
chr	χ_ρ
cht	χ_T
epsr	ϵ_ρ
epst	ϵ_T
kapr	κ_ρ
kapt	κ_T
del	∇
delad	∇_{ad}
xhe	Helium mass fraction.
derro	$d\log\rho/d\log r$

Table 3: TABLE19.DAT variables

tthl	τ_{th} Thermal timescale (s)
r	$r/\mathrm{R}_\star$ Fractional radius
xl	$\ln r/P$ Independent variable of pulsation code.
u	$U \equiv d\log M/d\log r$. Homology invariant variable.
v	$V \equiv -d\log P/d\log r$. Homology invariant variable.
voga1	V/Γ_1
ra	$rA = -rN^2/g$ This is in essence, the Brunt-Väisälä frequency.
c1	$(r/\mathrm{R}_\star)^3(\mathrm{M}_\star/m)$
chtor	$\chi_T/\chi\rho$
eta	$d\ln L_{rad}/d\ln r$
c4	C_4 See Saio & Cox for definition.
	Related to the thermal timescale at small optical depths.
b1	B_1 See Saio & Cox for definition.
b2	B_2 See Saio & Cox for definition.
b3	B_3 See Saio & Cox for definition.
b4	B_4 See Saio & Cox for definition.
	This is the ratio of the thermal to the dynamical timescale.
del	$\nabla \equiv (d\log T/d\log P)$
kapr	$\kappa_\rho \equiv (\partial\log\kappa/\partial\log\rho)$
kapt	$\kappa_T \equiv (\partial\log\kappa/\partial\log T)$
alfa	$\alpha \equiv (\nabla_{ad}/\nabla)$

The other output files and what they contain are listed below:

Table 4: Other Output Files From PRPWDXDL.F

File Name	Contents
output.dat	detailed model listing suitable for printing.
tape28.dat	First part of file of Runge-Kutta-Fehlberg pulsation code.
tape29.dat	Second part of file of Runge-Kutta-Fehlberg pulsation code.
modelp.dat	Model parameters for header of pulsation analysis results.
prop.dat	Plottable version of acoustic and Brunt-Väisälä frequency.
	Versus $-\log(1 - m/\mathrm{M}_\star)$, as are all plot files.
deld.dat	∇ and ∇_{ad} profiles.
kaprt.dat	κ, κ_ρ, and κ_T profiles.
xhe.dat	helium mass fraction, modified Ledoux term,
	and oxygen mass fraction profiles.
lrad.dat	Radiative luminosity profile.
temprp.dat	Temperature, density, and pressure profiles.
chirt.dat	χ_ρ and χ_T profiles.
epsrt.dat	ϵ, ϵ_ρ, and ϵ_T profiles.
cpvtga1.dat	C_P, C_v, and Γ_1 profiles.
tmp.dat	T_6, density, $\log R$, He, and O profiles. For diagnosing
	location of a given point on OPAL opacity tables.