

A decorative graphic on the left side of the slide, consisting of a vertical black line intersecting a horizontal grey line. To the left of the intersection are three overlapping squares: a blue one at the top, a red one on the left, and a yellow one at the bottom.

Site Review

New Control Programs



CyFlex Implementation of Controls

- General purpose user controls
 - Air and fuel flow systems
 - Cooling systems
 - Single loop or cascaded controls where one loop outputs the setpoint for another loop.
- Engine control systems
 - Speed control
 - Torque control
 - Manipulation of the engine throttle (fueling)
 - One or two devices to absorb load



User Control Specification Files

- Keyword format for user control specification files
 - One or more loops may be specified per file
 - Each loop has a name which can be different from the feedback variable
 - Launch with:
`user_ctrl_specs [filename] [loopname]`
 - Multiple instances of the `user_ctrl_task` will be launched by `user_ctrl_specs`
 - Reprocessing the file does not slay existing user control programs
 - If a loop is commented out in the file, use the command `"remove_pnp loop"` to clean things up



Engine Control Specification Files

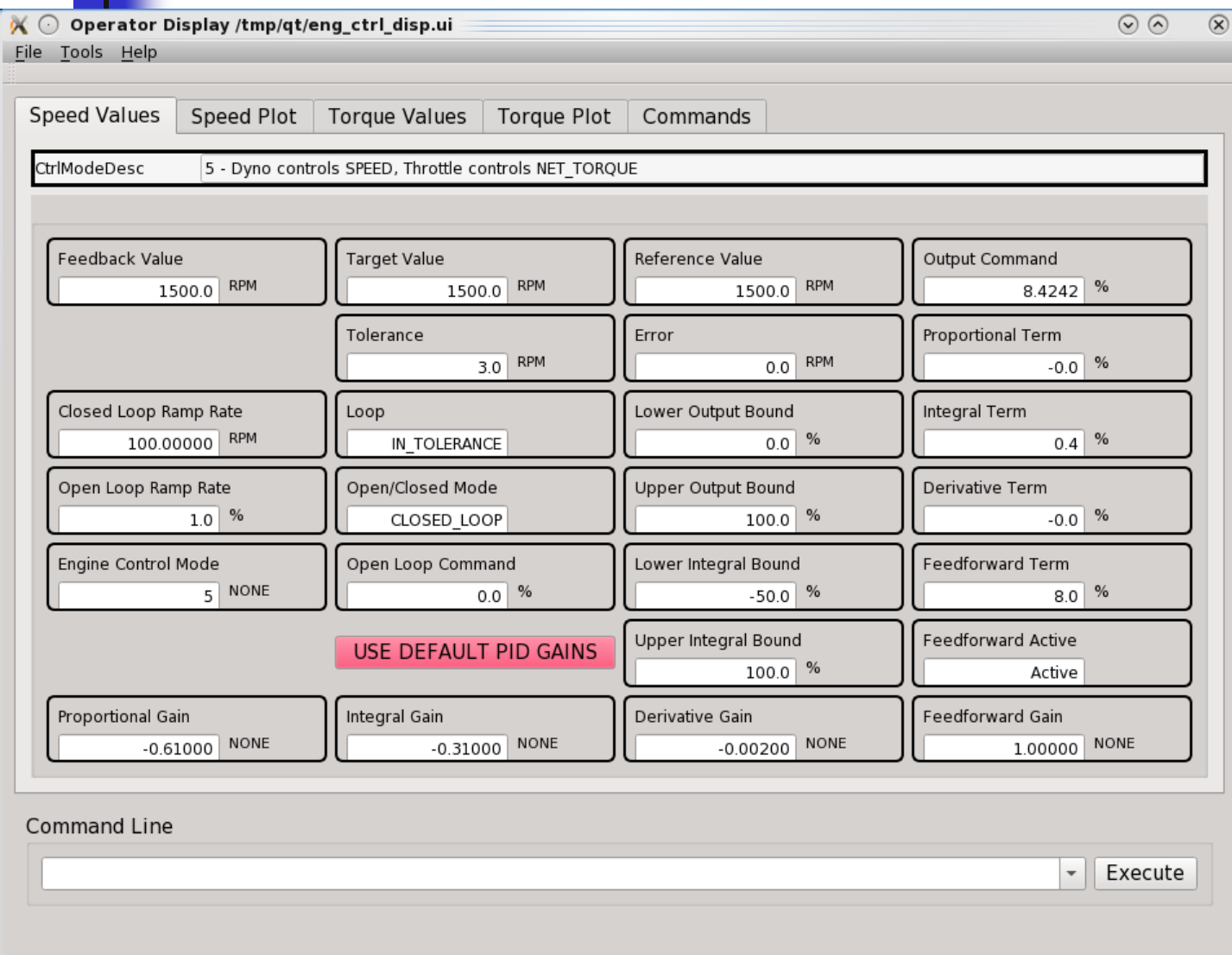
- Separate specification file for engine controls
 - Keyword format similar to user controls
 - Specify dyno (alternator) and throttle control loops
 - Launch with:
`eng_ctrl_specs [filename]`
 - More options are available over the old control task



Control Display Variables

- More CyFlex variables are created for both engine and user controls
- Most inputs can be values, CyFlex labels, or computed expressions
- Many are live and can be changed by the user by setting a value (svar), with a test procedure, or with the display GUI

Engine Control Display GUI



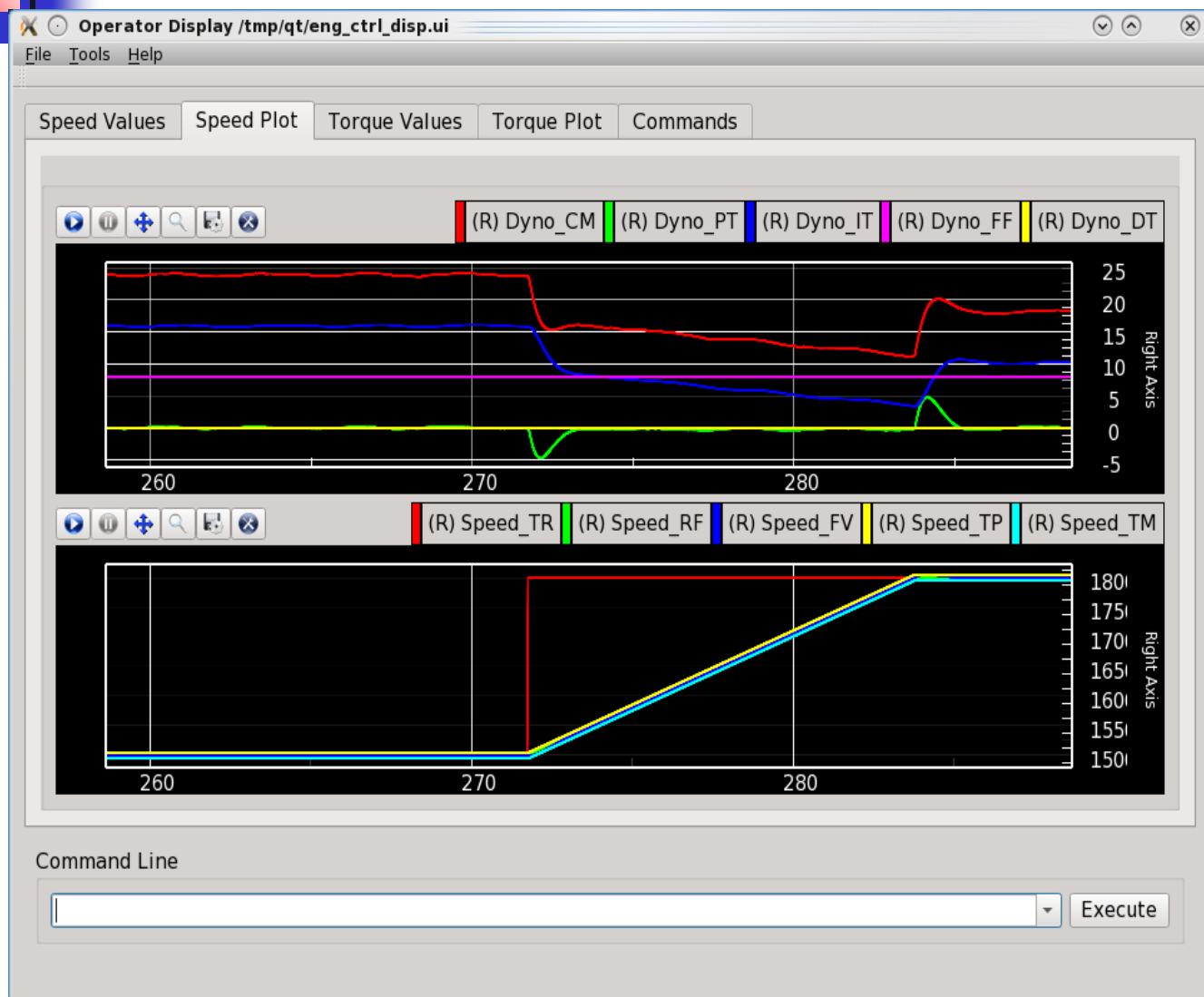
The screenshot shows the 'Operator Display /tmp/qt/eng_ctrl_disp.ui' window. It features a menu bar with 'File', 'Tools', and 'Help'. Below the menu bar are tabs for 'Speed Values', 'Speed Plot', 'Torque Values', 'Torque Plot', and 'Commands'. The 'Speed Values' tab is active, displaying a 'CtrlModeDesc' field with the text '5 - Dyno controls SPEED, Throttle controls NET_TORQUE'. The main area contains a grid of control parameters:

Feedback Value 1500.0 RPM	Target Value 1500.0 RPM	Reference Value 1500.0 RPM	Output Command 8.4242 %
	Tolerance 3.0 RPM	Error 0.0 RPM	Proportional Term -0.0 %
Closed Loop Ramp Rate 100.00000 RPM	Loop IN_TOLERANCE	Lower Output Bound 0.0 %	Integral Term 0.4 %
Open Loop Ramp Rate 1.0 %	Open/Closed Mode CLOSED_LOOP	Upper Output Bound 100.0 %	Derivative Term -0.0 %
Engine Control Mode 5 NONE	Open Loop Command 0.0 %	Lower Integral Bound -50.0 %	Feedforward Term 8.0 %
	USE DEFAULT PID GAINS	Upper Integral Bound 100.0 %	Feedforward Active Active
Proportional Gain -0.61000 NONE	Integral Gain -0.31000 NONE	Derivative Gain -0.00200 NONE	Feedforward Gain 1.00000 NONE

At the bottom, there is a 'Command Line' section with a text input field and an 'Execute' button.

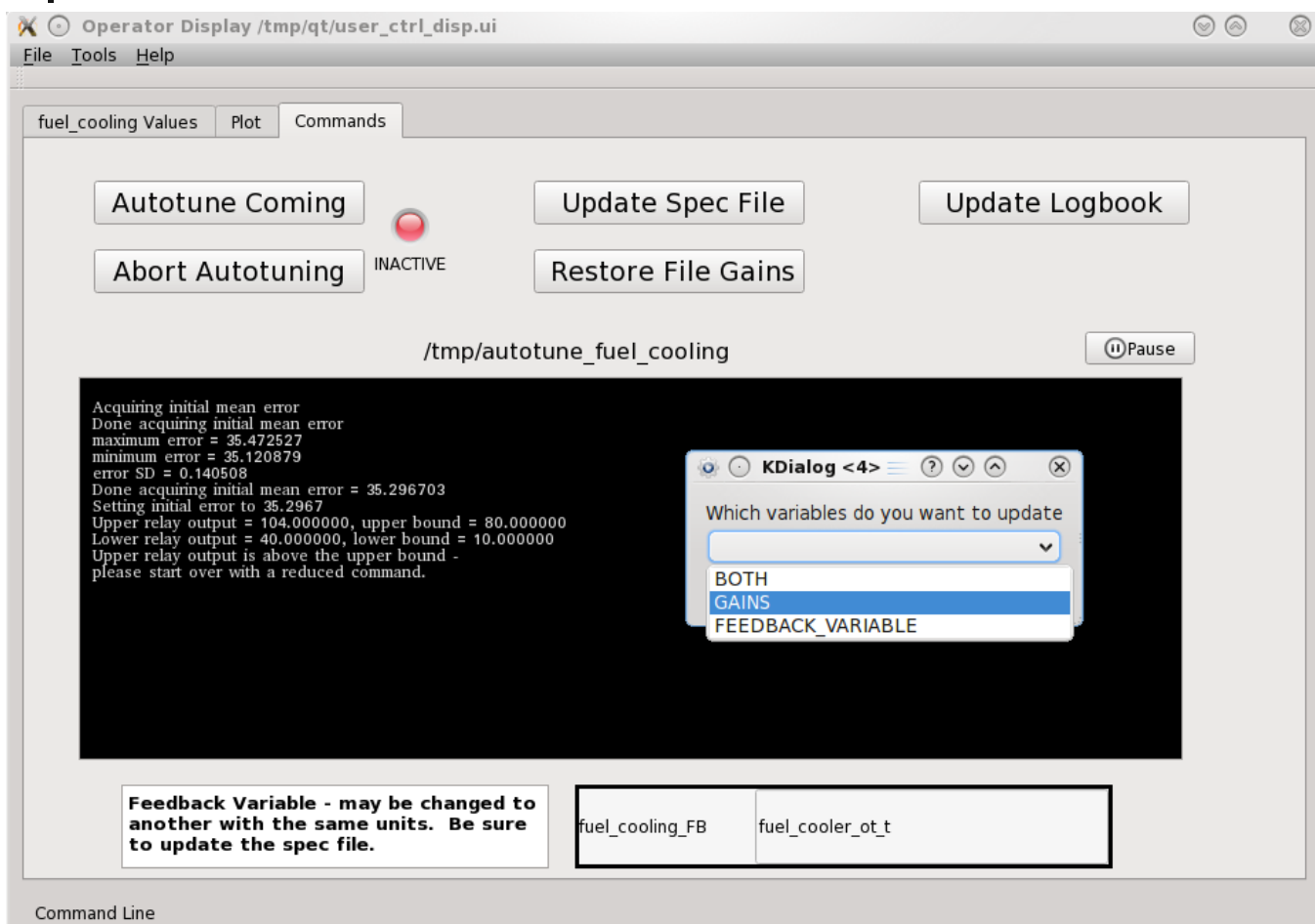
- Launch with ctrl_disp for engine loops

Control Display GUI



- Launch with "ctrl_disp"

User Control Display GUI



Operator Display /tmp/qt/user_ctrl_disp.ui

File Tools Help

fuel_cooling Values Plot Commands

Autotune Coming Update Spec File Update Logbook

Abort Autotuning INACTIVE Restore File Gains

/tmp/autotune_fuel_cooling Pause

```

Acquiring initial mean error
Done acquiring initial mean error
maximum error = 35.472527
minimum error = 35.120879
error SD = 0.140508
Done acquiring initial mean error = 35.296703
Setting initial error to 35.2967
Upper relay output = 104.000000, upper bound = 80.000000
Lower relay output = 40.000000, lower bound = 10.000000
Upper relay output is above the upper bound -
please start over with a reduced command.
    
```

Which variables do you want to update

- BOTH
- GAINS**
- FEEDBACK_VARIABLE

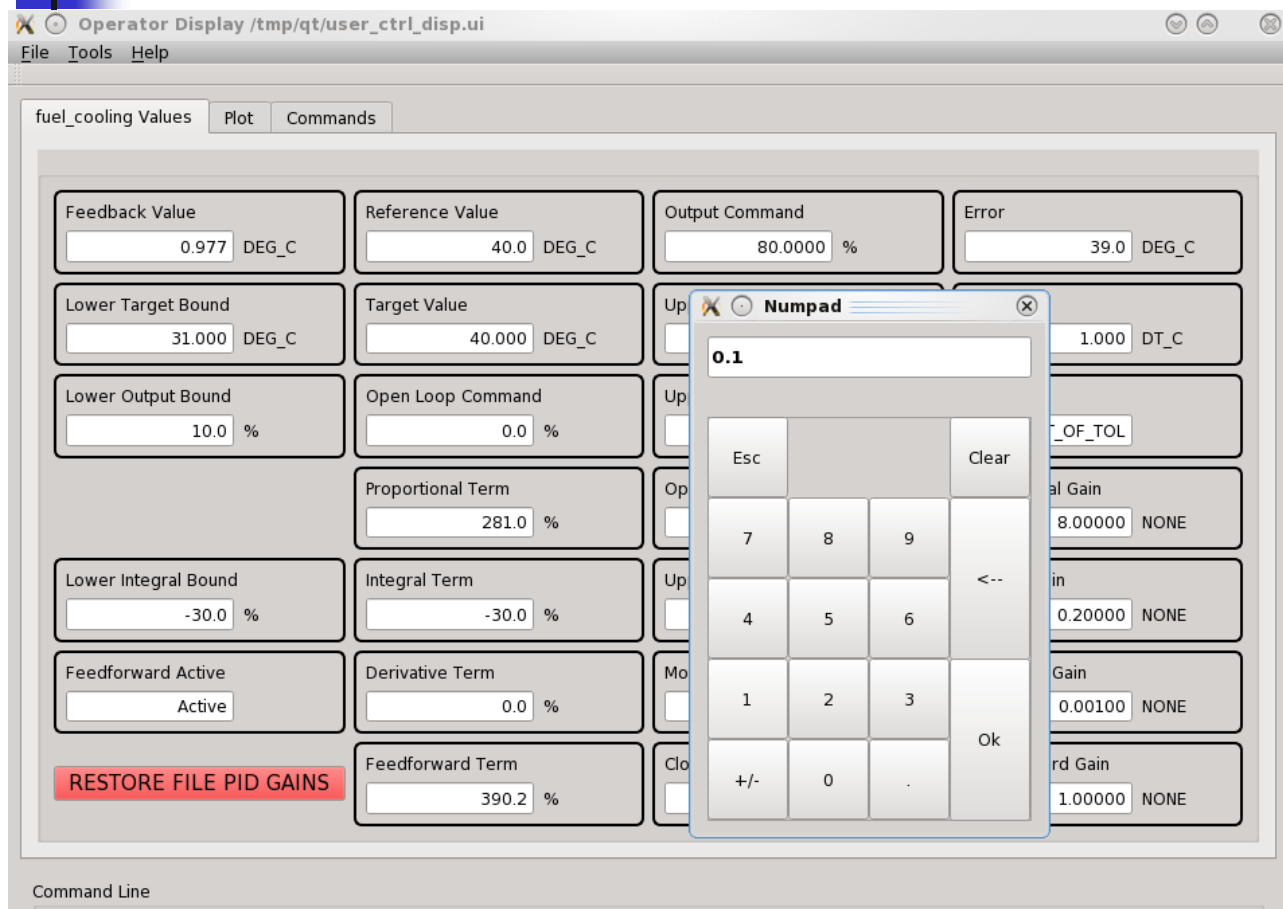
Feedback Variable - may be changed to another with the same units. Be sure to update the spec file.

fuel_cooling_FB fuel_cooler_ot_t

Command Line

- Launch with "ctrl_disp loop_name"

User Control Display GUI



- Change values with the GUI



New CyFlex Control Programs

- Alpha testing was done by Dan Redmon
 - All issues were addressed and requests for change were completed
- Alpha testing was also done in TRP test cells
- Beta testing was done by Scott McInerny on the CTC test bench
- Would like to work closely with a site when 6.3.X is installed