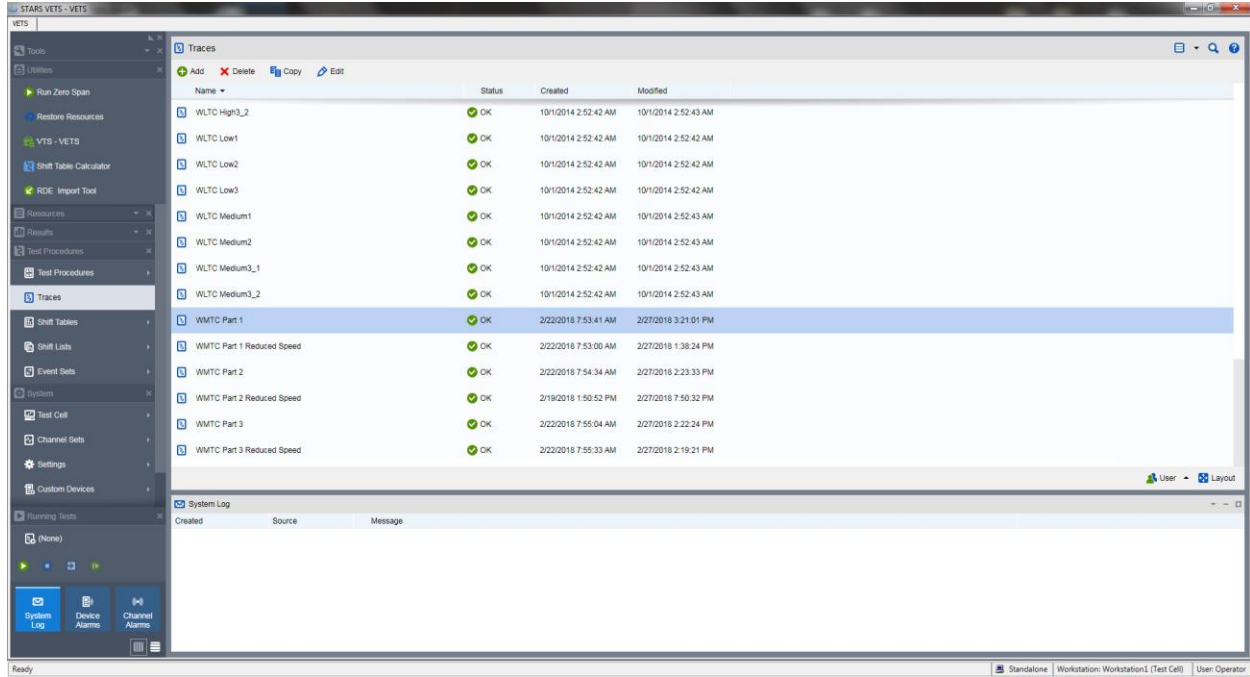


WMTC Shift Table Calculator Tool Documentation

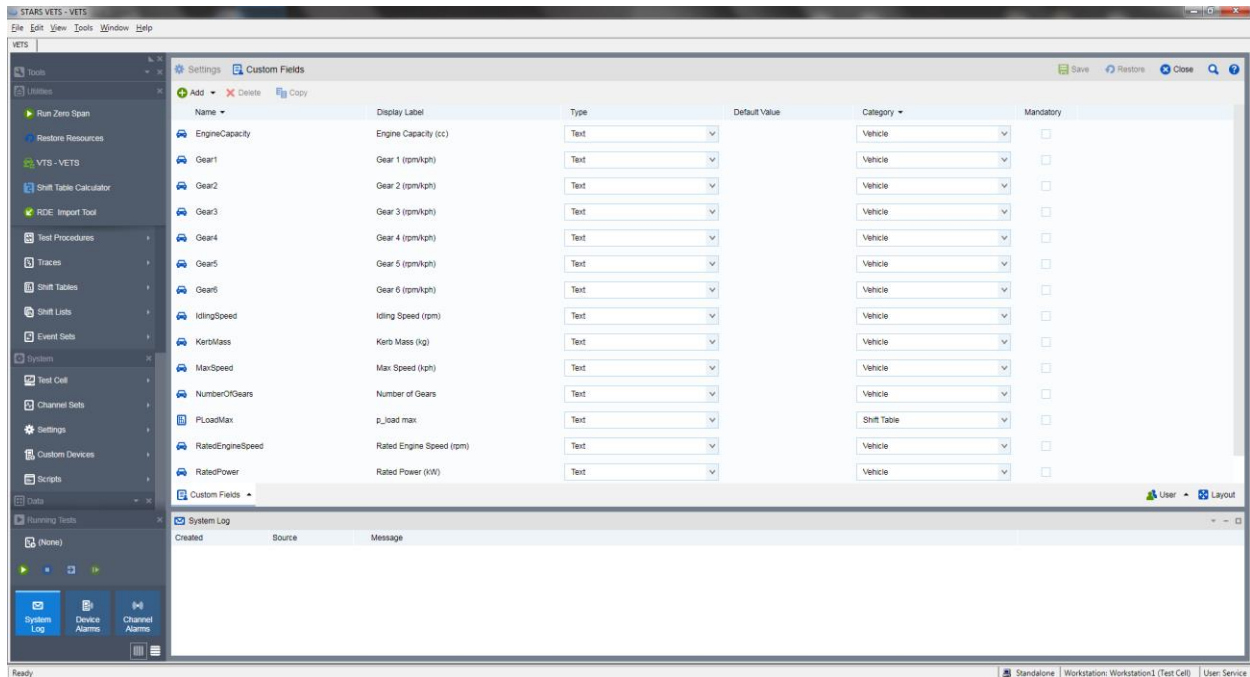
Author: Derek Savery

Date: 3/13/2018

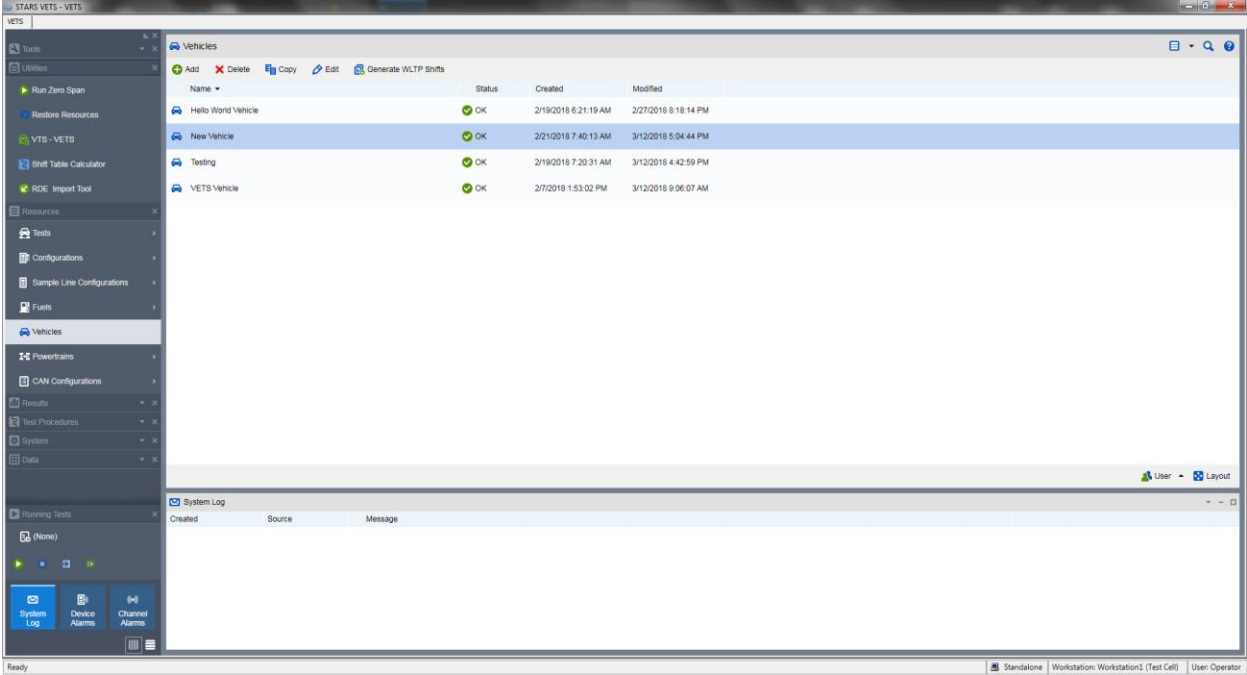
Open VETS, make sure WMTC Part 1, WMTC Part 1 Reduced Speed, WMTC Part 2, WMTC Part 2 Reduced Speed, WMTC Part 3, and WMTC Part 3 Reduced Speed traces are present.



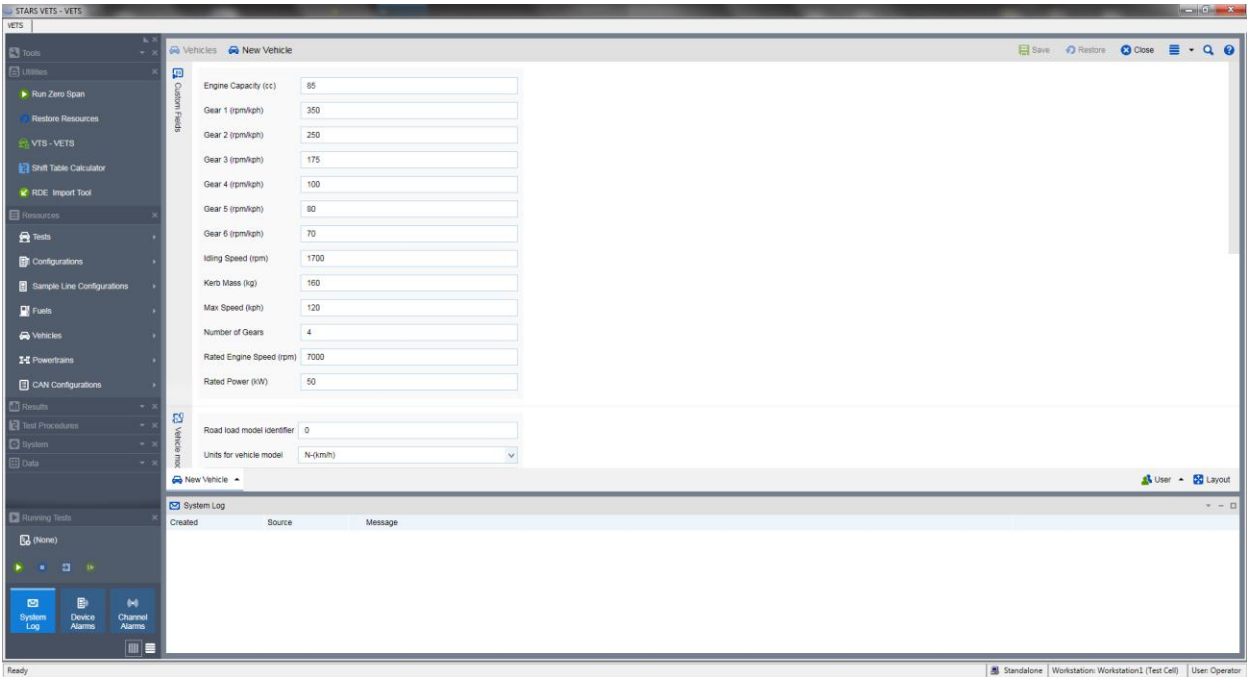
The following 14 custom fields are required for the Shift Table Calculator tool functionality. Display Label, Default Value, and Mandatory entries can be customized as desired, however, Name, Type, and Category values must match the image.



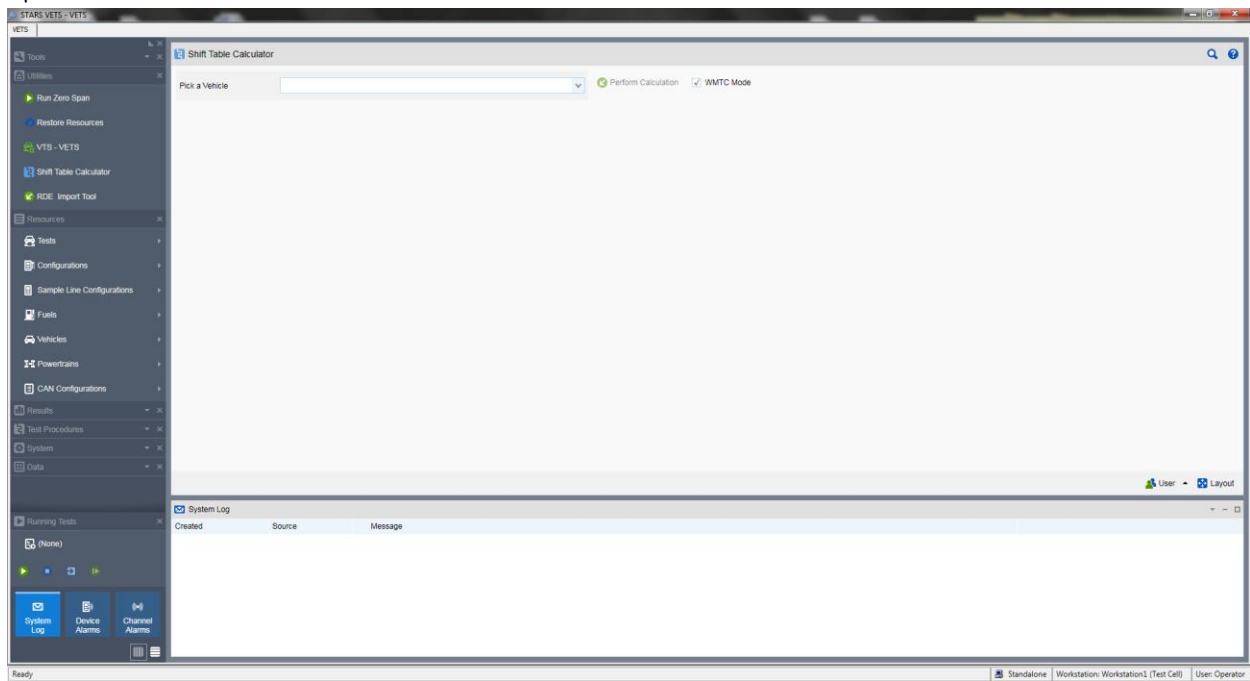
Make sure there are some vehicle resources are present within VETS.



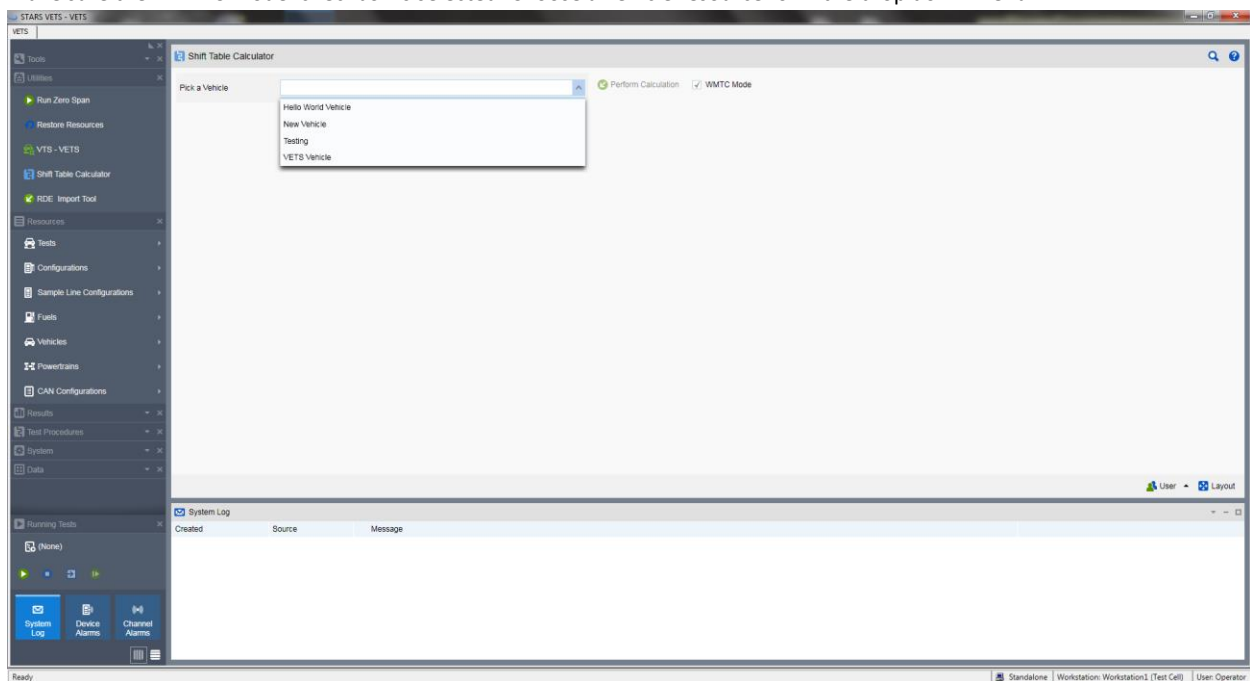
Add some values to the custom fields on the vehicle resources.



Open the Shift Table Calculator tool found in the utilities menu.



Make sure the 'WMTC Mode' checkbox is selected. Choose a vehicle resource form the drop down menu.



The tool will populate textboxes with the information contained in the custom fields of the selected vehicle resource. The 'Vehicle Class' value is auto-calculated using the values of 'Engine Capacity' and 'Max Speed'. Vehicle class can be: '1', '2.1', '2.2', '3.1', or '3.2'. The vehicle class determines which parts of the WMTC trace will be tested against, and therefore which parts of the trace a shift table will be calculated for. Class 1 -> Part 1 Reduced; Class 2.1 -> Part 1 Reduced, Part 2 Reduced; Class 2.2 -> Part 1, Part 2; Class 3.1 -> Part 1, Part 2, Part 3 Reduced; Class 3.2 -> Part 1, Part 2, Part 3.

The screenshot shows the 'Shift Table Calculator' window in the STARS VETS - VETS application. The interface includes a sidebar with various tool categories and a main workspace for configuring vehicle parameters.

Vehicle Configuration:

- Pick a Vehicle: Hello World Vehicle
- Part 1 Reduced: Hello World Vehicle WMTC Part 1 Reduced Speed
- Part 2 Reduced: Hello World Vehicle WMTC Part 2 Reduced Speed

Engine and Gear Parameters:

Parameter	Value	Parameter	Value
Engine Capacity (cc)	700	Number of Gears	6
Rated Power (kW)	300	Gear 1 (rpm/kph)	294.7
Kerb Mass (kg)	65	Gear 2 (rpm/kph)	171.4
Max Speed (kph)	18	Gear 3 (rpm/kph)	108.7
Rated Engine Speed (rpm)	7000	Gear 4 (rpm/kph)	80
Idling Speed (rpm)	1700	Gear 5 (rpm/kph)	70
Vehicle Class	2.1	Gear 6 (rpm/kph)	60

*Calculated from Engine Capacity and Max Speed

System Log:

Created	Source	Message
(Empty)		

The status bar at the bottom indicates 'Ready' and 'Standalone' mode.

The names of the shifts to be created are auto-generated using the name of the vehicle resource, but these can be changed as desired.

The screenshot shows the 'Shift Table Calculator' window in the STARS VETS - VETS application, configured for a 'New Vehicle'.

Vehicle Configuration:

- Pick a Vehicle: New Vehicle
- Part 1: New Vehicle WMTC Part 1
- Part 2: New Vehicle WMTC Part 2
- Part 3: New Vehicle WMTC Part 3

Engine and Gear Parameters:

Parameter	Value	Parameter	Value
Engine Capacity (cc)	85	Number of Gears	6
Rated Power (kW)	50	Gear 1 (rpm/kph)	350
Kerb Mass (kg)	160	Gear 2 (rpm/kph)	250
Max Speed (kph)	160	Gear 3 (rpm/kph)	175
Rated Engine Speed (rpm)	7000	Gear 4 (rpm/kph)	100
Idling Speed (rpm)	1700	Gear 5 (rpm/kph)	80
Vehicle Class	3.2	Gear 6 (rpm/kph)	70

*Calculated from Engine Capacity and Max Speed

System Log:

Created	Source	Message
(Empty)		

The status bar at the bottom indicates 'Ready' and 'Standalone' mode.

The textboxes which are linked to the custom fields of the vehicle resource can be edited from the tool view.

The screenshot shows the 'Shift Table Calculator' tool in the STARS VETS - VETS application. The interface includes a sidebar with navigation options like Tools, Utilities, Resources, Tests, Configurations, Sample Line Configurations, Fuels, Vehicles, Powertrains, CAN Configurations, Results, Test Procedures, Traces, and Shift Tables. The main area is titled 'Shift Table Calculator' and contains a 'Pick a Vehicle' dropdown set to 'New Vehicle'. Below this are three textboxes for 'Part 1', 'Part 2', and 'Part 3', all containing 'New Vehicle WMTTC Part 1', 'New Vehicle WMTTC Part 2', and 'New Vehicle WMTTC Part 3' respectively. To the right of these are checkboxes for 'Perform Calculation' (checked) and 'WMTTC Mode' (checked). Below these are two columns of input fields for vehicle specifications: Engine Capacity (cc), Rated Power (kW), Kerb Mass (kg), Max Speed (kph), Rated Engine Speed (rpm), Idling Speed (rpm), and Vehicle Class. The 'Number of Gears' field is also present. The bottom section of the tool view is a 'System Log' table with columns 'Created', 'Source', and 'Message'. The status bar at the bottom indicates 'Ready' and 'Standalone'.

Engine Capacity (cc)	Rated Power (kW)	Kerb Mass (kg)	Max Speed (kph)	Rated Engine Speed (rpm)	Idling Speed (rpm)	Vehicle Class	Number of Gears
85	50	160	160	7000	1700	3.2	4

Changes to the textboxes will automatically update and save the custom field values.

This screenshot shows the same 'Shift Table Calculator' tool view as the previous one, but with updated values in the input fields. The 'Number of Gears' field now contains the value '4'. The 'System Log' table remains empty. The status bar at the bottom indicates 'Ready' and 'Standalone'.

Engine Capacity (cc)	Rated Power (kW)	Kerb Mass (kg)	Max Speed (kph)	Rated Engine Speed (rpm)	Idling Speed (rpm)	Vehicle Class	Number of Gears
85	50	160	160	7000	1700	3.2	4

STARS VETS - VETS

VETS

Tools

Utilities

- Run Zero Span
- Restore Resources
- VTS - VETS
- Shift Table Calculator
- RDE Import Tool

Resources

- Tests
- Configurations
- Sample Line Configurations
- Fuels
- Vehicles
- Powertrains
- CAN Configurations

Results

- Test Procedures
- Test Procedures
- Traces
- Shift Tables

Running Tests

(None)

System Log

Device Alarms

Channel Alarms

Shift Table Calculator

Pick a Vehicle: New Vehicle

Perform Calculation: ☒ WMTC Mode

Part 1: New Vehicle WMTC Part 1

Part 2: New Vehicle WMTC Part 2

Part 3: New Vehicle WMTC Part 3

Engine Capacity (cc)	85	Number of Gears	4
Rated Power (kW)	50	Gear 1 (rpm/kph)	350
Kerb Mass (kg)	160	Gear 2 (rpm/kph)	250
Max Speed (kph)	180	Gear 3 (rpm/kph)	175
Rated Engine Speed (rpm)	7000	Gear 4 (rpm/kph)	100
Idling Speed (rpm)	1700		
Vehicle Class	3.2		

*Calculated from Engine Capacity and Max Speed

System Log

Created	Source	Message
---------	--------	---------

User Layout

Ready

Standalone Workstation: Workstation1 (Test Cell) User: Operator

Notice how changing 'Max Speed' also causes 'Vehicle Class' to change.

STARS VETS - VETS

VETS

Tools

Utilities

- Run Zero Span
- Restore Resources
- VTS - VETS
- Shift Table Calculator
- RDE Import Tool

Resources

- Tests
- Configurations
- Sample Line Configurations
- Fuels
- Vehicles
- Powertrains
- CAN Configurations

Results

- Test Procedures
- Test Procedures
- Traces
- Shift Tables

Running Tests

(None)

System Log

Device Alarms

Channel Alarms

Shift Table Calculator

Pick a Vehicle: New Vehicle

Perform Calculation: ☒ WMTC Mode

Part 1: New Vehicle WMTC Part 1

Part 2: New Vehicle WMTC Part 2

Part 3: New Vehicle WMTC Part 3

Engine Capacity (cc)	85	Number of Gears	4
Rated Power (kW)	50	Gear 1 (rpm/kph)	350
Kerb Mass (kg)	160	Gear 2 (rpm/kph)	250
Max Speed (kph)	120	Gear 3 (rpm/kph)	175
Rated Engine Speed (rpm)	7000	Gear 4 (rpm/kph)	100
Idling Speed (rpm)	1700		
Vehicle Class	2.2		

*Calculated from Engine Capacity and Max Speed

System Log

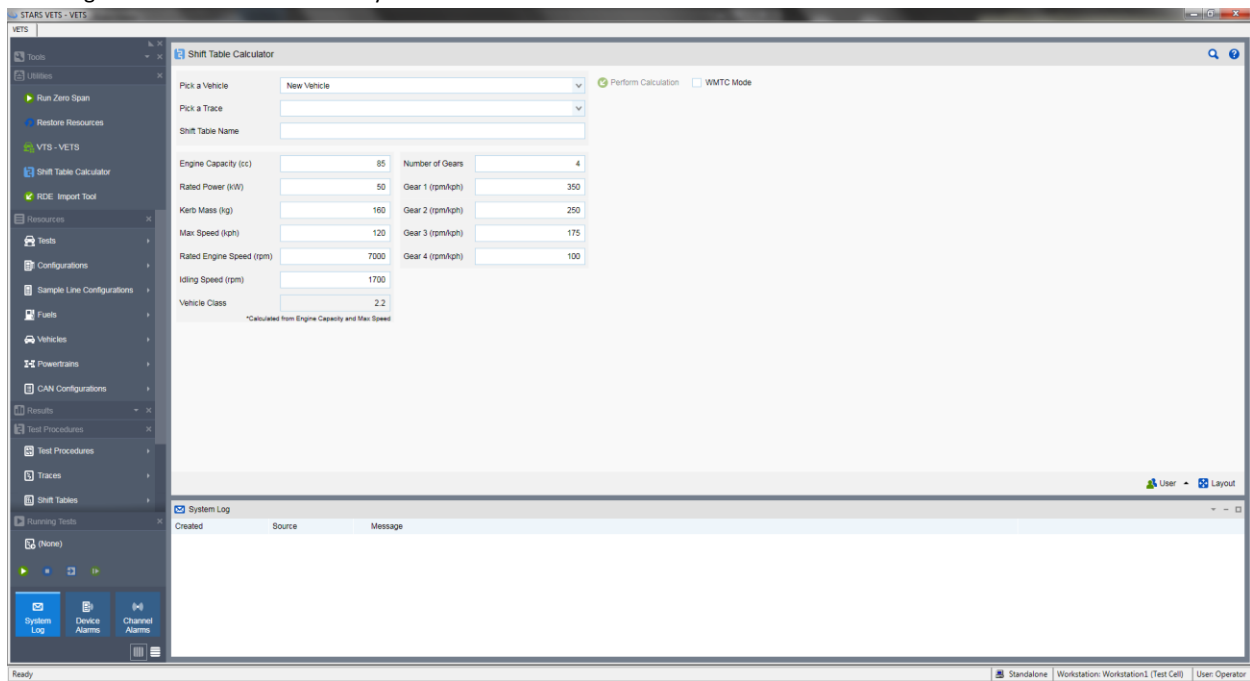
Created	Source	Message
---------	--------	---------

User Layout

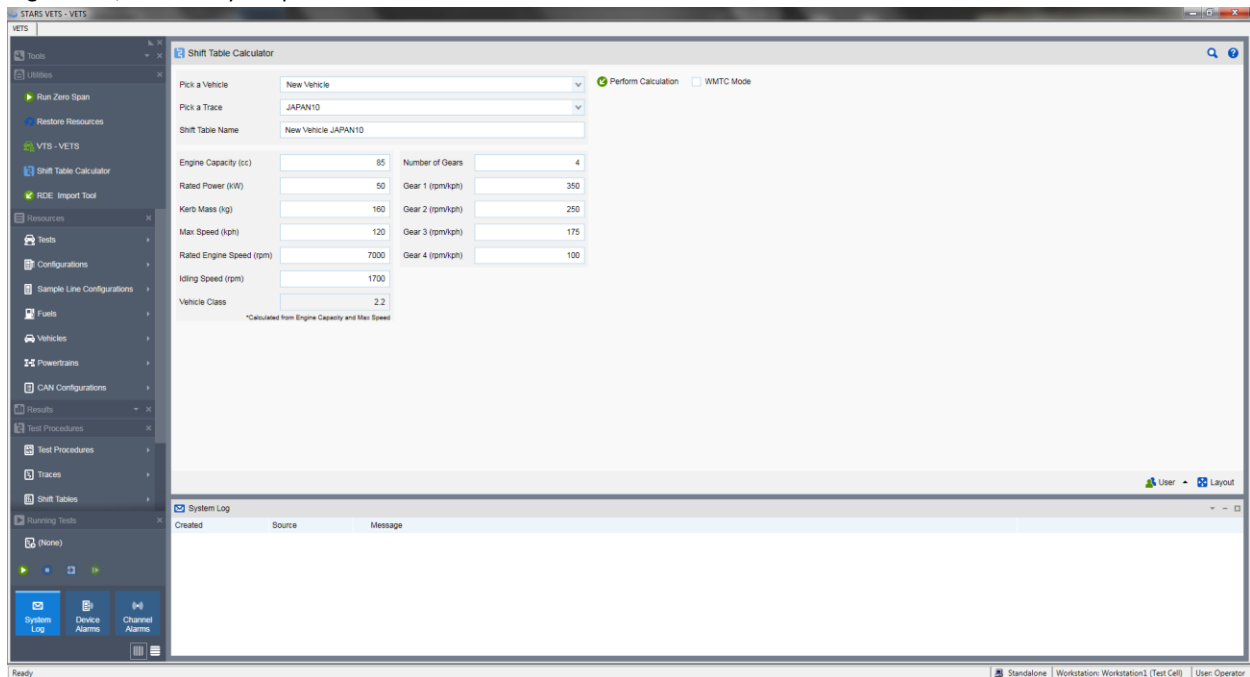
Ready

Standalone Workstation: Workstation1 (Test Cell) User: Operator

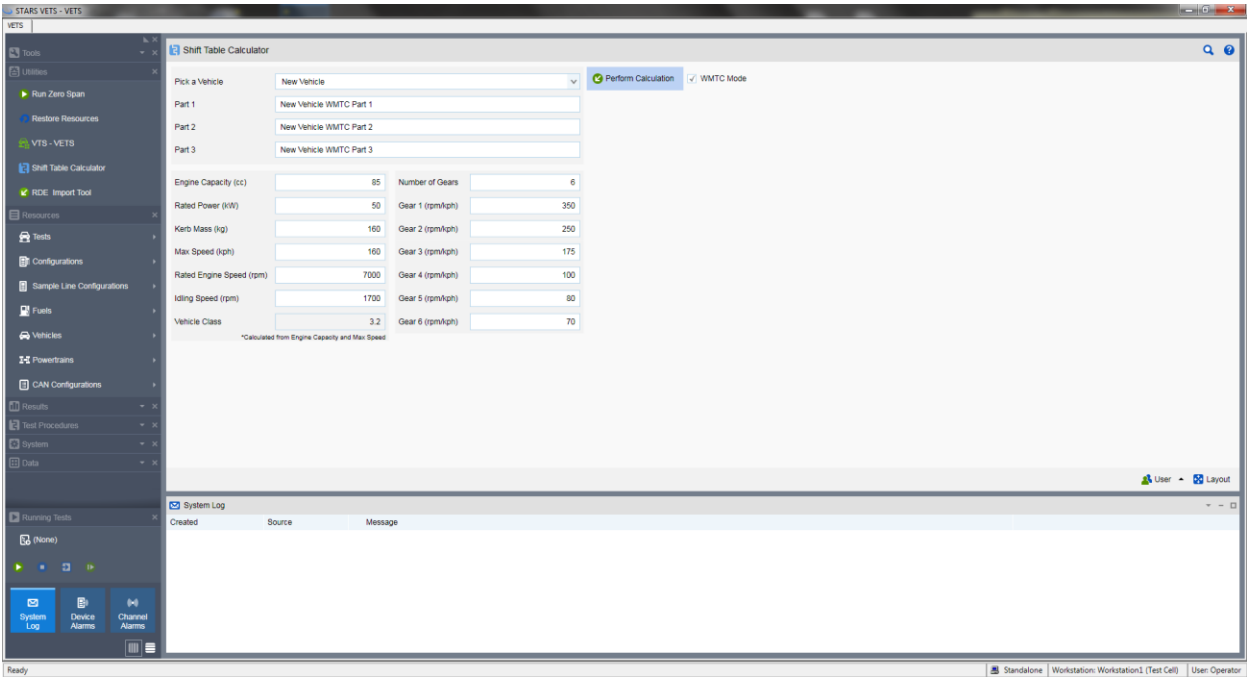
Disabling 'WMTC Mode' allows for any trace to be chosen for shift table calculation.



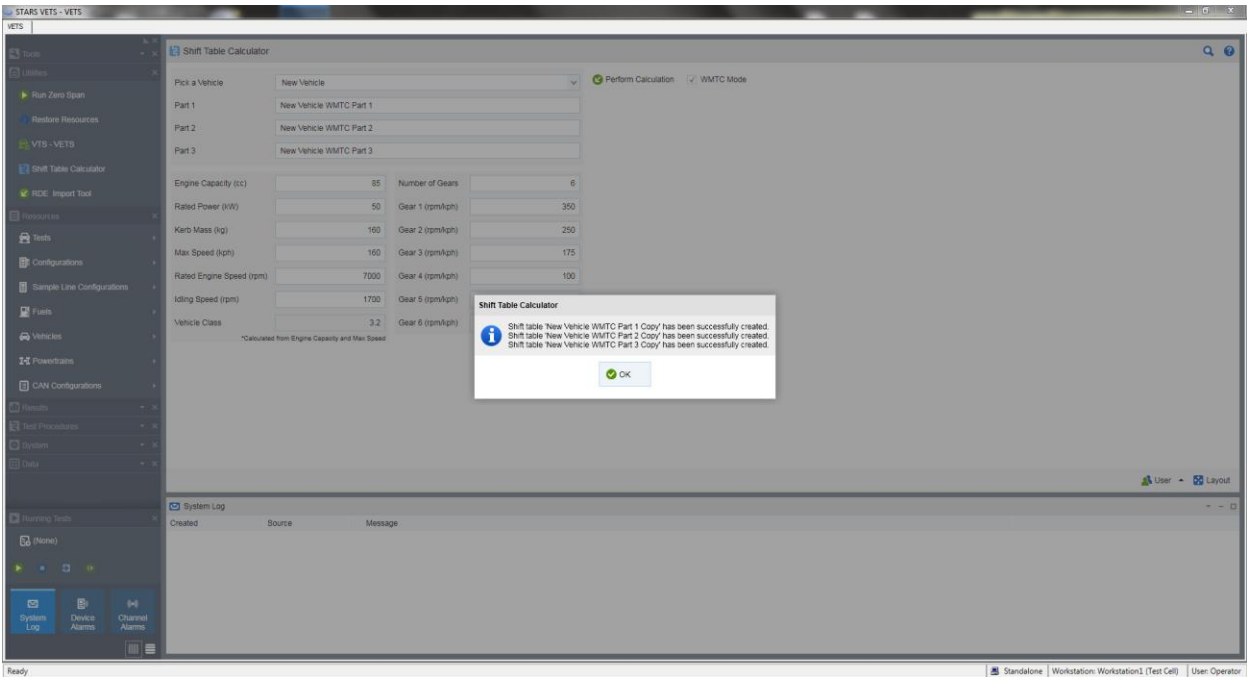
Keep in mind however that the underlying code performs shift calculations using methodologies pertaining to WMTC regulations, so this may not produce desired results.



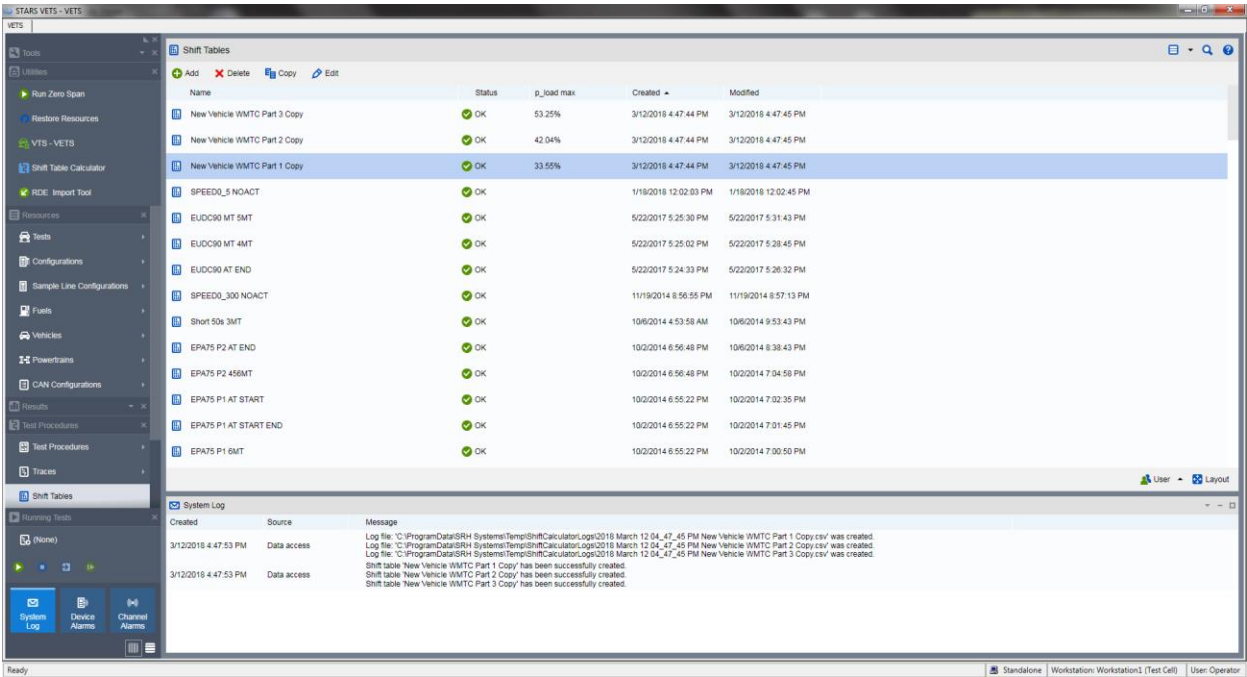
Once the values on the custom fields and names of the shift tables are set, click ‘Perform Calculation’.



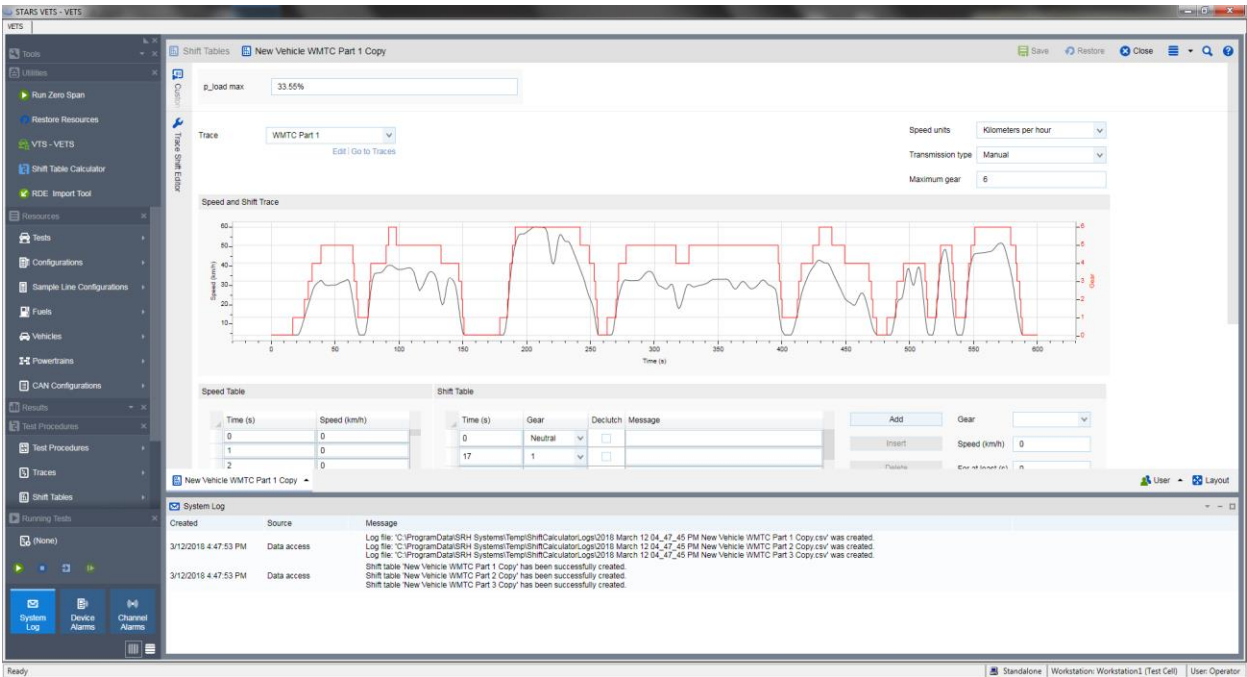
The shift tables will be calculated and created. The tool will automatically alter a chosen name to make it unique (such as by adding ‘Copy’ to the end) if a shift table resource with that name already exists within VETS.



The newly generated shifts will now be present within the Shift Tables view.



p_load max is an indicator of drivability. If p_load max > 100% then drivability issues are to be expected for the vehicle-trace combination (i.e. there is no shift transition timing order which will allow for required speeds and/or accelerations to be met).



If a value of $p_load\ max > 100\%$ is determined during shift table calculation, the tool will present a warning and ask if you wish to go ahead with the creation of the shift table anyways.

