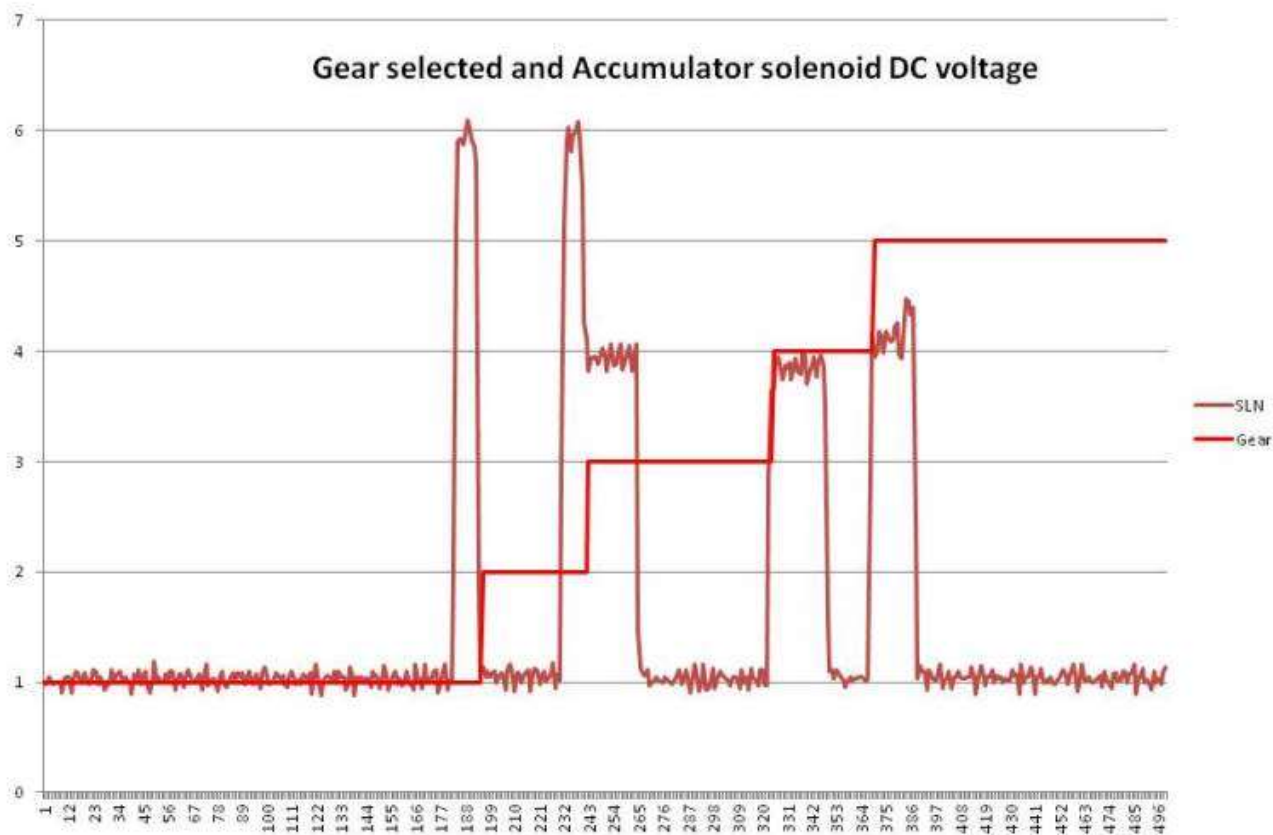


Hi James.

Here is some data recorded during a relatively gentle acceleration through all 5 gears.

First one is the accumulator solenoid that you can see activating in some cases before gear changes and in other cases after gear changes.

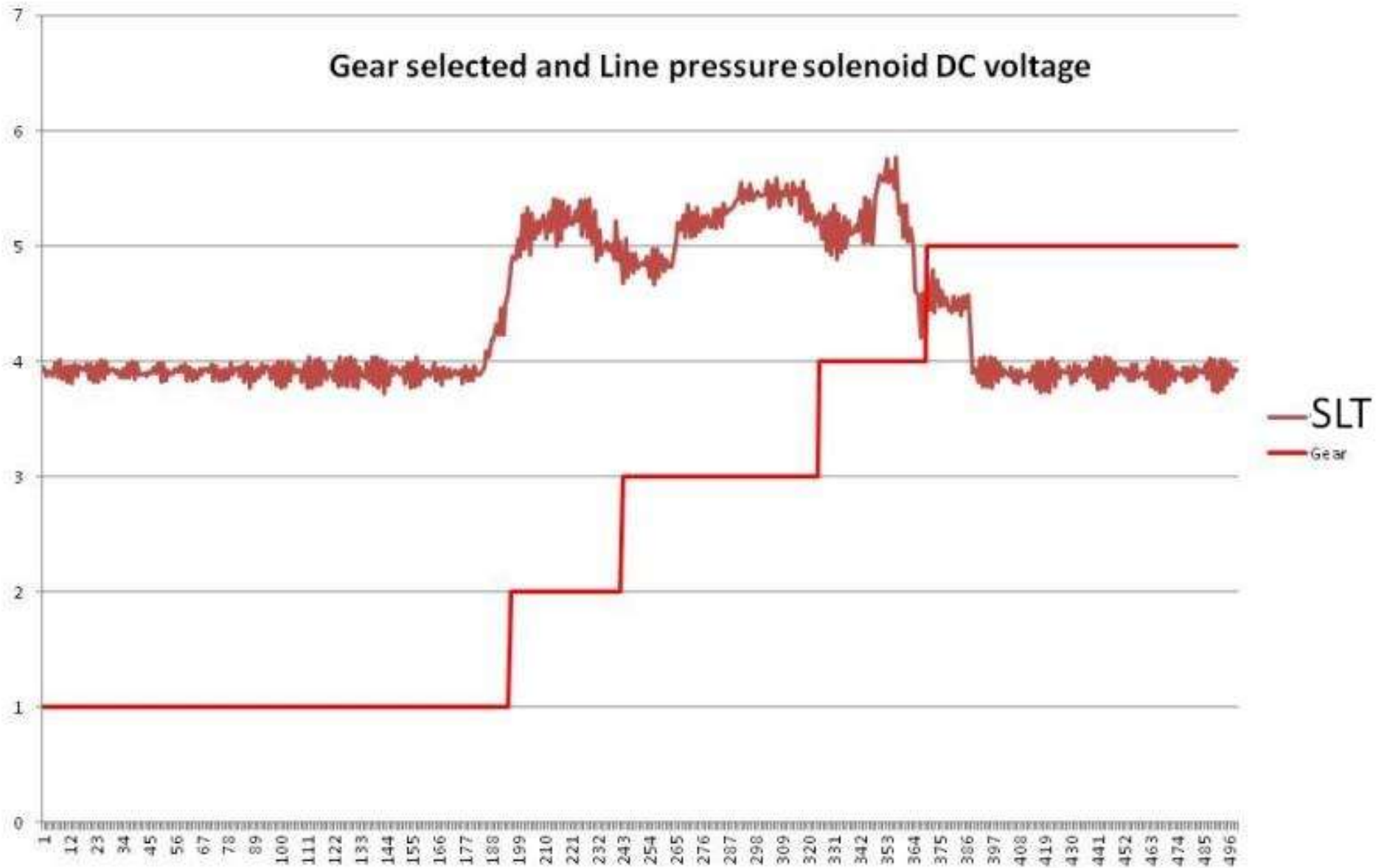


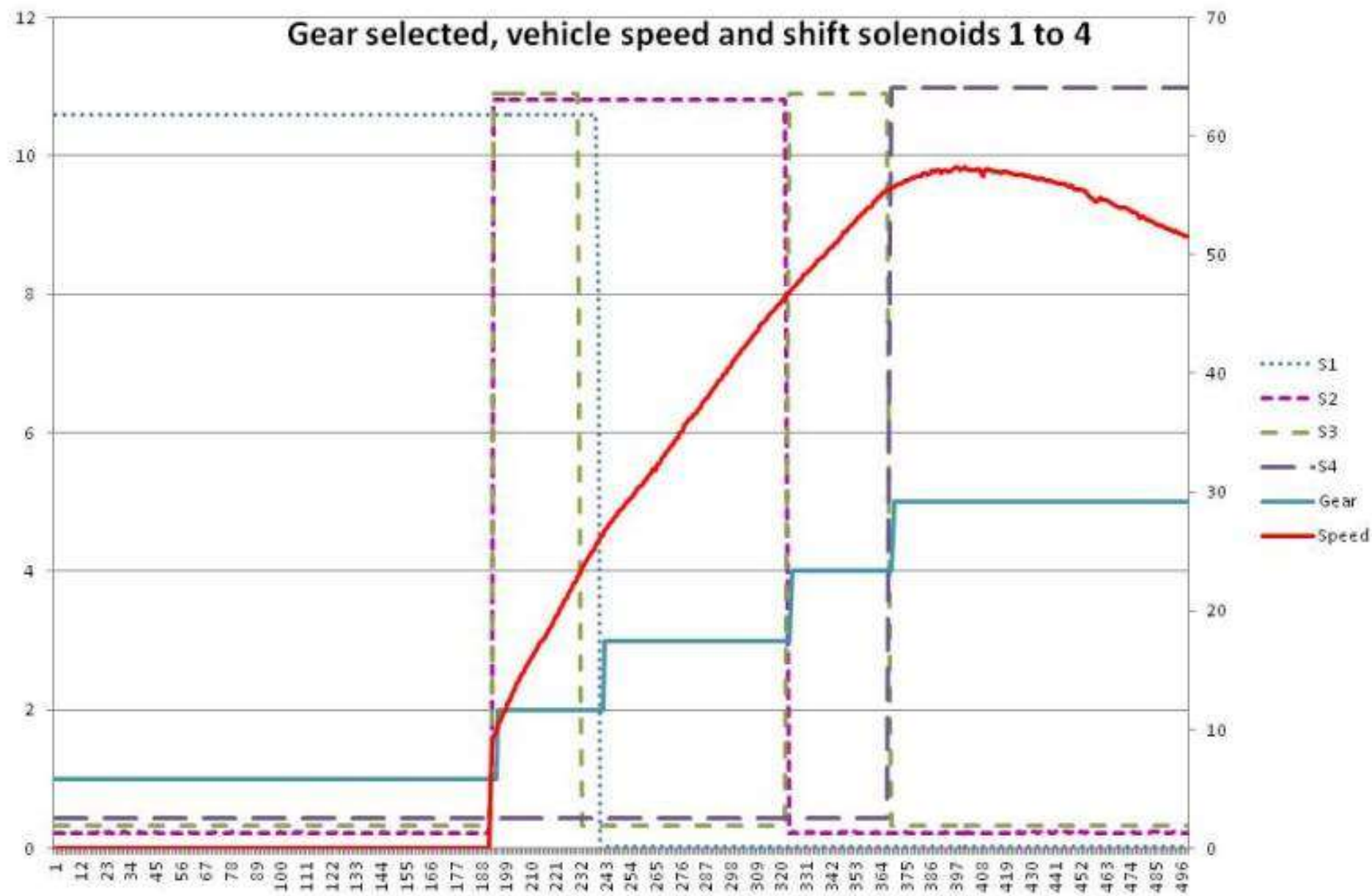
A couple of notes on the factory A650E controller.

Looks like the **accumulator solenoid is the most complicated** one and it will take a bit longer to figure out that one.

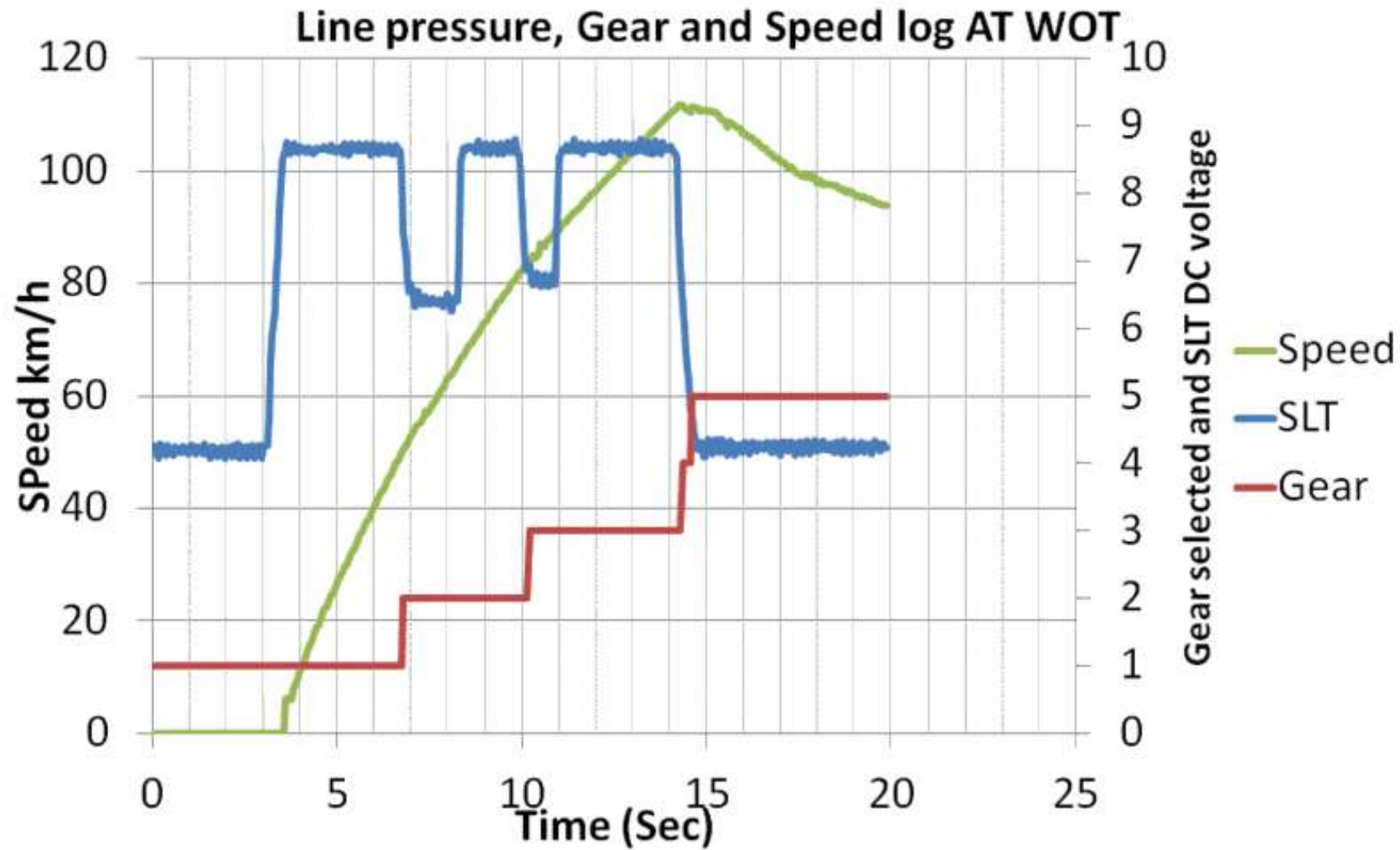
The **line pressure solenoid duty cycle** goes down with increasing throttle opening in a fairly linear way. It starts off at about 50% duty cycle and goes down to about 15% at WOT.

Second shows the relatively simple operation of the line pressure solenoid

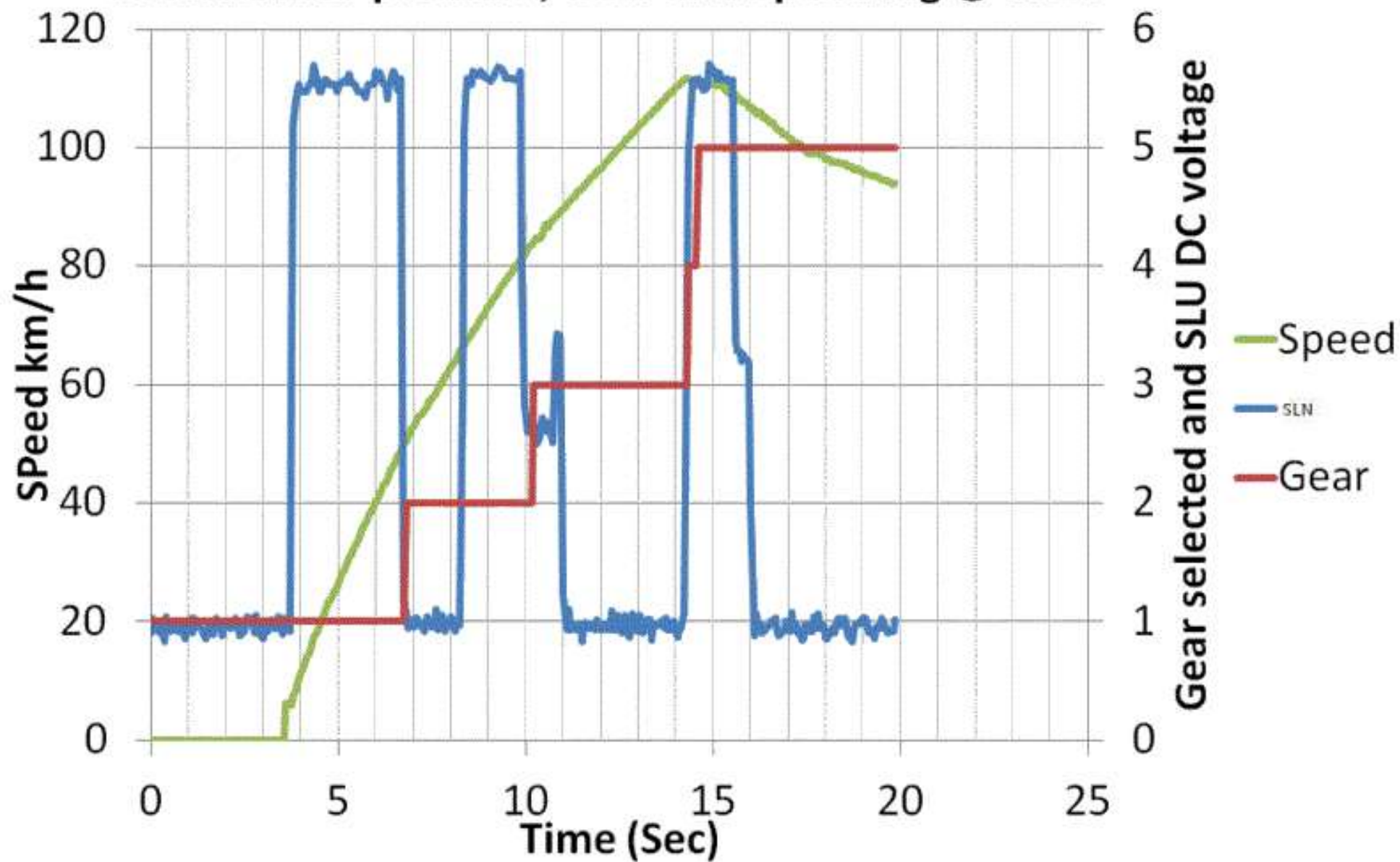




Here is some nice data logs at close to WOT from zero to about 110km/h. At this point the car is still only on 3rd Gear. I think to log data up to a higher speed will require a private road. You can work out my 0-100km/h time from this at about 9 secs. Not exactly a drag car.

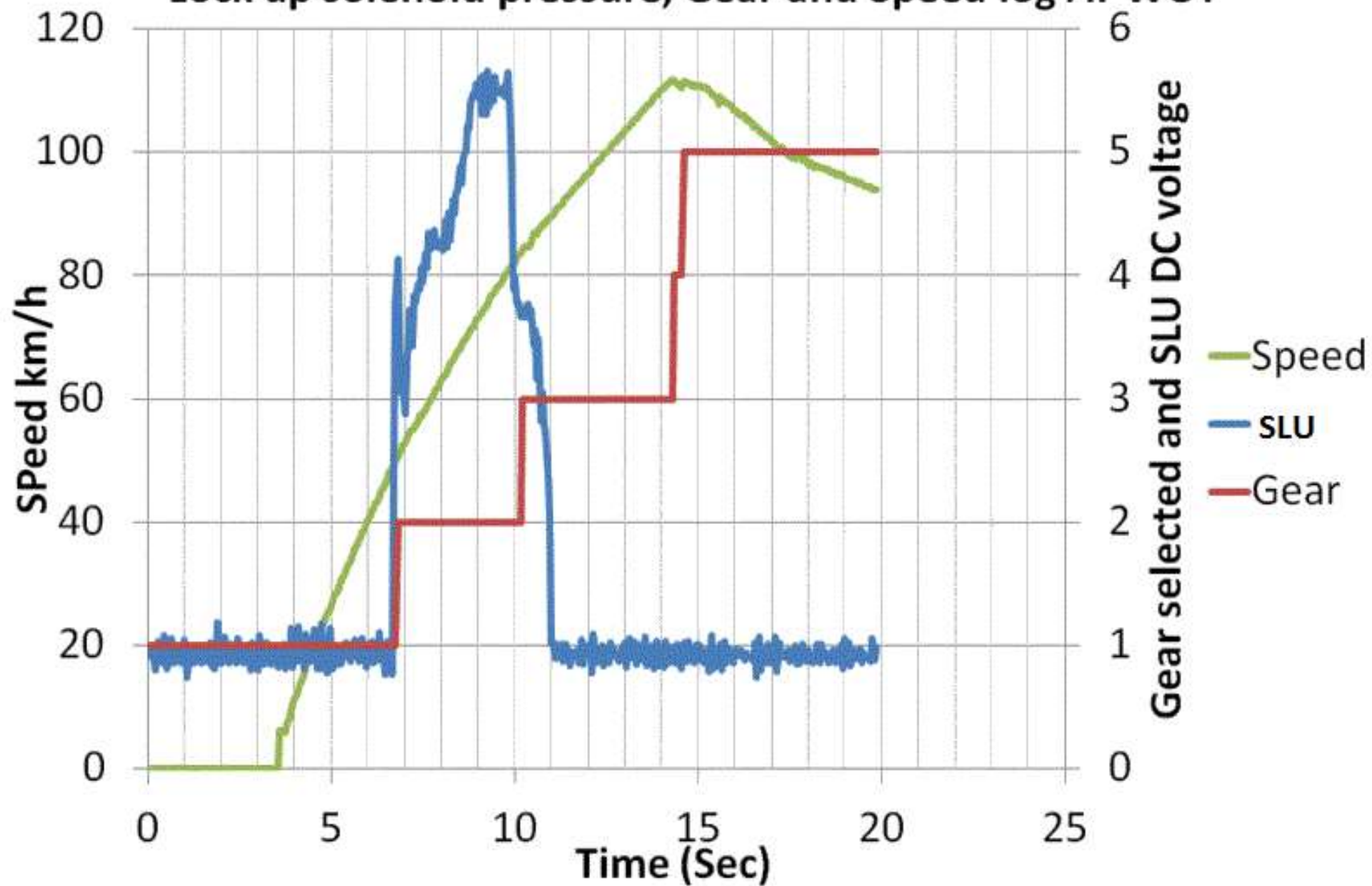


Accumulator pressure, Gear and Speed log @ WOT

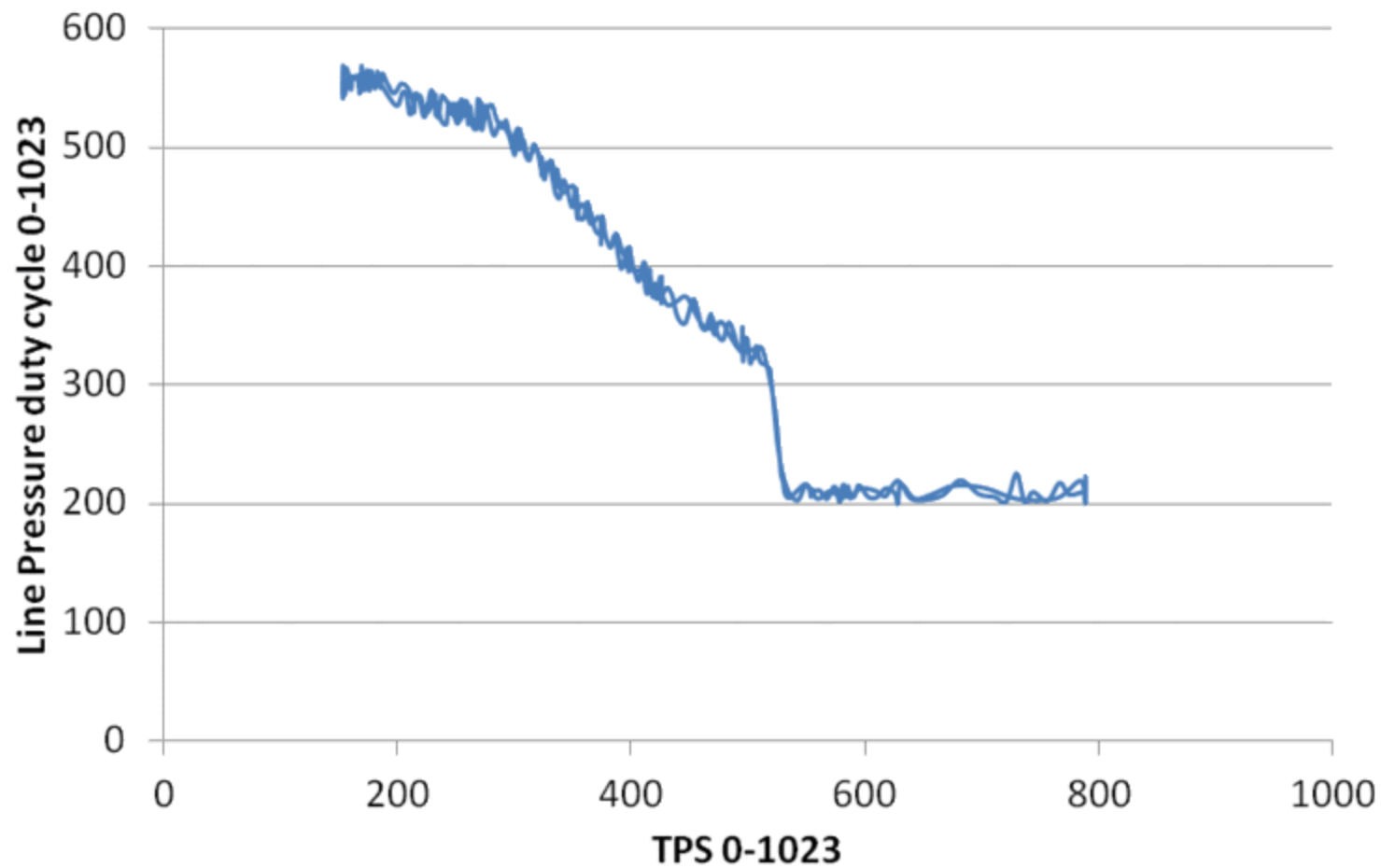




Lock up solenoid pressure, Gear and Speed log AT WOT



Here is a graph of the **line pressure solenoid versus the TPS** output that goes from about 1 volt to 4 volts from closed to WOT on the A650E. The outputs are on a scale of from 0-1023 or 10bits.



So the line pressure regulator actually relieves pressure with increasing duty cycle. At idle or closed throttle the duty cycle is about 50%, and from about 50% to WOT the duty cycle is about 20%.

All four shift solenoids are just on/off. The other 3 are pwm. If you leave the other 3 disconnected the trans will still operate.

\*\* It takes more than just selecting the shift solenoids to select second gear. You have to do some trickery with the PWM solenoids also. According to a Toyota new car features article for the GS300 it says that the Lock up solenoid regulator is used like a accumulator to achieve the change into second gear.

\*\* You first need to switch sol 3 on for one second then you play with the duty cycle of the lockup sol. Then you will get 2nd. The trick is to trend the Duty cycle according to load the get it to shift decent.

\*\* What sol 3 does is bleed off the pressure that goes to the lockup. Then the lockup will not engage. Then the feedback pressure controlling the lockup will activate the 2nd control sol. According to your signals you need to pulse the lockup the same time as you open sol3 for one second. the duty cycle will determine the engage pressure. then you need to increase the pressure afterward for a proper shift according to the load. It is a difficult one i know

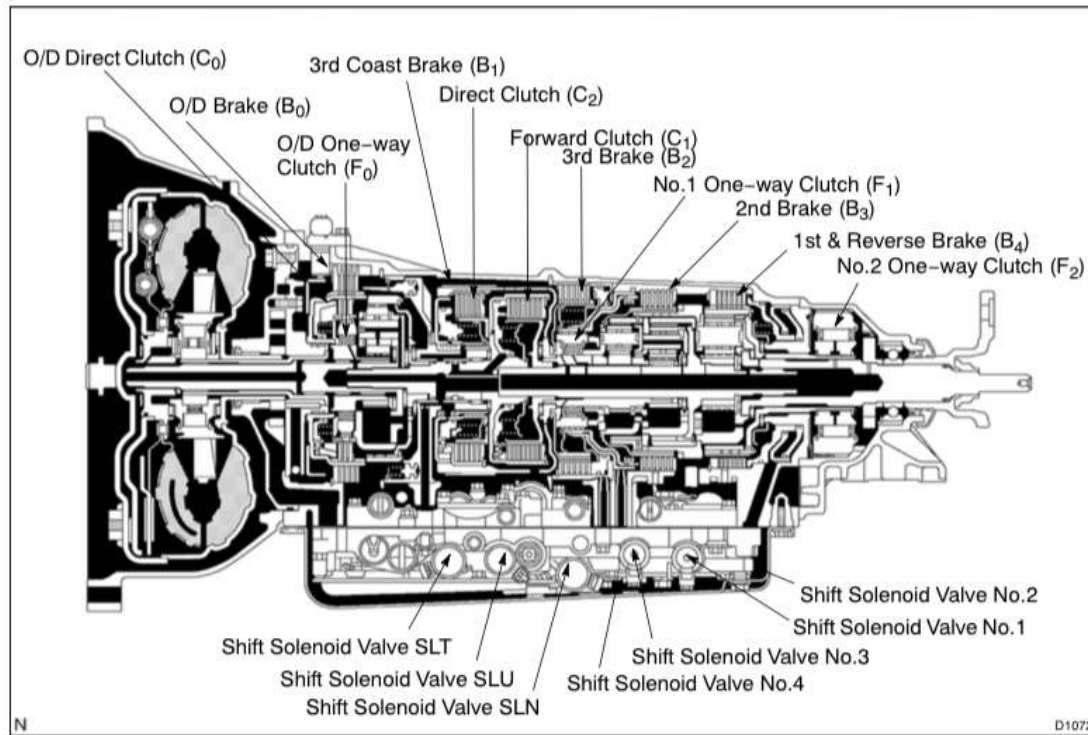
\*\*\*Update. It seems it needs a momentary application of the lock up solenoid when going into third also, otherwise it is a very slow gear change into third. The lock up is really solid as even at 30% duty cycle it will cause the car to stall when standing still in third.



# AUTOMATIC TRANSMISSION SYSTEM

## OPERATION

AT04A-01



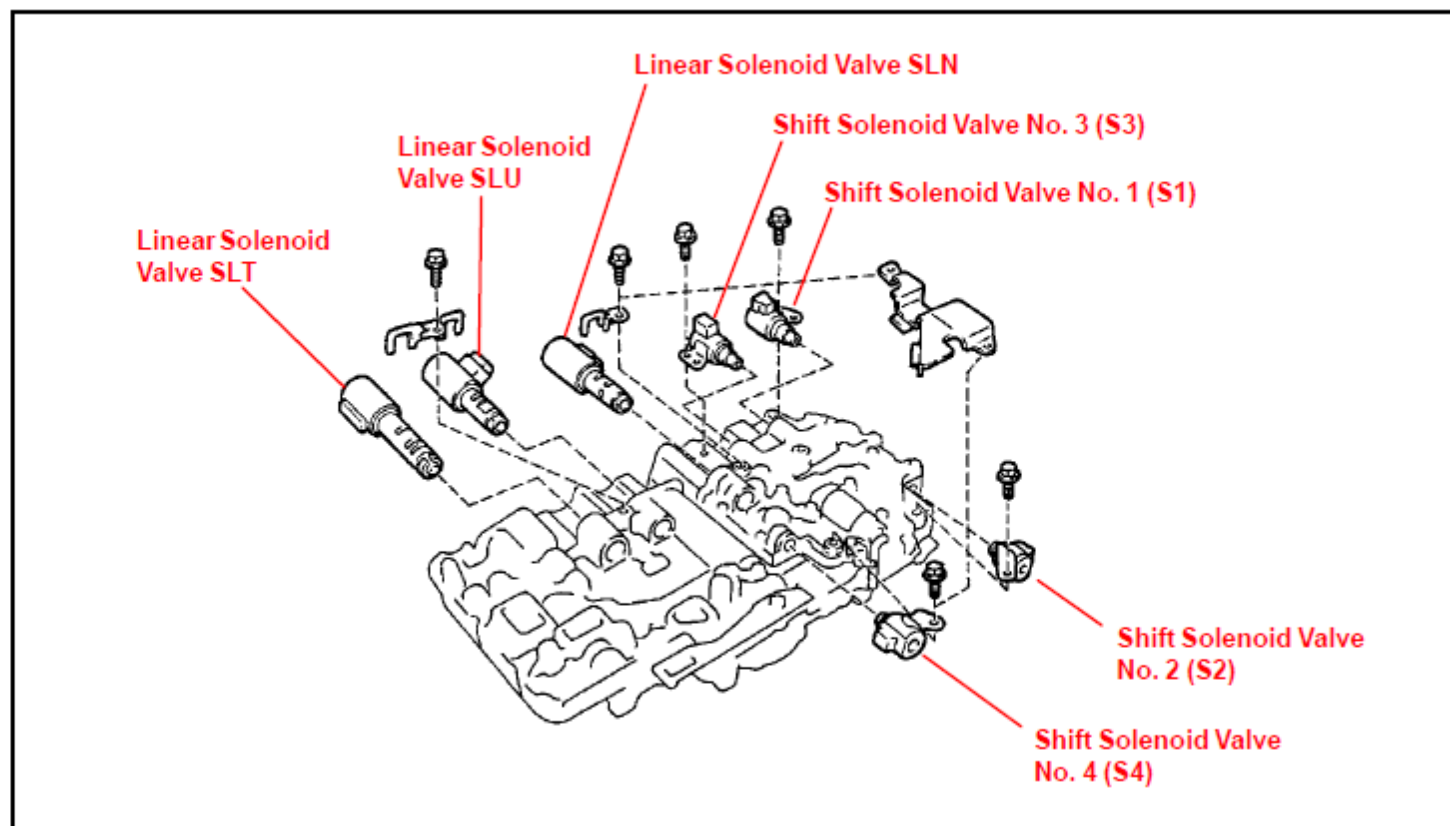
N

D10723

| Shift Lever Position | Gear Position | No. 1 | No. 2 | No. 3 | No. 4 | C <sub>0</sub> | C <sub>1</sub> | C <sub>2</sub> | B <sub>0</sub> | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | B <sub>4</sub> | F <sub>0</sub> | F <sub>1</sub> | F <sub>2</sub> |
|----------------------|---------------|-------|-------|-------|-------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| P                    | Park          | ON    | OFF   | ON    | OFF   | ○              |                |                |                |                |                |                |                |                |                |                |
| R                    | Reverse       | ON    | OFF   | OFF   | ON    |                |                | ○              | ○              |                |                |                | ○              |                |                |                |
| N                    | Neutral       | ON    | OFF   | ON    | OFF   | ○              |                |                |                |                |                |                |                |                |                |                |
| D                    | 1st           | ON    | OFF   | ON    | OFF   | ○              | ○              |                |                |                |                |                |                | ○              |                | ○              |
|                      | 2nd           | ON    | ON    | ON    | OFF   | ○              | ○              |                |                |                |                | ○              |                | ○              |                |                |
|                      | 3rd           | OFF   | ON    | OFF   | OFF   | ○              | ○              |                |                |                | ○              |                |                | ○              | ○              |                |
|                      | 4th           | OFF   | OFF   | ON    | OFF   | ○              | ○              | ○              |                |                | ○              |                |                | ○              |                |                |
|                      | 5th           | OFF   | OFF   | OFF   | ON    |                | ○              | ○              | ○              |                | ○              |                |                |                |                |                |
| 4                    | 1st           | ON    | OFF   | ON    | OFF   | ○              | ○              |                |                |                |                |                |                | ○              |                | ○              |
|                      | 2nd           | ON    | ON    | ON    | OFF   | ○              | ○              |                |                |                |                | ○              |                | ○              |                |                |
|                      | 3rd           | OFF   | ON    | OFF   | OFF   | ○              | ○              |                |                |                | ○              |                |                | ○              | ○              |                |
|                      | 4th           | OFF   | OFF   | ON    | OFF   | ○              | ○              | ○              |                |                | ○              |                |                | ○              |                |                |
| 3                    | 1st           | ON    | OFF   | ON    | OFF   | ○              | ○              |                |                |                |                |                |                | ○              |                | ○              |
|                      | 2nd           | ON    | ON    | ON    | OFF   | ○              | ○              |                |                |                |                | ○              |                | ○              |                |                |
|                      | 3rd           | OFF   | ON    | ON    | OFF   | ○              | ○              |                |                | ○              | ○              |                |                | ○              | ○              |                |
| 2                    | 1st           | ON    | OFF   | ON    | OFF   | ○              | ○              |                |                |                |                |                |                | ○              |                | ○              |
|                      | 2nd           | ON    | ON    | ON    | OFF   | ○              | ○              |                |                |                |                | ○              |                | ○              |                |                |
| L                    | 1st           | ON    | OFF   | OFF   | OFF   | ○              | ○              |                |                |                |                |                | ○              | ○              |                | ○              |

○ : Operating

# Transmission Solenoid Identification



| REPAIR MANUAL SOLENOID NAME | PART CATALOG DESCRIPTION                              |
|-----------------------------|---|
| S1                          | Solenoid Assembly, Automatic Transmission 3-Way No. 1 |
| S2                          | Solenoid Assembly, Transmission No. 3 (No. 1)         |
| S3                          | Solenoid Assembly, Automatic Transmission 3-Way No. 2 |
| S4                          | Solenoid Assembly, Transmission No. 3 (No. 2)         |
| SLN                         | Solenoid Assembly, Shift Control                      |
| SLT                         | Solenoid Assembly, Line Pressure Control              |
| SLU                         | Solenoid Assembly, Lock-up Control                    |

**Input Shaft Speed Sensor = 24 Teeth (VR Type sensor)**

**Output Speed Sensor = 12 teeth (VR Type Sensor)**

**Trans Fluid temp Sensor = 25'C (77'F) @ 3.5Kohm / 110'C (230'F) @ 231-263 Ohm**

