# CHAPTER IV

# DATA COLLECTION AND PROCESSING

## 4.1. Data Collection

Based on the research methodology, in order to implement assembly line balancing using Plant Simulation software, researcher needs to collect certain data to support the model implementation. The data needed to create the model is data of production process in assembly line. In this research, researcher focusing the study in mixed-model two-sided assembly line. The research location chosen is PT. Toyota Motor Manufacturing Indonesia. The company uses the type of assembly line based on the study.

### 4.1.1 Layout of Assembly Production Department

Assembly production department divided into several assembly sections. This researcher shows several assembly sections especially the section which is taken by the researcher. The layout of Assembly production department and Trimming Line 1 section can be seen of rectangle mark can be seen in Figure 4.1.

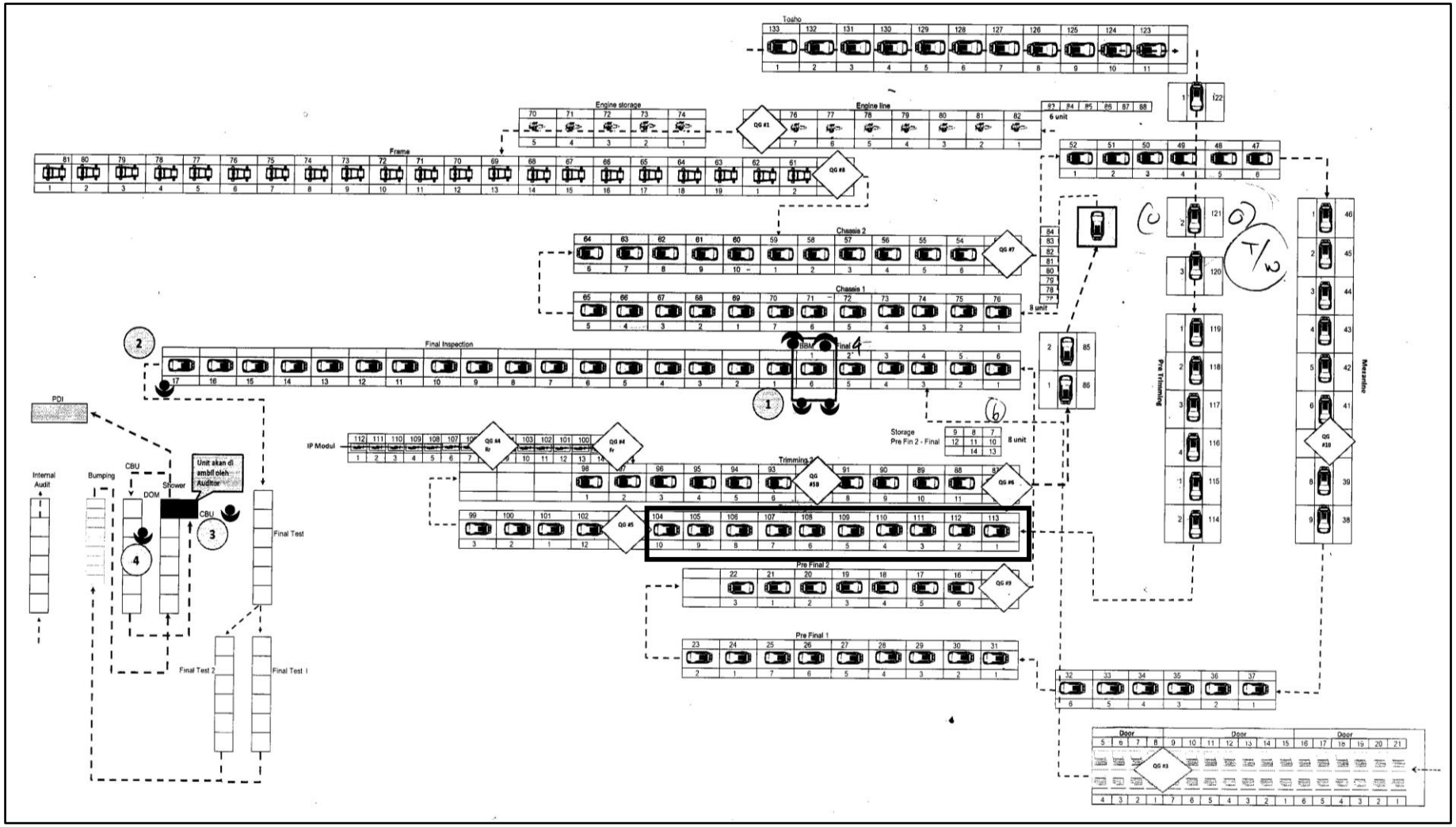



Figure 4.1 Assembly production layout at Plant

### 4.1.2 Detailed design

The detailed design refers to the stage where detailed layout and equipment specifications are verified for the system. While detailing the flow control model of assembly line with necessary workstations. The configuration is possible according to layout constraints. Mixed-model two-sided assembly line configuration in the section of Trimming line 1 is identified as described in Figure 4.2.

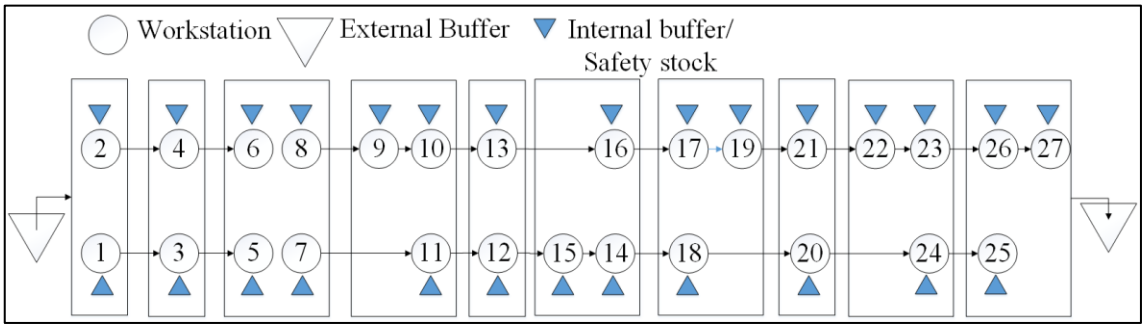



Figure 4.2 Line configuration of Trimming line 1 section

The section of trimming line 1 is divided into a number of processes in a workstation. The combining of workstation with another workstation is called mated-station where it has a pair workstation on the right and left side. There are two positions assembly in each sides such the right side has right and front position, whereas on the left side has left and rear position. It can be described in Table 4.1.

Table 4.1 Assembly station description

| No. Mated-Station | No. Workstation | Workstation Name and Position | Workstation Total | Description |
|---|---|---|---|---|
| 1 | 1<br>2 | Stay Hood (Front position)<br>Patent Plate (Left Position) | 4 | Stay hood assembles radiator, dash panel, rocker scratch protective and Patent plate fitting name plate on the left body fender. |

| No. Mated-Station | No. Workstation | Workstation Name and Position | Workstation Total | Description |
|---|---|---|---|---|
| 2 | 3 | Stay Backdoor (Rear position) | 2 | Assembly of stay backdoor exterior and insulator dash panel. |
| | 4 | Insulator Dashpanel (Front position) | | . |
| 3 | 5 | Wire Floor (Right position) | 4 | Wiring instalation on Wiring floor, cap machine and back door. |
| | 6 | Wire Floor (Left position) | | |
| | 7 | Wire Backdoor (Rear) | | |
| | 8 | Wire Engine Room (Front position) | | |
| 4 | 9 | Setting Garnish Backdoor (Rear) | 3 | Setting garnish backdoor and Assembly of Combination Lamp (license lamp, handle, camera, and rear lamp) and seat belt installation. |
| | 10 | Sealt Belt | | |

| No. Mated-Station | No. Workstation | Workstation Name and Position | Workstation Total | Description |
|---|---|---|---|---|
| | | RR (Left position) | | |
| | 11 | Sealt Belt RR (Right position) | | |
| 5 | 12 | Insulator Hood (Front position) | 2 | Assembly Process of Insulator hood and Rear Hose washer. |
| | 13 | RR Hose Washer (Rear) | | |
| 6 | 14 | CSA RH (Right position) | 3 | Process of setting ABS and Setting booster (brake fluid container on the front). |
| | 15 | Setting Booster (Front position) | | |
| | 16 | CSA LH (Left position) | | |
| 7 | 17 | Pedal LHD (Left position) | 3 | Tube Brake and Pedal instalation, meanwhile on the backdoor, rear lamps are assembled. |
| | 18 | Actuator (Front position) | | |
| | 19 | | | |

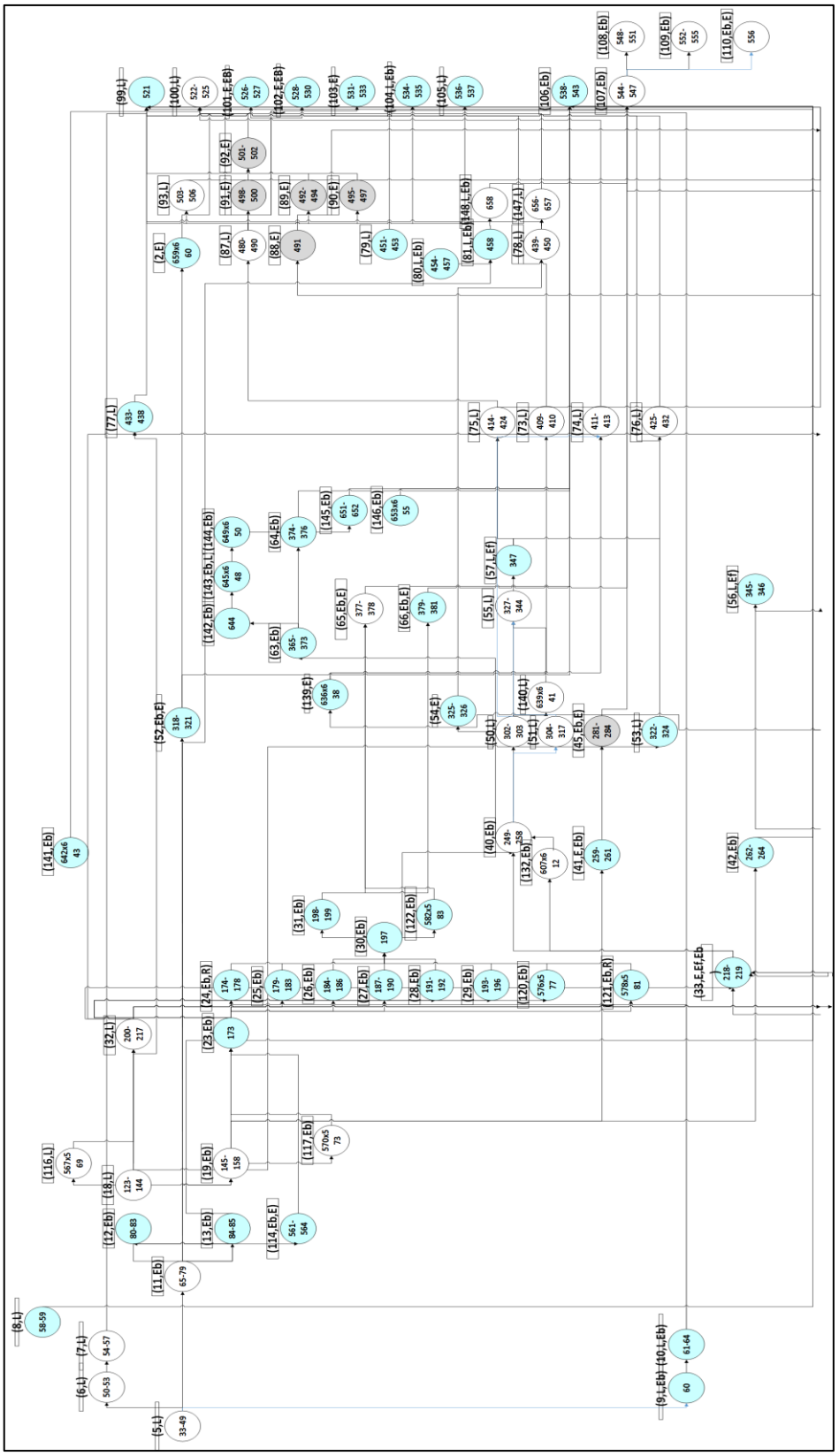
| No. Mated-Station | No. Workstation | Workstation Name and Position | Workstation Total | Description |
|---|---|---|---|---|
| | | Rear Lamp (Rear) | | |
| 8 | 20<br>21 | Plug Floor (Right position)<br>Cable Fuellid (Left position) | 2 | Assembly Process of Plug floor, Cable fuellid (Gasoline opener cable) and Shield fuel tank (rubber gasoline pipe). |
| 9 | 22<br>23<br>24 | Shield Fuel Tank (Left position)<br>Lamp Room (Either)<br>Setting H/Lining (Either) | 3 | Interior assembly such as head lining and room lamp. |
| 10 | 25<br>26<br>27 | Sunvisor RH (Right position)<br>Sunvisor LH (Left position)<br>RR Cooler (Rear) | 3 | Assembly of Sunvisor, assist grip and Rear cooler installation. |

### 4.1.3 The Information of Current Assembly Line

The current assembly line of Trimming line 1 has 281 units consisting of 128 and 153 units for Innova and Fortuner demand product per shift. The working time per shift is 7 hours 40 minutes. The assembly line situation has 10 mated-stations consisting of 31 workstations and 31 operators. There are 148 work elements consisting of 556 and 573 tasks for Innova and Fortuner product.

### 4.2.1 The Joint Precedence Diagram

In the type of asembly lines, each model has its own predecessor relationship which can be described by precedence graph. All of the precedence graphs of the model can be combined into a single predecessor diagram, called a joint precedence graph. The operator does their job in parallel with both two-sided assembly lines. There are several task types to give the direction in precedence diagram. It is grouped into five task types are right (R), left (L), either (E), either front (EF) and either back (EB) with two-sided assembly lines. The joint precedence diagram can be seen in Figure 4.3.



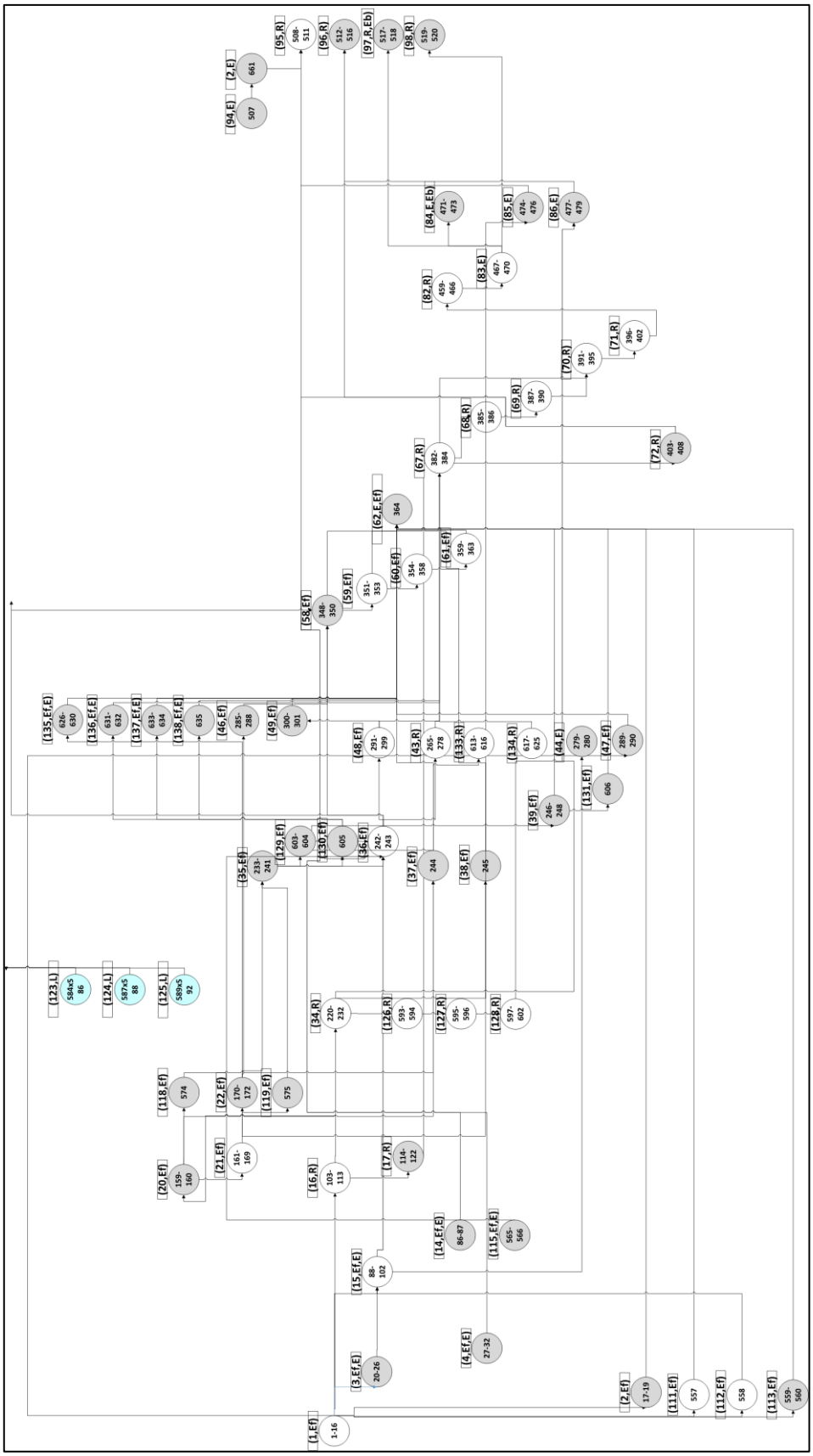


Figure 4.3 The joint precedence graph

### 4.2.2 The Task Time and Direction

The task times in this research is represented using work element which means combining the tasks that cannot be separate. The data that researcher used is based on the company data. The data of times and other informations of the task is provided in Table 4.2.

Table 4.2 The data information on Trimming Line 1.

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 1 | Hang the Radiator support Box | | | | √ | | √ | |
| 2 | Take the RH Body mount Bolt No.1 | | | | √ | | √ | |
| 3 | Put in the RH Body mount Bolt No.1 | | | | √ | | √ | |
| 4 | Take the LH Body mount Bolt No.1 | | | | √ | | √ | |
| 5 | Put in the LH Body mount Bolt No.1 | | | | √ | | √ | |
| 6 | Fitting Hood stay holder | 1 | 1 | Ef | √ | 68 | √ | 54 |
| 7 | Take the Hood stay | | | | √ | | √ | |
| 8 | Enter the Hood stay | | | | √ | | √ | |
| 9 | Fitting Clip Hood support | | | | √ | | √ | |
| 10 | Fitting Chusion rubber (small) X Radiator support (Side RH) | | | | √ | | | |
| 11 | Fitting Chusion rubber (small) X Radiator support (Side LH) | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 12 | Fitting Chusion rubber (small) X E/G (Side RH) | | | | √ | | | |
| 13 | Fitting Chusion rubber (small) X E/G (Side LH) | | | | √ | | | |
| 14 | Release the Radiator support Bolt | | | | √ | | √ | |
| 15 | Take the Radiator support X Body | | | | √ | | √ | |
| 16 | Enter the Radiator support X Body | | | | √ | | √ | |
| 17 | Take the Washer Nozzle | | | | √ | | √ | |
| 18 | Fitting FR Washer nozzle X E/G hood (side LH) | | 2 | Ef | √ | 17 | √ | 17 |
| 19 | Fitting FR Washer nozzle X E/G hood (side RH) | | | | √ | | √ | |
| 20 | Take the Dash Panel insulator pad Outside | | | | √ | | √ | |
| 21 | Set Position Dash panel insulator pad Outside (RHD) | | 3 | Ef,E | √ | 31 | √ | 17 |
| 22 | Fitting Dash Panel insulator pad clip Outside (RHD) | | | | √ | | √ | |
| 23 | Set Position Dash panel insulator pad | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | Outside (LHD) | | | | | | | |
| 24 | Fitting Dash Panel insulator pad clip Outside (LHD) | | | | √ | | √ | |
| 25 | Fitting Hole plug Dash panel (Outside) (RHD) | | | | √ | | | |
| 26 | Fitting Hole plug Dash panel (Outside) (LHD) | | | | √ | | | |
| 27 | Take the Rocker Scratch protective cover X box cover | | | | √ | | √ | |
| 28 | Bring the Rocker Scratch protective cover | | | | √ | | √ | |
| 29 | Take the FR Rocker Scratch protective cover (side RH) | | 4 | Ef,E | √ | 26 | | 13 |
| 30 | Set Cover FR Rocker Scratch protective cover (side RH) | | | | √ | | | |
| 31 | Take the RR Rocker Scratch protective cover (side RH) | | | | √ | | | |
| 32 | Set cover RR Rocker Scratch protective cover (side RH) | | | | √ | | | |
| 33 | Take the Name plate | | | | √ | | √ | |
| 34 | Set table kerja name plate table prepare | 2 | 5 | L | √ | 79 | √ | 74 |
| 35 | Release the Manifest | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 36 | Scan Name plate manifest bar code | | | | √ | | √ | |
| 37 | Check Name plate monitor | | | | √ | | √ | |
| 38 | Tekan tombol name plate Plate Stamping machine | | | | √ | | √ | |
| 39 | Take the Work completion name plate | | | | √ | | √ | |
| 40 | Check Work completion name plate | | | | √ | | √ | |
| 41 | Caulking name plate | | | | √ | | √ | |
| 42 | Caulking VIN plate hole | | | | √ | | √ | |
| 43 | Set table kerja VIN plate X Table prepare | | | | √ | | √ | |
| 44 | Scan VIN plate Bar code | | | | √ | | √ | |
| 45 | Check VIN plate Bar code | | | | √ | | √ | |
| 46 | Tekan tombol VIN plate Plate Stamping machine | | | | √ | | √ | |
| 47 | Take the Work completion VN plate | | | | √ | | √ | |
| 48 | Check Work completion VN plate | | | | √ | | √ | |
| 49 | Caulking VIN plate | | | | √ | | √ | |
| 50 | Scan certification regulation info Bar | | 6 | L | √ | 18 | √ | 18 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | code | | | | | | | |
| 51 | Take the work completion certification regulation info | | | | √ | | √ | |
| 52 | Check certification regulation info | | | | √ | | √ | |
| 53 | Add the label cover film | | | | √ | | √ | |
| 54 | Take the mark JIG certification regulation info (LHD) | | | | √ | | √ | |
| 55 | Set Position Mark JIG X CTR pillar (LHD) | | | | √ | | √ | |
| 56 | Add the certification regulation info X CTR pillar (LHD) | | 7 | L | √ | 13 | √ | 15 |
| 57 | Return the mark JIG certification regulation info (LHD) | | | | √ | | √ | |
| 58 | Take the PSG Rocker Scratch protective cover (LH) | | 8 | L | √ | 4 | | 0 |
| 59 | Bring the PSG Rocker Scratch protective cover (LH) | | | | √ | | | |
| 60 | Lap Panel B/D (side LH) | | 9 | L,Eb | √ | 14 | | 0 |
| 61 | Take the Backdoor mark jig (side LH) | | 10 | L,Eb | √ | 24 | | 0 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 62 | Set Position Mark JIG B/D side (side LH) | | | | √ | | | |
| 63 | Add the backdoor model mark X (side LH) | | | | √ | | | |
| 64 | Return the mark JIG (side LH) | | | | √ | | | |
| 65 | Take the B/D JIG | | | | √ | | √ | |
| 66 | Enter the B/D JIG | | | | √ | | √ | |
| 67 | Take the LWR stay BKT B/D (side RH) | | | | √ | | √ | |
| 68 | Tighten the LWR stay BKT B/D (side RH) | | | | √ | | √ | |
| 69 | Take the UPR stay BKT B/D (side RH) | | | | √ | | √ | |
| 70 | Tighten the UPR stay BKT B/D (side RH) | | | | √ | | √ | |
| 71 | Take the LWR stay BKT B/D (side LH) | 3 | 11 | Eb | √ | 61 | √ | 65 |
| 72 | Tighten the LWR stay BKT B/D (side LH) | | | | √ | | √ | |
| 73 | Take the UPR stay BKT (side LH) | | | | √ | | √ | |
| 74 | Tighten the UPR stay BKT B/D (side LH) | | | | √ | | √ | |
| 75 | Take the Stay B/D | | | | √ | | √ | |
| 76 | Fitting Stay B/D (side LH) | | | | √ | | √ | |
| 77 | Fitting Stay B/D (side RH) | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 78 | Release the B/D JIG X B/D | | | | √ | | √ | |
| 79 | Return the B/D JIG X B/D | | | | √ | | √ | |
| 80 | Take the B/D Damper (LWR) | | | | √ | | | |
| 81 | Tighten the B/D damper (LWR) (side LH) | | 12 | Eb | √ | 13 | | 0 |
| 82 | Take the B/D Damper | | | | √ | | | |
| 83 | Tighten the B/D damper (LWR) (side RH) | | | | √ | | | |
| 84 | Take the Spare tire carrier guide | | 13 | Eb | √ | 10 | √ | 13 |
| 85 | Fitting Spare tire carrier guide | | | | √ | | √ | |
| 86 | Take the FR Floor Silincer | | 14 | Ef,E | √ | 14 | √ | 11 |
| 87 | Install the FR Floor Silence | | | | √ | | √ | |
| 88 | Take the SPS dari box No.1 | 4 | | | √ | | | |
| 89 | Bring the SPS dari box No.1 | | | | √ | | | |
| 90 | Potong insulator dash panel | | 15 | Ef,E | √ | 72 | | 36 |
| 91 | Take the insulator dash panel | | | | √ | | √ | |
| 92 | Set Position D.P | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | insulator pad CTR | | | | | | | |
| 93 | Set Position D.P insulator pad RH | | | | √ | | √ | |
| 94 | Set Position D.P insulator pad LH | | | | √ | | √ | |
| 95 | Fitting LWR clip DP insulator | | | | √ | | √ | |
| 96 | Fitting DP insulator PAD Clip x CW | | | | √ | | √ | |
| 97 | Fitting DP insulator PAD Clip x LH | | | | √ | | √ | |
| 98 | Fitting UPR CLIP DP insulator PAD Clip | | | | √ | | √ | |
| 99 | Take the cowl top brace (side RH) | | | | √ | | | |
| 100 | Tighten the CLIP to Brace RH | | | | √ | | | |
| 101 | Take the Cowl rop brace (side LH) | | | | √ | | | |
| 102 | Tighten the cowl to brace LH | | | | √ | | | |
| 103 | Tidying the jalur Floor W/H (side RH) X CTR Floor | | | | √ | | √ | |
| 104 | Fitting Floor W/H Protector X Tunnel Side BKT (side RH) | 5 | 16 | R | √ | 45 | √ | 46 |
| 105 | Fitting Floor W/H Clamp X CTR Tunnel (side RH) | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 106 | Fitting Floor W/H Clamp X Floor BKT (side RH) | | | | √ | | √ | |
| 107 | Fitting Floor W/H X FR Carpet Hook (side RH) | | | | √ | | √ | |
| 108 | Fitting Floor W/H Clamp X FR Floor (side RH) | | | | √ | | √ | |
| 109 | Fitting Floor W/H J/B X cowl side (side RH) | | | | √ | | √ | |
| 110 | Fitting Floor W/H Clamp X cowl side (side RH) | | | | √ | | √ | |
| 111 | Tighten the Fitting Floor W/H earth X cowl side (side RH) | | | | √ | | √ | |
| 112 | Torque Fitting Floor W/H earth X cowl side (side RH) | | | | √ | | √ | |
| 113 | Check Fitting Floor W/H earth X cowl side (side RH) | | | | √ | | √ | |
| 114 | Take the Door CTL Relay | | | | √ | | √ | |
| 115 | Connect the Door CTl Relay X Floor W/H C/N (side RH) | | 17 | R | √ | 42 | √ | 40 |
| 116 | Tighten the Door CTl Relay X cowl side | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | (side RH) | | | | | | | |
| 117 | Fitting Floor W/H Clamp X CTR side panel (side RH) (1) | | | | √ | | √ | |
| 118 | Fitting Floor W/H Clamp X CTR Pillar (side RH) | | | | √ | | √ | |
| 119 | Fitting Floor W/H Clamp X Roof R/F (side RH) | | | | √ | | √ | |
| 120 | Fitting Floor W/H Clamp X CTR side panel (side RH) (2) | | | | √ | | √ | |
| 121 | Fitting Floor W/H To Door (side RH) | | | | √ | | √ | |
| 122 | Fitting Floor J/B W/H To Door (side RH) | | | | √ | | √ | |
| 123 | Take the Floor W/H | | | | √ | | | |
| 124 | Tidying the jalur Floor W/H (side LH) X CTR Floor | | | | √ | | √ | |
| 125 | Fitting Floor W/H Protector X Tunnel Side BKT (side LH) | 6 | 18 | L | √ | 83 | √ | 57 |
| 126 | Fitting Floor W/H Clamp X CTR Tunnel (side LH) | | | | √ | | √ | |
| 127 | Fitting Floor W/H Clamp X Floor BKT (side LH) | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 128 | Fitting Floor W/H X FR Carpet Hook (side LH) | | | | √ | | √ | |
| 129 | Fitting Floor W/H Clamp X FR Floor (side LH) | | | | √ | | √ | |
| 130 | Fitting Floor W/H J/B X cowl side (side LH) | | | | √ | | √ | |
| 131 | Fitting Floor W/H R/B X cowl side (side LH) | | | | √ | | √ | |
| 132 | Fitting Floor W/H Clamp X cowl side (side LH) | | | | √ | | √ | |
| 133 | Tighten the Floor W/H R/B X cowl side (side LH) | | | | √ | | √ | |
| 134 | Tighten the Floor W/H earth X cowl side (side LH) | | | | √ | | | |
| 135 | Torque Floor W/H earth X cowl side (side LH) | | | | √ | | √ | |
| 136 | Check Floor W/H earth X cowl side (side LH) | | | | √ | | √ | |
| 137 | Take the Door CTL Relay | | | | √ | | | |
| 138 | Connect the Door CTl Relay X Floor W/H C/N (side LH) | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 139 | Tighten the Door CTl Relay X cowl side (side LH) | 7 | 19 | Eb | √ | 88 | | 39 |
| 140 | Fitting Floor W/H Clamp X CTR side panel (side LH) (1) | | | | √ | | √ | |
| 141 | Fitting Floor W/H Clamp X CTR Pillar (side LH) | | | | √ | | √ | |
| 142 | Fitting Floor W/H Clamp X CTR side panel (side LH) (2) | | | | √ | | | |
| 143 | Fitting Floor W/H To Door (side LH) | | | | √ | | √ | |
| 144 | Fitting Floor J/B W/H To Door (side LH) | | | | √ | | √ | |
| 145 | Take the RR Washer Nozzle | | | | √ | | | |
| 146 | Fitting RR Washer nozzle B/D | | | | √ | | | |
| 147 | Take the RR Washer nozzle G/M | | | | √ | | | |
| 148 | Fitting RR Washer nozzle G/M X B/D | | | | √ | | | |
| 149 | Fitting RR Washer nozzle G/M Body | | | | √ | | | |
| 150 | Take the B/D W/H | | | | √ | | √ | |
| 151 | Put in B/D W/H X Body | | | | √ | | √ | |
| 152 | Fitting B/D W/H G/M | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | X B/D Hole | | | | | | | |
| 153 | Fitting B/D W/H G/M X B/D Body roof Hole | | | | √ | | √ | |
| 154 | Fitting B/D W/H Clip X LH QTR Panel (Inside) | | | | √ | | √ | |
| 155 | Fitting B/D W/H Multiplex network (W/SMART) | | | | √ | | | |
| 156 | Fitting B/D W/H (4) X B/D | | | | √ | | √ | |
| 157 | Fitting B/D W/H (10) X B/D | | | | √ | | √ | |
| 158 | Set Position B/D W/H C/N X B/D hole | | | | √ | | | |
| 159 | Take the E/G room main W/H | | | | √ | | √ | |
| 160 | Fitiing E/G room main W/H Relay box | | 20 | Ef | √ | 15 | √ | 15 |
| 161 | Fitiing E/G room main W/H G/M X Dash panel outer (side LH) | | | | √ | | √ | |
| 162 | Fitiing E/G room main W/H clamp X LH Fender (Inside) | 8 | 21 | Ef | √ | 68 | √ | 37 |
| 163 | Fitiing E/G room main W/H clamp X Dash panel outer (3) | | | | √ | | √ | |
| 164 | Fitiing E/G room main W/H G/M X Dash | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | panel outer (Middle) | | | | | | | |
| | Fitiing E/G room main W/H clamp X Dash | | | | √ | | √ | |
| 165 | panel outer (1) | | | | | | | |
| | Fitiing E/G room main W/H protector X Dash | | | | √ | | √ | |
| 166 | panel outer (side RH) | | | | | | | |
| | Fitiing E/G room main W/H G/M X Dash | | | | √ | | | |
| 167 | panel outer (Middle) | | | | | | | |
| | Fitiing E/G room main W/H protector X Dash | | | | √ | | | |
| 168 | panel outer (side LH) | | | | | | | |
| | Fitiing E/G room main W/H clamp X Dash | | | | √ | | | |
| 169 | panel outer (4) | | | | | | | |
| | Fitting Wireless door lock buzzer W/H X | | | | √ | | √ | |
| 170 | Fender (side RH) | | 22 | Ef | | 38 | | 13 |
| | Fitiing E/G room main W/H clamp X LH | | | | √ | | | |
| 171 | Fender (Inside) (3) | | | | | | | |
| | Fitiing E/G room main W/H clamp X LH | | | | √ | | √ | |
| 172 | Fender (Inside) (7) | | | | | | | |
| 173 | Close the B/D | | 23 | Eb | √ | 5 | √ | 1.5 |
| | Lap Panel B/D (side | | | | √ | | √ | |
| 174 | RH) | 9 | 24 | Eb,R | | 22 | | 26 |
| | Take the RR grade | | | | √ | | √ | |
| 175 | emblem Jig (side RH) | | | | | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 176 | Set Position RR grade emblem jig (side RH) | | | | √ | | √ | |
| 177 | Add the Backdoor X RR grade emblem (side RH) | | | | √ | | √ | |
| 178 | Return the Mark JIG (side RH) | | | | √ | | | |
| 179 | Take the License lamp | | | | √ | | √ | |
| 180 | Connect the License lamp (side LH) | | | | √ | | | |
| 181 | Fitting License lamp (side LH) | | 25 | Eb | √ | 17 | √ | 19 |
| 182 | Connect the License lamp (side RH) | | | | √ | | √ | |
| 183 | Fitting License lamp (side RH) | | | | √ | | √ | |
| 184 | Take the B/D handle | | | | √ | | √ | |
| 185 | Connect the B/D handle | | 26 | Eb | √ | 8 | √ | 13 |
| 186 | Fitting B/D handle | | | | √ | | √ | |
| 187 | Take the B/D camera | | | | √ | | √ | |
| 188 | Connect the B/D camera | | | | √ | | √ | |
| 189 | Fitting B/D camera | | 27 | Eb | √ | 14 | √ | 11 |
| 190 | Tighten the B/D camera | | | | √ | | √ | |
| 191 | Take the B/D outer G/N | | 28 | Eb | √ | 15 | √ | 18 |
| 192 | Fitting B/D outer G/N | | | | √ | | √ | |
| 193 | Take the Rear lamp | | 29 | Eb | √ | 20 | √ | 18 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | (side RH) | | | | | | | |
| 194 | Fitting Rear lamp (side RH) | | | | √ | | √ | |
| 195 | Take the Rear lamp (side LH) | | | | √ | | √ | |
| 196 | Fitting Rear lamp (side LH) | | | | √ | | √ | |
| 197 | Open the B/D | | 30 | Eb | √ | 3 | √ | 2.5 |
| 198 | Connect the Rear lamp (side RH) | | 31 | Eb | √ | 17 | √ | 11 |
| 199 | Connect the Rear lamp (side LH) | | | | √ | | √ | |
| 200 | Fitting Floor plug hole X CTR Floor (side LH) | | | | √ | | √ | |
| 201 | Fitting Floor plug hole X CTR Floor (side LH) | | | | √ | | √ | |
| 202 | Add the Plug plate X CTR Floor (side LH) | | | | √ | | √ | |
| 203 | Add the Tape seal sheet X CTR Floor (side LH) | 10 | 32 | L | √ | 60 | √ | 67 |
| 204 | Fitting Floor W/H X CTR Floor carpet hook (side LH) | | | | √ | | √ | |
| 205 | Fitting Floor W/H clamp X QTR pillar (LWR) | | | | √ | | √ | |
| 206 | Fitting Floor W/H | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | clamp X QTR pillar (UPR) | | | | | | | |
| 207 | Tighten the Floor W/H earth X QTR pillar (side LH) | | | | √ | | | |
| 208 | Torque Floor W/H earth X QTR pillar (side LH) | | | | √ | | | |
| 209 | Check Floor W/H earth X QTR pillar (side LH) | | | | √ | | | |
| 210 | Fitting Floor W/H to CSA (side LH) | | | | √ | | √ | |
| 211 | Take the RR Seat Belt No.1 | | | | √ | | √ | |
| 212 | Tighten the RR Seat Belt No.1 (side LH) | | | | √ | | √ | |
| 213 | Torque RR Seat Belt No.1 X Roof (side LH) | | | | √ | | | |
| 214 | Check RR Seat Belt No.1 X Roof (side LH) | | | | √ | | | |
| 215 | Tighten the RR Seat Belt No.1 X Roof (side LH) | | | | √ | | √ | |
| 216 | Torque RR Seat Belt No.1 X Roof (side LH) | | | | √ | | √ | |
| 217 | Check RR Seat Belt | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | No.1 X Roof (side LH) | | | | | | | |
| 218 | Take the Empty box SPS No.1 | | | | √ | | | |
| 219 | Return the Empty box SPS No.1 | | 33 | E,Ef,Eb | √ | 6 | | 0 |
| 220 | Fitting Floor W/H clamp X QTR pillar (side RH) (1) | | | | √ | | √ | |
| 221 | Fitting Floor W/H clamp X QTR pillar (side RH) (2) | | | | √ | | √ | |
| 222 | Tighten the Floor W/H earth X QTR pillar (side RH) | | | | √ | | | |
| 223 | Torque Floor W/H earth X QTR pillar (side RH) | | | | √ | | | |
| 224 | Check Floor W/H earth X QTR pillar (side RH) | 11 | 34 | R | √ | 77 | | 20 |
| 225 | Fitting Floor W/H to CSA (side RH) | | | | √ | | √ | |
| 226 | Take the RR Seat Belt No.2 | | | | √ | | | |
| 227 | Tighten the RR Seat Belt No.2 (side RH) (3) | | | | √ | | | |
| 228 | Torque RR Seat Belt No.1 X Roof (side | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | RH) (3) | | | | | | | |
| 229 | Check RR Seat Belt No.1 X Roof (side RH) (3) | | | | √ | | | |
| 230 | Tighten the RR Seat Belt No.1 X Roof (side RH) (1) | | | | √ | | | |
| 231 | Torque RR Seat Belt No.1 X Roof (side RH) (1) | | | | √ | | | |
| 232 | Check RR Seat Belt No.1 X Roof (side RH) (1) | | | | √ | | | |
| 233 | Take the SPS part box No.3 | | | | √ | | √ | |
| 234 | Bring the SPS part box No.3 | | | | √ | | √ | |
| 235 | Fitting E/G room main W/H clamp X LH Fender (Inside) (2) | | | | √ | | √ | |
| 236 | Fitting E/G room main W/H To washertank penjepit | 12 | 35 | Ef | √ | 55 | √ | 48 |
| 237 | Fitting FR washer hose clip | | | | √ | | | |
| 238 | Take the FR washer hose | | | | √ | | √ | |
| 239 | Connect the FR washer hose X RH Washer nozzle | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 240 | Connect the FR washer hose X LH Washer nozzle | 13 | 36 | Ef | √ | 24 | √ | 31 |
| 241 | Merapikan jalur FR Washer hose | | | | √ | | √ | |
| 242 | Take the Hood insulator | | | | √ | | √ | |
| 243 | Fitting Hood insulator clip | | | | √ | | √ | |
| 244 | Tighten the E/G room main W/h Relay box | | 37 | Ef | √ | 3 | √ | 9.7 |
| 245 | Tighten the E/G room main W/H Protector X Dash panel outer (side LH) | | 38 | Ef | √ | 3 | √ | 8.5 |
| 246 | Take the security horn | | 39 | Ef | √ | 14 | | 0 |
| 247 | Connect the Security horn | | | | √ | | | |
| 248 | Tighten the Security horn | | | | √ | | | |
| 249 | Take the RR washer hose | | 40 | Eb | √ | 55 | √ | 42 |
| 250 | Fitting RR washer hose Clip X Cowl side (side LH) | | | | √ | | √ | |
| 251 | Fitting RR washer hose G/M X Cowl side (side LH) | | | | √ | | √ | |
| 252 | Fitting RR washer hose X xowl side (side | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | LH) | | | | | | | |
| 253 | Fitting RR washer hose X Floor W/H clamp (side FR) | | | | √ | | √ | |
| 254 | Fitting RR washer hose X Carpet hook (side FR) | | | | √ | | √ | |
| 255 | Fitting RR washer hose X CTR Floor W/H (side LH) | | | | √ | | √ | |
| 256 | Fitting RR washer hose X CTR Carpet hook (side LH) | | | | √ | | √ | |
| 257 | Fitting RR washer hose X C pillar Floor W/H clamp (1) | | | | √ | | √ | |
| 258 | Fitting RR washer hose X C pillar Floor W/H clamp (2) | | | | √ | | √ | |
| 259 | Take the Smart antenna | | | | √ | | √ | |
| 260 | Fitting Smart antenna X B/D W/H C/N | | 41 | Eb | √ | 19 | √ | 19 |
| 261 | Tighten the B/D outer G/N (Inside) | | | | √ | | √ | |
| 262 | Take the RR wiper motor | | | | √ | | √ | |
| 263 | Tighten the RR wiper motor B/D | | 42 | Eb | √ | 17 | √ | 16 |
| 264 | Connect the RR wiper | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | motor B/D | | | | | | | |
| 265 | Take the RH Curtain A/B | | | | √ | | | |
| 266 | Add the CSA barcode label (side RH) X check sheet | | | | √ | | | |
| 267 | Connect the Floor W/H C/N X Curtain A/B inflator (side RH) | | | | √ | | | |
| 268 | Check Floor W/H C/N X Curtain A/B inflator (side RH) | | | | √ | | | |
| 269 | Set Position A/B inflator X Body roof hole (side RH) | | | | √ | | | |
| | Tighten the Curtain | 14 | 43 | R | | 82 | | 0 |
| 270 | A/B inflator X Body (side RH) | | | | √ | | | |
| 271 | Torque A/B inflator (side RH) | | | | √ | | | |
| 272 | Check A/B inflator Bolt (side RH) | | | | √ | | | |
| 273 | Fitting Clip RR certain A/B (side RH) | | | | √ | | | |
| 274 | Fitting Clip CTR certain A/B (side RH) | | | | √ | | | |
| 275 | Fitting Clip FR certain A/B (side RH) | | | | √ | | | |
| 276 | Ketok Clip RR certain A/B (side RH) | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 277 | Ketok Clip CTR certain A/B (side RH) | 15 | 44 | E | √ | 10 | | 14 |
| 278 | Ketok Clip FR certain A/B (side RH) | | | | √ | | | |
| 279 | Take the protective vinyl sheet QTR | | | | √ | | √ | |
| 280 | Install the protective vinyl sheet | | | | √ | | √ | |
| 281 | Take the RR Antenna cord Assy | | 45 | Eb,E | √ | 18 | √ | 19 |
| 282 | Connect the RR Antenna cord C/N X Roof antenna | | | | √ | | √ | |
| 283 | Fitting RR Antenna cord Assy X Body | | | | √ | | √ | |
| 284 | Tighten the RR Antenna cord Assy X RR Pillar | | | | √ | | √ | |
| 285 | Fitting E/G room main W/H H/L C/N | | 46 | Ef | √ | 16 | √ | 17 |
| 286 | Tighten the E/G room main W/H earth | | | | √ | | √ | |
| 287 | Torque E/G room main W/H earth | | | | √ | | √ | |
| 288 | Check E/G room main W/H earth | | | | √ | | √ | |
| 289 | Take the Hood lock cable | | 47 | Ef | √ | 12 | √ | 15 |
| 290 | Fitting Hood lock CTL cable | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 291 | Take the Brake M/C Assy | | | | √ | | √ | |
| 292 | Take the Brake M/C gasket | | | | √ | | √ | |
| 293 | Enter the Brake M/C gasket | | | | √ | | √ | |
| 294 | Enter the Brake M/C Dash Panel | | | | √ | | √ | |
| 295 | Connect the Brake M/C Vacuum sensor C/N | | 48 | Ef | √ | 37 | √ | 50 |
| 296 | Take the Brake tube clamp Apron portion | | | | √ | | √ | |
| 297 | Tighten the Brake tube clamp Apron portion | | | | √ | | √ | |
| 298 | Take the Hose to hose No.2 | | | | √ | | √ | |
| 299 | Tighten the Hose to hose No.2 X Dash panel | | | | √ | | √ | |
| 300 | Take the Empty box SPS No.3 | | 49 | Ef | √ | 6 | | 0 |
| 301 | Return the Empty box SPS No.3 | | | | √ | | | |
| 302 | Take the SPS part box No.4 | | | | √ | | √ | |
| 303 | Bring the SPS part box No.4 | 16 | 50 | L | √ | 95 | √ | 91 |
| 304 | Take the LH Curtain A/B | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 305 | Add the CSA barcode label (side LH) X check sheet | | | | √ | | √ | |
| 306 | Connect the Floor W/H C/N X Curtain A/B inflator (side LH) | | | | √ | | √ | |
| 307 | Check Floor W/H C/N X Curtain A/B inflator (side LH) | | | | √ | | √ | |
| 308 | Set Position A/B inflator X Body roof hole (side LH) | | | | √ | | | |
| 309 | Tighten the Curtain A/B inflator X Body (side LH) | | | | √ | | √ | |
| 310 | Torque A/B inflator (side LH) | | | | √ | | √ | |
| 311 | Check A/B inflator Bolt (side LH) | | | | √ | | √ | |
| 312 | Fitting Clip RR certain A/B (side LH) | | | | √ | | √ | |
| 313 | Fitting Clip CTR certain A/B (side LH) | | | | √ | | √ | |
| 314 | Fitting Clip FR certain A/B (side LH) | | | | √ | | √ | |
| 315 | Ketok Clip RR certain A/B (side LH) | | | | √ | | √ | |
| 316 | Ketok Clip CTR certain A/B (side LH) | | | | √ | | √ | |
| 317 | Ketok Clip FR certain | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | A/B (side LH) | | | | | | | |
| 318 | Take the Cushion B/D damper | | | | √ | | √ | |
| 319 | Tighten the Cushion B/D damper (side RH) | | | | √ | | √ | |
| 320 | Take the Cushion B/D damper | | 51 | Eb,E | √ | 19 | √ | 19 |
| 321 | Tighten the Cushion B/D damper (side LH) | | | | √ | | √ | |
| 322 | Fitting Floor plug hole X RR Floor (side LH) | | | | √ | | √ | |
| 323 | Fitting plug plate X QTR panel (Inside) | | 52 | L | √ | 15 | √ | 20 |
| 324 | Fitting plug plate X QTR RR Floor (side LH) | | | | √ | | √ | |
| 325 | Take the Empty box SPS No.4 | | | | √ | | √ | |
| 326 | Return the Empty box SPS No.4 | | 53 | E | √ | 6 | √ | 6.4 |
| 327 | Take the Brake pedal BKT | | | | √ | | √ | |
| 328 | Fitting Brake pedal BKT (side LH) | | | | √ | | √ | |
| 329 | Take the Clutch pedal Assy | 17 | 54 | L | √ | 90 | √ | 100 |
| 330 | Set Position Clutch pedal X Clutch M/C push rod | | | | √ | | √ | |
| 331 | Tighten the Clutch | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | pedal | | | | | | | |
| 332 | Torque Clutch pedal | | | | √ | | √ | |
| 333 | Check Clutch pedal | | | | √ | | √ | |
| 334 | Install the Clutch pedal crevice Pin Beta pin | | | | √ | | √ | |
| 335 | Hang the Clutch pedal Tension spring | | | | √ | | √ | |
| 336 | Take the Brake pedal | | | | √ | | √ | |
| 337 | Set Position Brake pedal X Brake M/C | | | | √ | | √ | |
| 338 | Install the Brake pedal crevice Pin Beta pin | | | | √ | | √ | |
| 339 | Tighten the Brake pedal | | | | √ | | √ | |
| 340 | Tighten the Brake pedal BKT (side LH) | | | | √ | | √ | |
| 341 | Torque Brake pedal | | | | √ | | √ | |
| 342 | Check Brake pedal | | | | √ | | √ | |
| 343 | Hang the Brake pedal Tension spring | | | | √ | | √ | |
| 344 | Check Operasi Brake pedal | | | | √ | | √ | |
| 345 | Fitting E/G room main W/H clamp Dash panel | | | | √ | | √ | |
| 346 | Connect the E/G room main W/H X E/G room main W/H No. 2 | | 55 | L,Ef | √ | 13 | | 8.2 |
| 347 | Fitting Hood lock CTL | | 56 | L,Ef | √ | 9 | √ | 7 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | cable clamp X Clutch pedal BKT | | | | | | | |
| 348 | Tighten the E/G room main W/H earth (side LH) | | | | √ | | √ | |
| 349 | Torque E/G room main W/H earth (side LH) | | 57 | Ef | √ | 19 | √ | 19 |
| 350 | Check E/G room main W/H earth (side LH) | | | | √ | | √ | |
| 351 | Tighten the E/G room main W/H earth (side RH) | | | | √ | | √ | |
| 352 | Torque E/G room main W/H earth (side RH) | | 58 | Ef | √ | 15 | √ | 15 |
| 353 | Check E/G room main W/H earth (side RH) | 18 | | | √ | | √ | |
| 354 | Take the Actuator ASSY | | | | √ | | √ | |
| 355 | Fitting Actuator ASSY | | | | √ | | √ | |
| 356 | Tighten the Actuator ASSY (side RH) | | 59 | Ef | √ | 35 | √ | 34 |
| 357 | Torque Actuator ASSY (side RH) | | | | √ | | √ | |
| 358 | Check Actuator ASSY (side RH) | | | | √ | | √ | |
| 359 | Take the Actuator ASSY | | 60 | Ef | √ | 34 | | 0 |
| 360 | Fitting Actuator ASSY | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 361 | Tighten the Actuator ASSY (side LH) | | | | √ | | | |
| 362 | Torque Actuator ASSY (side LH) | | | | √ | | | |
| 363 | Check Actuator ASSY (side LH) | | | | √ | | | |
| 364 | Close the E/G hood | | 61 | Ef | √ | 5 | √ | 8.5 |
| 365 | Fitting Floor W/H clamp X RR Pillar (side LH) | | | | √ | | √ | |
| 366 | Tighten the Floor W/H clamp X RR Pillar (side LH) | | | | √ | | √ | |
| 367 | Torque Floor W/H clamp X RR Pillar (side LH) | | | | √ | | √ | |
| 368 | Check Floor W/H clamp X RR Pillar (side LH) | 19 | 62 | Eb | √ | 31 | √ | 22 |
| 369 | Connect the B/D W/H C/N X Floor W/H (UPR) (1) | | | | √ | | √ | |
| 370 | Connect the B/D W/H C/N X Floor W/H (UPR) (2) | | | | √ | | √ | |
| 371 | Fitting Floor W/H clamp X RR Pillar (UPR) | | | | √ | | | |
| 372 | Connect the B/D W/H C/N X Floor W/H | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | (LWR) | | | | | | | |
| 373 | Fitting Floor W/H clamp X RR Pillar (LWR) | | | | √ | | | |
| 374 | Fitting RR washer hose X RR Pillar | | | | √ | | √ | |
| 375 | Connect the RR washer hose X Washer nozzle | | 63 | Eb | √ | 12 | √ | 8.4 |
| 376 | Fitting RR washer hose Clip X RR roof | | | | √ | | | |
| 377 | Tighten the Rear lamp (side RH) | | | | √ | | √ | |
| 378 | Tighten the Rear lamp (side LH) | | 64 | Eb,E | √ | 21 | √ | 20 |
| 379 | Take the TPMS receiver | | | | √ | | √ | |
| 380 | Release the White tape | | | | √ | | | |
| | Tighten the RTPMS receiver X D pillar | | 65 | Eb | | 12 | | 11 |
| 381 | Roof side inner (side RH) | | | | √ | | √ | |
| 382 | Fitting Stop lamp S/W adjuster (RHD) | | | | √ | | √ | |
| 383 | Putar tangan Stop lamp S/W (RHD) | 20 | 66 | R | √ | 17 | √ | 17 |
| 384 | Connect the E/G room main W/H Stop lamp S/W (RHD) | | | | √ | | √ | |
| 385 | Take the Accelerator | | 67 | R | √ | 7 | √ | 9.4 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | pedal (RHD) | | | | | | | |
| 386 | Tighten the Accelerator pedal (RHD) | | | | √ | | √ | |
| 387 | Torque Accelerator pedal (RHD) | | | | √ | | √ | |
| 388 | Check Accelerator pedal (RHD) | | | | √ | | √ | |
| 389 | Connect the E/G room main W/H Acceleration pedal (RHD) | | 68 | R | √ | 11 | √ | 14 |
| 390 | Check E/G room main W/H C/N X Acceleration pedal (RHD) | | | | √ | | | |
| 391 | Fitting Fuel lid opener cable X FR Floor W/H (side RH) | | | | √ | | √ | |
| 392 | Fitting Fuel lid opener cable X FR Carpet hook (side RH) | | | | √ | | √ | |
| 393 | Fitting Fuel lid opener cable X Floor W/H (side RH) | | 69 | R | √ | 23 | √ | 24 |
| 394 | Fitting Fuel lid opener cable Clip Tunnel (side RH) | | | | √ | | √ | |
| 395 | Fitting Fuel lid opener cable X FR Floor W/H | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | (side RH) | | | | | | | |
| 396 | Fitting Floor Plug hole X FR Floor W/H (side RH) | | | | √ | | √ | |
| 397 | Fitting Floor Plug hole X CTR Floor W/H (side RH) | | | | √ | | √ | |
| 398 | Fitting Floor Plug hole X CTR Floor W/H (Middle) | | | | √ | | √ | |
| | Fitting Floor Plug hole | | 70 | R | | 32 | | 30 |
| 399 | X CTR Floor W/H (side RH) | | | | √ | | √ | |
| 400 | Add the Plug Plate X CTR Floor (side RH) | | | | √ | | √ | |
| 401 | Add the Plug Plate X CTR Floor (Middle) | | | | √ | | √ | |
| 402 | Add the Tape seal sheet X CTR Floor (side RH) | | | | √ | | √ | |
| 403 | Take the side A/B sensor (W/CSA) | | | | √ | | √ | |
| 404 | Connect the Side A/B sensor Floor W/H (side RH) | | | | √ | | √ | |
| | Check Side A/B | | 71 | R | | 20 | | 19 |
| 405 | sensor C/N X Floor W/H (side RH) | | | | √ | | √ | |
| 406 | Tighten the Side A/B sensor X wheel house | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | (side RH) | | | | | | | |
| 407 | Torque Side A/B sensor X Wheel house (side RH) | | | | √ | | √ | |
| 408 | Check Side A/B sensor X Wheel house (side RH) | | | | √ | | √ | |
| 409 | Connect the RR Fog lamp relay X Floor W/H R/B | | 72 | L | √ | 10 | | 0 |
| 410 | Connect the Defogger relay X Floor W/H R/B | | | | √ | | | |
| 411 | Fitting Stop lamp S/W adjuster (LHD) | | | | √ | | √ | |
| 412 | Putar tangan Stop lamp S/W (LHD) | | 73 | L | √ | 14 | √ | 16 |
| 413 | Connect the E/G room W/H Stop lamp S/W (LHD) | 21 | | | √ | | √ | |
| 414 | Take the Acelerator pedal (LHD) | | | | √ | | √ | |
| 415 | Tighten the Acelerator pedal (LHD) | | | | √ | | √ | |
| 416 | Torque Acelerator pedal (LHD) | | 74 | L | √ | 36 | √ | 35 |
| 417 | Check Acelerator pedal (LHD) | | | | √ | | √ | |
| 418 | Fitting E/G room main W/H X Brake pedal | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | BKT (LHD) | | | | | | | |
| 419 | Connect the E/G room main W/H (UPR) X Floor W/H (LHD) | | | | √ | | √ | |
| 420 | Connect the E/G room main W/H (LWR) X Floor W/H (LHD) | | | | √ | | √ | |
| 421 | Fitting Floor W/H BKT X Dash panel (LHD) | | | | √ | | √ | |
| 422 | Connect the E/G room main W/H Acelerator pedal (LHD) | | | | √ | | √ | |
| 423 | Check E/G room main W/H C/N X Accelerator pedal (LHD) | | | | √ | | √ | |
| 424 | Tighten the Floor W/H BKT X Dash panel | | | | √ | | √ | |
| 425 | Take the Fuel lid opener cable | | | | √ | | √ | |
| 426 | Fitting Fuel lid opener cable X FR Floor W/H (side LH) (LHD) | | | | √ | | √ | |
| 427 | Fitting Fuel lid opener cable X FR Carpet hook (side LH) (LHD) | | 75 | L | √ | 31 | √ | 29 |
| 428 | Fitting Fuel lid opening lid X Floor W/H (side LH) (1) | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 429 | Fitting Fuel lid opening lid X Floor W/H (side LH) (2) | | | | √ | | √ | |
| 430 | Fitting Fuel lid opener X RR Floor carpet hook (side LH) | | | | √ | | √ | |
| 431 | Fitting Fuel lid opener X RR Floor W/H (side LH) | | | | √ | | √ | |
| 432 | Put in Fuel lid opener X LH QTR panel | | | | √ | | √ | |
| 433 | Take the Side A/B sensor | | | | √ | | √ | |
| 434 | Connect the Side A/B sensor Floor W/H (side LH) | | | | √ | | √ | |
| 435 | Check Side A/B sensor C/N X Floor W/H (side LH) | | | | √ | | √ | |
| 436 | Tighten the Side A/B sensor X Wheel house (side LH) | | 76 | L | √ | 18 | √ | 17 |
| 437 | Torque Side A/B sensor X Wheel house (side LH) | | | | √ | | √ | |
| 438 | Check Side A/B sensor X Wheel house (side LH) | | | | √ | | √ | |
| 439 | Take the SPS dari box No.5 | 22 | 77 | L | √ | 57 | √ | 50 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 440 | Bring the SPS dari box No.5 | | | | √ | | √ | |
| 441 | Take the Fuel tank pipe shield | | | | √ | | √ | |
| 442 | Fitting Fuel tank pipe shield | | | | √ | | √ | |
| 443 | Take the Fuel (big) inlet ring | | | | √ | | √ | |
| 444 | Enter the Fuel (big) inlet ring | | | | √ | | √ | |
| 445 | Take the Fuel (small) inlet ring | | | | √ | | √ | |
| 446 | Enter the Fuel (small) inlet ring | | | | √ | | √ | |
| 447 | Fitting Fuel lid spring | | | | √ | | √ | |
| 448 | Fitting Fuel filler opening lid lock retainer | | | | √ | | √ | |
| 449 | Fitting Fuel filler opening lid X Fuel filler opening lid lock | | | | √ | | | |
| 450 | Fitting Fuel lid opener cable Clip Jack BKT | | | | √ | | √ | |
| 451 | Take the Multiplex network Door CPU | | | | √ | | √ | |
| 452 | Connect the Multiplex network Door CPU | | 78 | L | √ | 10 | √ | 16 |
| 453 | Tighten the Multiplex network Door CPU | | | | √ | | √ | |
| 454 | Take the B/D lock | | 79 | L,Eb | √ | 25 | √ | 23 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 455 | Install the B/D lock Scratch cover | 23 | 81 | R | √ | 66 | √ | 47 |
| 456 | Connect the B/D lock X BD W/H | | | | √ | | √ | |
| 457 | Connect the B/D lock X BD hole | | | | √ | | √ | |
| 458 | Tighten the B/D lock | | | | √ | | √ | |
| 459 | Take the CTR Headlining Special Jig (side RH) | | | | √ | | √ | |
| 460 | Hang the CTR Headlining Special Jig (side RH) | | | | √ | | √ | |
| 461 | Take the Headlining Assy | | | | √ | | | |
| 462 | Bring the Headlining Assy Body | | | | √ | | | |
| 463 | Fitting Headlining Clip | | | | √ | | √ | |
| 464 | Connect the RR Roof antenna Code | | | | √ | | √ | |
| 465 | Release the CTR Headlining Special Jig (side RH) | | | | √ | | √ | |
| 466 | Return the CTR Headlining Special Jig (side RH) | | | | √ | | √ | |
| 467 | Fitting Headlining Clip | | 82 | E | √ | 16 | √ | 8.2 |
| 468 | Fitting Dome lamp X | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | Roof R/F | | | | | | | |
| 469 | Fitting Headlining X Roof R/F | | | | √ | | | |
| 470 | Fitting Magic fastener X Roof R/F | | | | √ | | | |
| 471 | Take the RR Assist grip No.2 | | | | √ | | √ | |
| 472 | Fitting RH RR Assist grip No.2 | | 83 | E,Eb | √ | 22 | √ | 22 |
| 473 | Fitting LH RR Assist grip No.2 | | | | √ | | √ | |
| 474 | Take the RR Seatbelt cover | | | | √ | | √ | |
| 475 | Fitting LH RR Sealtbelt cover | | 84 | E | √ | 22 | √ | 25 |
| 476 | Fitting Belt guide X RR Sealtbelt cover | | | | √ | | √ | |
| 477 | Take the CTR Sealtbelt cover | | | | √ | | | |
| 478 | Fitting CTR Sealtbelt cover | | 85 | E | √ | 22 | | 0 |
| 479 | Fitting Belt guide X CTR Sealtbelt cover | | | | √ | | | |
| 480 | Take the FR Headlining Special Jig (side LH) | | | | √ | | √ | |
| 481 | Take the CTR Headlining Special Jig (side LH) | 24 | 86 | L | √ | 54 | √ | 53 |
| 482 | Hang the FR | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | Headlining Special Jig (side LH) | | | | | | | |
| 483 | Hang the CTR Headlining Special Jig (side LH) | | | | √ | | √ | |
| 484 | Take the Headlining Assy | | | | √ | | √ | |
| 485 | Bring the Headlining Assy Body | | | | √ | | √ | |
| 486 | Set Position Headlining Assy Roof | | | | √ | | √ | |
| 487 | Take the Sunvisor holder | | | | √ | | √ | |
| 488 | Fitting Sunvisor holder X Headlining | | | | √ | | √ | |
| 489 | Release the FR Headlining Special jig (side RH) | | | | √ | | | |
| 490 | Return the FR Headlining Special jig (side RH) | | | | √ | | | |
| 491 | Connect the FR Radio antenna code X Antenna cord | | 87 | E | √ | 2 | | 0 |
| 492 | Take the FR Assist grip RHD | | | | √ | | √ | |
| 493 | Fitting LH FR Assist grip RHD | | 88 | E | √ | 15 | √ | 11 |
| 494 | Fitting RH FR Assist grip cover RHD | | | | √ | | | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 495 | Take the FR Assist grip LHD | | | | √ | | √ | |
| 496 | Fitting RH FR Assist grip LHD | | 89 | E | √ | 15 | √ | 13 |
| 497 | Fitting LH FR Assist grip cover LHD | | | | √ | | | |
| 498 | Take the Roof console Box | | | | √ | | √ | |
| 499 | Connect the Roof console Box | | 90 | E | √ | 16 | √ | 14 |
| 500 | Fitting Roof console Box | | | | √ | | √ | |
| 501 | Connect the Roof console Box | | 91 | E | √ | 13 | | 0 |
| 502 | Fitting Roof console | | | | √ | | | |
| 503 | Release the FR Headlining Special jig (side LH) | | | | √ | | √ | |
| 504 | Return the FR Headlining Special jig (side LH) | | 92 | L | √ | 8 | √ | 8 |
| 505 | Release the CTR Headlining Special jig (side LH) | | | | √ | | √ | |
| 506 | Return the CTR Headlining Special jig (side LH) | | | | √ | | √ | |
| 507 | Fitting Antenna cord clip X FR pillar (side RH) | 25 | 93 | R | √ | 9 | √ | 6.4 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 508 | Take the D side Sunvisor | 26 | 94 | R | √ | 27 | √ | 24 |
| 509 | Tighten the RH Sunvisor | | | | √ | | √ | |
| 510 | Fitting RH Sunvisor cover BKT | | | | √ | | √ | |
| 511 | Fitting RH Sunvisor X Visor holder | | | | √ | | √ | |
| 512 | Take the A/B ECU | | 95 | R | √ | 30 | √ | 36 |
| 513 | Tighten the A/B ECU | | | | √ | | √ | |
| 514 | Torque A/B ECU | | | | √ | | √ | |
| 515 | Check A/B ECU | | | | √ | | √ | |
| 516 | Check A/B ECU Protective cover | | | | √ | | √ | |
| 517 | Take the RR Assist grip No.1 | | 96 | R,Eb | √ | 12 | √ | 16 |
| 518 | Fitting RH Assist grip No.1 | | | | √ | | √ | |
| 519 | Take the RH roof side G/N | | 97 | R | √ | 13 | | 0 |
| 520 | Fitting RH roof side G/N | | | | √ | | | |
| 521 | Fitting Roof W/H clip X FR pillar (side LH) | | 98 | L | √ | 7 | √ | 8.4 |
| 522 | Take the P side Sunvisor | | 99 | L | √ | 23 | √ | 19 |
| 523 | Tighten the LH Sunvisor | | | | √ | | √ | |
| 524 | Fitting LH Sunvisor cover | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 525 | Fitting LH Sunvisor X Visor holder | | | | √ | | √ | |
| 526 | Take the RR Assist grip No.1 | | 100 | E,Eb | √ | 14 | √ | 14 |
| 527 | Fitting LH RR Assist grip No.1 | | | | √ | | √ | |
| 528 | Take the RR A/C S/W | | | | √ | | √ | |
| 529 | Connect the RR A/C S/W X Floor W/H | | 101 | E,Eb | √ | 11 | √ | 7.6 |
| 530 | Fitting RR A/C S/W X Illumination lamp | | | | √ | | √ | |
| 531 | Take the RR A/C S/W | | | | √ | | | |
| 532 | Connect the RR A/C S/W X Floor W/H | | 102 | E | √ | 11 | | 6.4 |
| 533 | Fitting RR A/C S/W X Headlining | | | | √ | | √ | |
| 534 | Take the Smart antenna | | 103 | L,Eb | √ | 6 | √ | 7.4 |
| 535 | Fitting Smart antenna X Floor W/H C/N | | | | √ | | √ | |
| 536 | Take the LH roof side G/N | | 104 | L | √ | 11 | | 0 |
| 537 | Fitting LH roof G/N | | | | √ | | | |
| 538 | Take the LUGG W/H No.2 | | | | √ | | √ | |
| 539 | Fitting LUGG W/H G/M No.2 | 27 | 105 | Eb | √ | 22 | √ | 22 |
| 540 | Fitting LUGG W/H clip Outside | | | | √ | | √ | |
| 541 | Fitting LUGG W/H | | | | √ | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | clip inside | | | | | | | |
| 542 | Fitting LUGG G/M QTR panel | | | | √ | | √ | |
| 543 | Connect the LUGG W/H C/N X Floor W/H | | | | √ | | √ | |
| 544 | Take the RR A/C unit Assy | | | | √ | | √ | |
| 545 | Set Position RR A/C unit Assy | | | | √ | | √ | |
| 546 | Tighten the RR A/C unit Assy | | 106 | Eb | √ | 22 | √ | 22 |
| 547 | Tighten the RR A/C unit Assy Pipe | | | | √ | | √ | |
| 548 | Tighten the Floor W/H earth X RR pillar (side RH) | | | | √ | | √ | |
| 549 | Torque Floor W/H earth X RR pillar (side RH) | | | | √ | | √ | |
| 550 | Check Floor W/H earth X RR pillar (side RH) | | 107 | Eb | √ | 12 | √ | 12 |
| 551 | Fitting Floor W/H clamp X RR pillar (side RH) | | | | √ | | √ | |
| 552 | Fitting Floor W/H clamp X RR A/C unit | | | | √ | | √ | |
| 553 | Connect the Floor W/H C/N No. 1 X RR | | 108 | Eb | √ | 28 | √ | 28 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 554 | A/C Blower Connect the Floor W/H C/N No. 2 X RR A/C unit | 1 | 109 | Ef | √ | | √ | 9.2 |
| 555 | Connect the Floor W/H C/N No. 3 X RR A/C unit | | | | √ | | √ | |
| 556 | Enter the RR cooler UPR Duct | | | | √ | | √ | |
| 557 | Fitting Hood lock CTL cable clamp (RHD) | | | | | | √ | |
| 558 | Fitting Seal cowl water extract X Cowl top Panel (RHD) | | 110 | Ef | | | √ | 4 |
| 559 | Take the Hood Bulge (KD) | | 111 | Ef | | | √ | 30 |
| 560 | Tighten the Hood Bulge*Hood Body (KD) | | | | | | √ | |
| 561 | Take the Stopper B/D (LWR) | 3 | 112 | Eb | | | √ | 20 |
| 562 | Tighten the Stopper LWR B/D (side LH) | | | | | | √ | |
| 563 | Take the stopper B/D (LWR) | | | | | | √ | |
| 564 | Tighten the Stopper LWR B/D (side RH) | | | | | | √ | |
| 565 | Take the Pad cowl top silencer No.2 | 4 | 113 | Ef,L | | | √ | 12 |
| 566 | Fitting Pad cowl top | | | | | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | silencer No.2 | | | | | | | |
| 567 | Tighten the Floor W/H Earth X CTR Pillar (side LH) | | | | | | √ | |
| 568 | Torque W/H Earth CTR Pillar (side LH) | 6 | 114 | L | | | √ | 13 |
| 569 | Check W/H Earth X CTR Pillar (side LH) | | | | | | √ | |
| 570 | Put in B/D W/H X B/D | | | | | | √ | |
| 571 | Fitting Can Junction C/N X B/D Panel No.1 | | | | | | √ | |
| 572 | Fitting Power B/D W/H X B/D Panel No.1 | 7 | 115 | Eb | | | √ | 31 |
| 573 | Tighten the B/D W/H Earth X B/D Panel No.1 | | | | | | √ | |
| 574 | Letakkan E/G room main W/H X Fender Apron (side LH) | 8 | 116 | Ef | | | √ | 3 |
| 575 | Fitiing E/G room main W/H protector X Cowl top LHD | | 117 | Ef | | | √ | 3.2 |
| 576 | Take the B/D emblem | | 118 | Eb | | | √ | 9.4 |
| 577 | Add the B/D emblem | | | | | | √ | |
| 578 | Take the Door Nameplate Jig (side RH) | 9 | 119 | Eb,R | | | √ | 27 |
| 579 | Set Position Door | | | | | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | Nameplate Jig (side RH) | | | | | | | |
| 580 | Add the Door Nameplate No.2 X B/D panel No.1 | | | | | | √ | |
| 581 | Add the RR license plate cushion X B/D | | | | | | √ | |
| 582 | Connect the B/D camera S/W X B/D W/H | | 120 | Eb | | | √ | 6 |
| 583 | Connect the B/D camera S/W X B/D W/H | | | | | | √ | |
| 584 | Torque RR Seat Belt X Body (side LH) | | | | | | √ | |
| 585 | Check RR Seat Belt X Body (side LH) | | 121 | L | | | √ | 7 |
| 586 | Check RR Seat Belt X Body (side LH) (W/seat belt no.1) | | | | | | √ | |
| 587 | Take the CTR Seat belt shoulder | 10 | 122 | L | | | √ | 12 |
| 588 | Tighten the CTR Seat belt shoulder X Body | | | | | | √ | |
| 589 | Take the FR Tape seal sheet RR Wheel house (side LH) | | 123 | L | | | √ | 12 |
| 590 | Add the FR Tape seal sheet RR Wheel house (side LH) | | | | | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 591 | Take the RR Tape seal sheet RR Wheel house (side LH) | 11 | 124 | R | | | √ | 16 |
| 592 | Add the RR Tape seal sheet RR Wheel house (side LH) | | | | | | √ | |
| 593 | Fitting Floor W/H X CTR Floor Carpet Hook (side RH) | | | | | | √ | |
| 594 | Add the Plug Plate X Wheel House | | | | | | √ | |
| 595 | Fitting Floor W/H clamp (side RH) X QTR pillar | | 125 | R | | | √ | 7.4 |
| 596 | Fitting Floor W/H clamp X Roof R/F (side RH) | | | | | | √ | |
| 597 | Take the FR Tape seal sheet RR Wheel house (side RH) | | 126 | R | | | √ | 33 |
| 598 | Add the FR Tape seal sheet RR Wheel house (side RH) | | | | | | √ | |
| 599 | Take the RR Tape seal sheet RR Wheel house (side RH) | | | | | | √ | |
| 600 | Add the RR Tape seal sheet RR Wheel house (side RH) | | | | | | √ | |
| 601 | Take the RR Tape seal | | | | | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | sheet RR Wheel house No.2 | | | | | | | |
| 602 | Add the RR Tape seal sheet RR Wheel house No.2 | | | | | | √ | |
| 603 | Connect the FR washer hose X RH Washer nozzle (KD) | | 127 | Ef | | | √ | 14 |
| 604 | Connect the FR washer hose X LH Washer nozzle (KD) | 12 | | | | | √ | |
| 605 | Fitting FR washer hose | | 128 | Ef | | | √ | 6 |
| 606 | Tighten the E/G room main W/H Protector X Fender (side LH) | | 129 | Ef | | | √ | 3.5 |
| 607 | Take the SPS part box No.2 | | | | | | √ | |
| 608 | Bring the SPS part box No.2 | | | | | | √ | |
| 609 | Take the Empty box SPS No.2 | | | | | | √ | |
| 610 | Kembali Empty box SPS No.2 | 13 | 130 | Eb | | | √ | 12 |
| 611 | Take the W/H protector | | | | | | √ | |
| 612 | Fitting W/H protector X Cowl side (side LH) | | | | | | √ | |
| 613 | Take the Roofside airduct | 14 | 131 | R | | | √ | 23 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 614 | Take the Packing | | | | | | √ | |
| 615 | Add the Packing X Air duct | | | | | | √ | |
| 616 | Fitting Roofside airduct X Roof side (side RH) | | | | | | √ | |
| 617 | Take the RH RR Side rail spacer | | | | | | √ | |
| 618 | Fitting RH RR Side rail spacer X B pillar Roof (side RH) | | | | | | √ | |
| 619 | Tighten the RH RR Side rail spacer X B pillar Roof | | | | | | √ | |
| 620 | Take the FR RH side rail spacer | | | | | | √ | |
| 621 | Fitting FR RH side rail spacer | | 132 | R | | | √ | 39 |
| 622 | Take the RR RH side rail spacer | | | | | | √ | |
| 623 | Fitting RR RH side rail spacer | | | | | | √ | |
| 624 | Take the RR RH side rail spacer No.2 | | | | | | √ | |
| 625 | Fitting RR RH side rail spacer No.2 | | | | | | √ | |
| 626 | Take the vacuum Switching valve BKT SUV TR LHD | 15 | 133 | Ef,E | | | √ | 26 |
| 627 | Tighten the vacuum | | | | | | √ | |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | Switching valve BKT SUV TR LHD | | | | | | | |
| 628 | Take the vacuum Switching valve SUV TR LHD | | | | | | √ | |
| 629 | Tighten the vacuum Switching valve SUV TR LHD | | | | | | √ | |
| 630 | Fitting vacuum Switching valve SUV | | | | | | √ | |
| 631 | Take the Clutch M/C BKT RHD GD | | 134 | Ef,E | | | √ | 19 |
| 632 | Enter the Clutch M/C BKT RHD GD | | | | | | √ | |
| 633 | Take the Clutch M/C Assy LHD | | 135 | Ef,E | | | √ | 15 |
| 634 | Enter the Clutch M/C Assy LHD | | | | | | √ | |
| 635 | Fitting Brake tube flexible hose LHD | | 136 | Ef,E | | | √ | 2.6 |
| 636 | Take the LH RR Side rail spacer | | | | | | √ | |
| 637 | Fitting LH RR Side rail spacer X B pillar Roof (side LH) | 16 | 137 | E | | | √ | 12 |
| 638 | Tighten the LH RR Side rail spacer X B pillar Roof | | | | | | √ | |
| 639 | Fitting Lh Curtain A/B RR Protector Clip | | 138 | L | | | √ | 7.2 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| 640 | Fitting Lh Curtain A/B CTR Protector Clip | 19 | 139 | Eb | | | √ | 13 |
| 641 | Fitting Lh Curtain A/B FR Protector Clip | | | | | | √ | |
| 642 | Take the protective vinyl sheet QTR (side LH) | | | | | | √ | |
| 643 | Install the protective vinyl sheet X QTR (side LH) | | | | | | √ | |
| 644 | Fitting floor W/H X LH RR Pillar (UPR) | | 140 | Eb | | | √ | 6.8 |
| 645 | Take the BKT Floor W/H (side RR) | | 141 | Eb,L | | | √ | 23 |
| 646 | Fitting Floor W/H C/N X BKT | | | | | | √ | |
| 647 | Fitting Floor W/H C/N X BKT 16YM | | | | | | √ | |
| 648 | Tighten the W/floor W/H BKT X RR roof | | | | | | √ | |
| 649 | Fitting Floor W/H clamp X RR roof | | | | | | √ | |
| 650 | Fitting Floor W/H clamp X RR roof 16YM | | 142 | Eb | | | √ | 4 |
| 651 | Fitting RR washer hose Clip X RR roof | | 143 | Eb | | | √ | 7.4 |
| 652 | Fitting Screw G/M X B/D | | | | | | √ | |
| 653 | Take the Wireless | | 144 | Eb | | | √ | 6 |

| No | Task | Station | Work Element | Side | Innova | | Fortuner | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Available task | Task times | Available task | Task times |
| | door lock buzzer | | | | | | | |
| 654 | Connect the Wireless door lock buzzer X B/D W/H | | | | | | √ | |
| 655 | Fitting Wireless door lock buzzer X B/D W/H | | | | | | √ | |
| 656 | Fitting Cushion X Fuel lid | | | | | | √ | |
| 657 | Fitting Fuel filler opening lid lock retainer X Fuel opener wire | 22 | 145 | L | | | √ | 8.2 |
| 658 | Release the B/D lock Scratch cover | | 146 | L,Eb | | | √ | 1 |
| 659 | Take the empty box SPS No.5 | 24 | 147 | E | | | √ | 8.4 |
| 660 | Return the empty box SPS No.5 | | | | | | √ | |
| 661 | Fitting Cable clamp X FR pillar (side RH) | 25 | 148 | E | | | √ | 7.9 |

### 4.2. Data processing

The data processing will used to create a model then simulate by using Tecnomatix Plant Simulation 12. The computer used to run the simulation model is supported with an Intel Core i3 M370 2.40 GHz, 2.00 GB RAM, and Windows 7 32-bit OS. In this case, the problem is run with several assumptions:

1. The number of product simulated in accordance with consumer demand but in the sequence is random product.

2. Determination of the new cycle time for the proposed model according to the cycle time constraint and selected cycle time with the most optimal results.
3. Task assignment in the proposed model in accordance with the precedence constraint and assignment restrictions.
4. In the running of simulation, when the operator has completed the task in a particular order directly working on the next order.
5. In the optimization process, the assignment placement must have same from one model to the other model. However, when the assignment placement of the model must be moved since the station time of a given model exceed the cycle time that has already determined so that it can be moved to another station but it must follow the constraints and not all of the task can be moved.

### 4.3.1 Modeling the Mixed-model Two-sided Assembly Line

Based on actual production, the modeling of mixed-model two-sided assembly lines and the test problem can be seen in Figure 4.4 and 4.5.

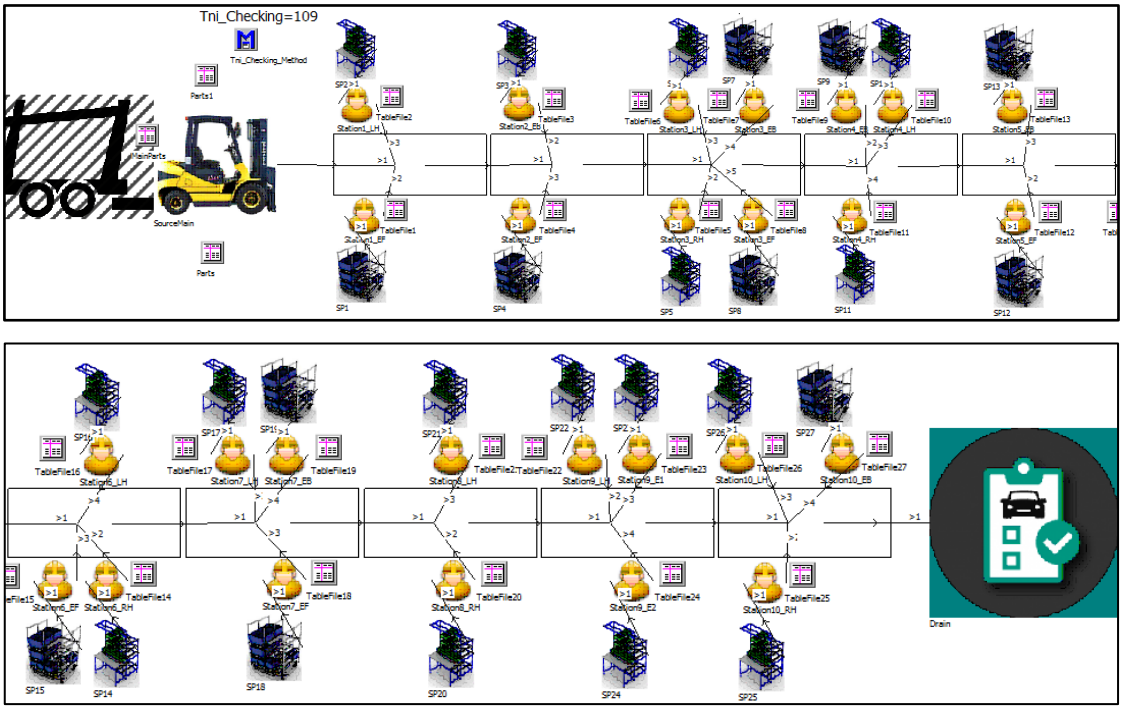



Figure 4.4 Mixed-model two-sided assembly line model

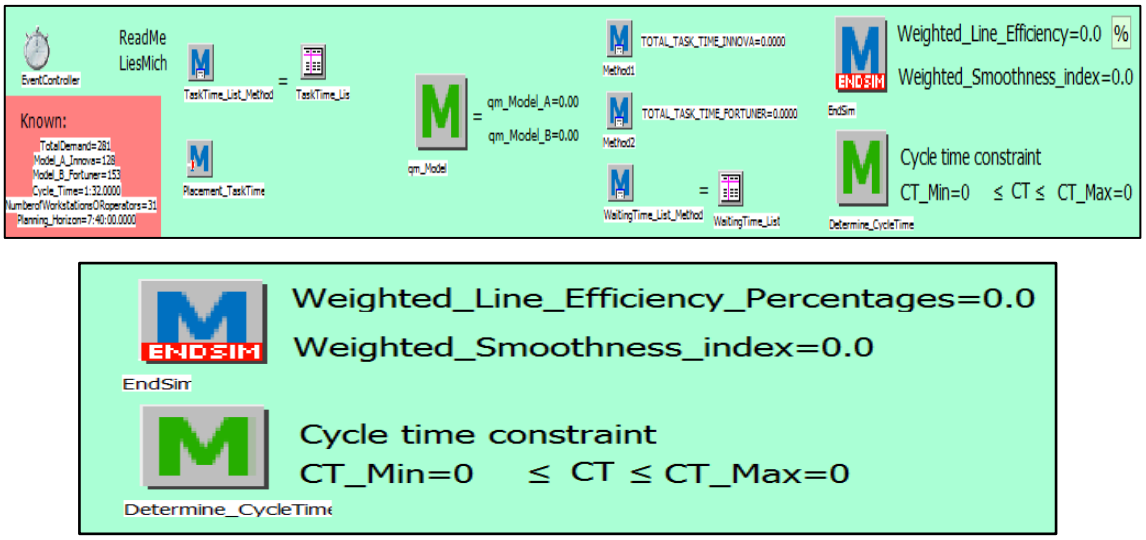



Figure 4.5 Test problem model

### 4.3.2 Input Data

The joint precedence graph that has already made can be converted into software using the object "SingleProc". The conversion result of joint precedence graph can be seen in Figure 4.6.

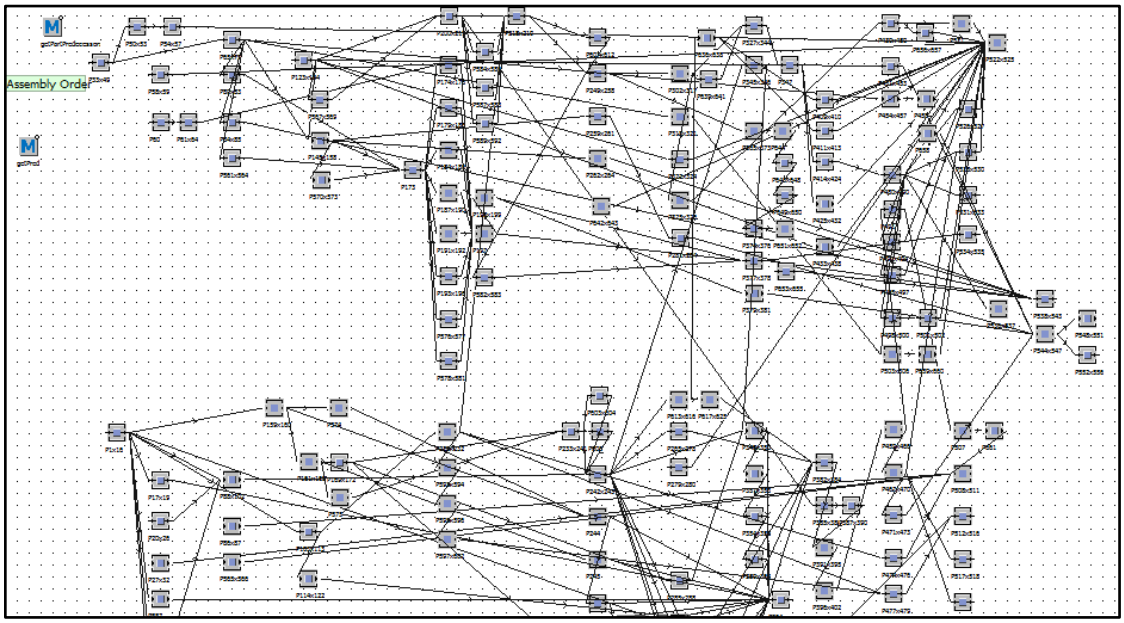


Figure 4.6 Joint precedence graph in the software

The task times data of the products will be entered into software through the work elements. The work elements in each station can be seen in Table 4.3.

Table 4.3 The work elements in each station

| No. | Station name | Mated-station | Work element (Innova and Fortuner) |
|---|---|---|---|
| 1 | Stay hood | 1_EF | 1,2,3,4,109,110,111 |
| 2 | Patent Plate | 1_LH | 5,6,7,8,9,10 |
| 3 | Stay B/Door | 2_EB | 11,12,13,112 |
| 4 | Insulator D. panel | 2_EF | 14,15,113 |
| 5 | Wire Floor RH | 3_RH | 16,17 |
| 6 | Wire Floor LH | 3_LH | 18,114 |
| 7 | Wire B/Door | 3_EB | 19,115 |
| 8 | Wire E/G Room | 3_EF | 20,21,22,116,117 |
| 9 | Setting G/N B/Door | 4_EB | 23,24,25,26,27,28,29,30,31,118,119,120 |
| 10 | Sealt Belt RR LH | 4_LH | 32,33,121,122,123 |
| 11 | Sealt Belt RR RH | 4_RH | 34,124,125,126 |
| 12 | Insulator Hood | 5_EF | 35,36,37,38,39,127,128,129 |
| 13 | RR Hose Washer | 5_EB | 40,41,42,130 |
| 14 | CSA RH | 6_RH | 43,44,45,131,132 |
| 15 | Setting Booster | 6_EF | 46,47,48,49,133,134,135,136 |
| 16 | CSA LH | 6_LH | 50,51,52,53,137,138,139 |
| 17 | Pedal LHD | 7_LH | 54,55,56 |
| 18 | Actuator | 7_EF | 57,58,59,60,61 |
| 19 | Rear Lamp | 7_EB | 62,63,64,65,140,141,142,143,144 |
| 20 | Plug Floor RH | 8_RH | 66,67,68,69,70,71 |
| 21 | Cabel Fuellid LHD | 8_LH1 | 72,73,74,75,76 |
| 22 | Shield Fuel Tank | 8_LH2 | 77,78,79,80,145,146 |
| 23 | Lamp Room | 9_E1 | 81,82,83,84,85 |
| 24 | Setting H/Linning | 9_E2 | 86,87,88,89,90,91,92,147 |
| 25 | Sunvisor RH | 10_RH | 93,94,95,96,97,148 |
| 26 | Sunvisor LH | 10_LH | 98,99,100,101,102,103,104 |
| 27 | RR Cooler | 10_EB | 105,106,107,108 |

Based on the real system, the placement of task each station can be represented by work element of the products that assigned to the object "Table" which is indicated by the symbol (x). The data input into software can be seen in Figure 4.7.

.

| | string 0 | string 1 | time 2 | string 3 | string 4 | string 5 | string 6 | string 7 | string 8 | string 9 | string 10 | string 11 | string 12 | string 13 | string 14 | string 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| string | | Part | Assembl | | Station1_EF | Station1_LH | Station2_EB | Station2_EF | Station3_RH | Station3_LH | Station3_EB | Station3_EF | Station4_EB | Station4_LH | Station4_RH | Station5_EF |
| 1 | P1x16 | P1x16 | 1:08.000 | Station1_EF | x | | | | | | | | | | | |
| 2 | P17x19 | P17x19 | 16.6000 | Station1_EF | x | | | | | | | | | | | |
| 3 | P20x26 | P20x26 | 31.4000 | Station1_EF | x | | | | | | | | | | | |
| 4 | P27x32 | P27x32 | 25.6000 | Station1_EF | x | | | | | | | | | | | |
| 5 | P33x49 | P33x49 | 1:18.700 | Station1_LH | | x | | | | | | | | | | |
| 6 | P50x53 | P50x53 | 17.8000 | Station1_LH | | x | | | | | | | | | | |
| 7 | P54x57 | P54x57 | 12.8000 | Station1_LH | | x | | | | | | | | | | |
| 8 | P58x59 | P58x59 | 4.0000 | Station1_LH | | x | | | | | | | | | | |
| 9 | P60 | P60 | 13.9000 | Station1_LH | | x | | | | | | | | | | |
| 10 | P61x64 | P61x64 | 24.4000 | Station1_LH | | x | | | | | | | | | | |
| 11 | P65x79 | P65x79 | 1:01.200 | Station2_EB | | | x | | | | | | | | | |
| 12 | P80x83 | P80x83 | 13.1000 | Station2_EB | | | x | | | | | | | | | |
| 13 | P84x85 | P84x85 | 10.4000 | Station2_EB | | | x | | | | | | | | | |
| 14 | P86x87 | P86x87 | 13.8000 | Station2_EFR | | | | x | | | | | | | | |
| 15 | P88x102 | P88x102 | 1:12.000 | Station2_EFR | | | | x | | | | | | | | |
| 16 | P103x113 | P103x113 | 44.5400 | Station3_RH | | | | | x | | | | | | | |
| 17 | P114x122 | P114x122 | 41.5100 | Station3_RH | | | | | x | | | | | | | |
| 18 | P123x144 | P123x144 | 1:23.000 | Station3_LH | | | | | | x | | | | | | |
| 19 | P145x158 | P145x158 | 1:28.000 | Station3_EB | | | | | | | x | | | | | |
| 20 | P159x160 | P159x160 | 15.0000 | Station3_EF | | | | | | | | x | | | | |
| 21 | P161x168 | P161x168 | 1:08.000 | Station3_EF | | | | | | | | x | | | | |

Figure 4.7 Data input

### 4.3.3 Simulation of Current Model with Tecnomatix Plant Simulation

The simulation model of the mixed-model two-sided assembly lines can be seen in Figure 4.8. In addition, the simulation program runs in 7 hours 40 minutes working time.

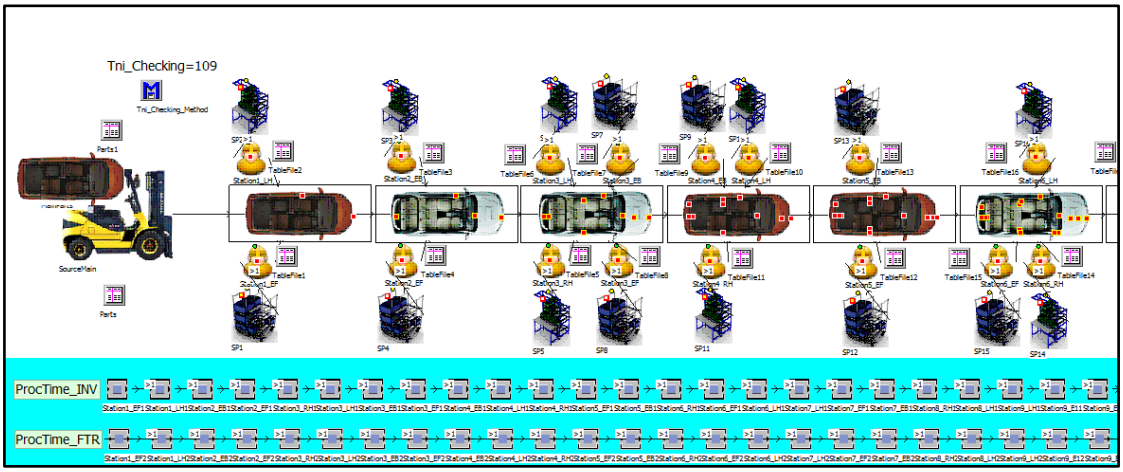



Figure 4.8 Current model

The result of program simulation can be seen in Figure 4.9 and the waiting time result is described in Table 4.4 . It is mentioned that weighted line efficiency is 98.4% and

weighted smoothness index is 60.5% with the total waiting time is 219 seconds (Innova) and 242.2 seconds (Fortuner). Furthermore, the simulation results are given in Figure 4.9.

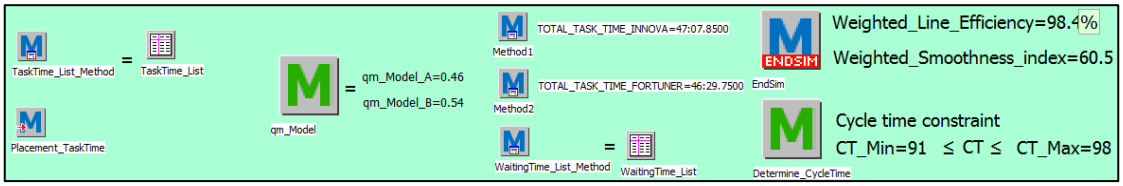



Figure 4.9 The result of simulation program at current model

Table 4.4 The simulation program result of waiting time

| No | Workstation | Task Time (INV) | Task Time (FTR) | Waiting Time (INV) | Waiting Time (FTR) |
|---|---|---|---|---|---|
| 1 | Station1_EF_O1&O2 | 02:23.6 | 02:26.3 | -51.6 | -54.3 |
| 2 | Station1_LH_O1&O2 | 02:33.6 | 01:49.2 | -1:01.6 | -17.2 |
| 3 | Station2_EB | 01:26.7 | 01:39.6 | 5.3 | -7.6 |
| 4 | Station2_EFR | 01:27.8 | 01:00.9 | 4.2 | 31.1 |
| 5 | Station3_RH | 01:28.1 | 01:27.7 | 3.95 | 4.35 |
| 6 | Station3_LH | 01:25.0 | 01:11.9 | 7 | 20.1 |
| 7 | Station3_EB | 01:30.0 | 01:12.4 | 2 | 19.6 |
| 8 | Station3_EF | 02:18.2 | 01:13.6 | -46.2 | 18.4 |
| 9 | Station4_EB | 02:02.4 | 02:44.4 | -30.4 | -1:12.4 |
| 10 | Station4_LH | 01:08.4 | 01:39.6 | 23.6 | -7.6 |
| 11 | Station4_RH | 01:13.0 | 01:18.4 | 19 | 13.6 |
| 12 | Station5_EF | 01:41.8 | 02:02.6 | -9.8 | -30.6 |
| 13 | Station5_EB | 01:32.2 | 01:31.1 | -0.2 | 0.9 |
| 14 | Station6_RH | 01:52.4 | 01:37.1 | -20.4 | -5.1 |
| 15 | Station6_EF | 01:13.1 | 02:26.1 | 18.9 | -54.1 |
| 16 | Station6_LH_O1&O2 | 02:16.2 | 02:50.9 | -44.2 | -1:18.9 |
| 17 | Station7_LH | 01:53.7 | 01:57.2 | -21.7 | -25.2 |
| 18 | Station7_EF | 01:50.6 | 01:19.7 | -18.6 | 12.3 |
| 19 | Station7_EB | 01:17.4 | 01:50.2 | 14.6 | -18.2 |
| 20 | Station8_RH | 01:53.1 | 01:55.3 | -21.1 | -23.3 |

| No | Workstation | Task Time (INV) | Task Time (FTR) | Waiting Time (INV) | Waiting Time (FTR) |
|---|---|---|---|---|---|
| 21 | Station8_LH1 | 01:50.8 | 01:39.8 | -18.8 | -7.8 |
| 22 | Station8_LH2 | 01:44.7 | 01:50.5 | -12.7 | -18.5 |
| 23 | Station9_E1 | 02:28.6 | 01:44.3 | -56.6 | -12.3 |
| 24 | Station9_E2 | 02:04.6 | 01:49.7 | -32.6 | -17.7 |
| 25 | Station10_RH | 01:32.7 | 01:32.2 | -0.7 | -0.2 |
| 26 | Station10_LH | 01:25.0 | 01:04.9 | 7 | 27.1 |
| 27 | Station10_EB | 01:26.2 | 01:26.2 | 5.8 | 5.8 |
| | Total | 47:08.0 | 46:29.7 | 09:18.55 | 10:04.25 |

Next on the summary of the model simulation results can be seen in Figure 4.10 It is mentioned that the result of Innova and Fortuner model simulation on mean life time or time throughput is 21:41.4125 and 21:50.0931. The production amount of each model is 88 and 87. The throughput of each hour produces 11 units.

**Simulation time:** 7:40:00.0000

**Cumulated Statistics of the Parts which the Drain Deleted**

| Object | Name | Mean Life Time | Throughput | TPH | Production | Transport | Storage | Value added | Portion |
|---|---|---|---|---|---|---|---|---|---|
| Drain | FTR | 21:50.0931 | 87 | 11 | 100.00% | 0.00% | 0.00% | 0.00% | |
| Drain | INV | 21:41.4125 | 88 | 11 | 100.00% | 0.00% | 0.00% | 0.00% | |

Figure 4.10 The simulation result of current model

#### 4.2.3.3 Assembly Line Balancing Procedure

Assembly line balancing procedure is performed in the different frame. It can be shown in Figure 4.11.

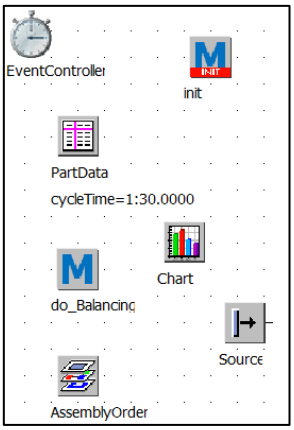



Figure 4.11 Assembly line balancing process

In the figure above, the objects are needed to perform the assembly line balancing procedure. There are many objects based on their function, as follows:

| | | |
|---|---|---|
| PartData | : | The object is to fill the data that will be assigned before line balancing process. |
| AssemblyOrder | : | The object is to read the precedence diagram. |
| CycleTime | : | The object is to fill the amount of cycle time that required. |
| Init | : | The object is the program to clean the data cache in PartData object. |
| Do_Balancing | : | The object is to program the line balancing process that dynamically redistribute flexible work contents depend on the cycle time. |
| Source | : | The object is source of station object that will be balanced. |
| Chart | : | The object is graph to show the result of assembly line balancing. |

In the PartData object, the researcher assigns the possibility of tasks that can be assigned in accordance with the precedence constraint and assignment restriction. It is marked with the symbol x of each part column and station row. Here's the assignment process on each product model:

a. Innova product model

   The initial assignment process is on the Innova model. The task assignment on the Innova model can be seen in Figure 4.12.

| | string 0 | string 1 | time 2 | string 3 | string 4 | string 5 | string 6 | string 7 | string 8 | string 9 | string 10 | string 11 | string 12 | string 13 | string 14 | string 15 | st 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| string | | Part | Assembl | | Station1_EF | Station1_LH | Station2_EB | Station2_EF | Station3_RH | Station3_LH | Station3_EB | Station3_EF | Station4_EB | Station4_LH | Station4_RH | Station5_EF | St |
| 1 | P1x16 | P1x16 | 1:08.000 | Station1_EF | x | | | | | | | | | | | | |
| 2 | P17x19 | P17x19 | 16.6000 | Station1_EF | x | | | | | | | | | | | | |
| 3 | P20x26 | P20x26 | 31.4000 | Station2_EFR | x | x | | x | | | | | | | | | |
| 4 | P27x32 | P27x32 | 25.6000 | Station1_LH | x | x | | x | x | x | | x | | x | x | x | |
| 5 | P33x49 | P33x49 | 1:18.700 | Station1_LH | | x | | | | | | | | | | | |
| 6 | P50x53 | P50x53 | 17.8000 | Station3_LH | | x | | | | x | | | | x | | | |
| 7 | P54x57 | P54x57 | 12.8000 | Station5_EB | | | | | | | | | | | | | x |
| 8 | P58x59 | P58x59 | 4.0000 | Station3_LH | | x | | | | x | | | | x | | | |
| 9 | P60 | P60 | 13.9000 | Station2_EB | | x | x | | | x | x | | | | | | |
| 10 | P61x64 | P61x64 | 24.4000 | Station4_LH | | x | x | | | | | | | x | | | |
| 11 | P65x79 | P65x79 | 1:01.200 | Station2_EB | | | x | | | | | | | | | | |
| 12 | P80x83 | P80x83 | 13.1000 | Station2_EB | | | x | | | | x | | | | | | |
| 13 | P84x85 | P84x85 | 10.4000 | Station2_EB | | | x | | | | x | | | | | | |
| 14 | P86x87 | P86x87 | 13.8000 | Station1_EF | x | x | | x | x | x | | x | | x | x | x | |
| 15 | P88x102 | P88x102 | 1:12.000 | Station2_EFR | | | | x | | | | | | | | | |
| 16 | P103x113 | P103x113 | 44.5400 | Station3_RH | | | | | x | | | | | | | | |
| 17 | P114x122 | P114x122 | 41.5100 | Station3_RH | | | | | x | | | | | | x | | |
| 18 | P123x144 | P123x144 | 1:23.000 | Station3_LH | | | | | | x | | | | | | | |
| 19 | P145x158 | P145x158 | 1:28.000 | Station3_EB | | | | | | | x | | | | | | |
| 20 | P159x160 | P159x160 | 15.0000 | Station3_EF | x | | | | | | | x | | | | | |
| 21 | P161x168 | P161x168 | 1:08.000 | Station3_EF | | | | | | | | x | | | | | |
| 22 | P169x172 | P169x172 | 38.2000 | Station6_EF | | | | | | | | x | | | | x | |

Figure 4.12 The task assignment of Innova product model

b. Fortuner product model

In this product model, the part that will enter the station is equated with the Innova model to make the assembly process will be same. The task assignment of Fortuner can be seen in Figure 4.13.

| | string 0 | string 1 | time 2 | string 3 | string 4 | string 5 | string 6 | string 7 | string 8 | string 9 | string 10 | string 11 | string 12 | string 13 | string 14 | string 15 | st 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| string | | Part | Assembl | | Station1_EF | Station1_LH | Station2_EB | Station2_EF | Station3_RH | Station3_LH | Station3_EB | Station3_EF | Station4_EB | Station4_LH | Station4_RH | Station5_EF | St |
| 1 | P1x16 | P1x16 | 54.0000 | Station1_EF | x | | | | | | | | | | | | |
| 2 | P17x19 | P17x19 | 16.6000 | Station1_EF | x | | | | | | | | | | | | |
| 3 | P20x26 | P20x26 | 17.2000 | Station2_EFR | | | | x | | | | | | | | | |
| 4 | P27x32 | P27x32 | 13.3000 | Station1_LH | | x | | | | | | | | | | | |
| 5 | P33x49 | P33x49 | 1:14.100 | Station1_LH | | x | | | | | | | | | | | |
| 6 | P50x53 | P50x53 | 17.8000 | Station3_LH | | | | | | x | | | | | | | |
| 7 | P54x57 | P54x57 | 15.3000 | Station5_EB | | | | | | | | | | | | | x |
| 8 | P58x59 | P58x59 | 0.0000 | Station3_LH | | | | | | x | | | | | | | |
| 9 | P60 | P60 | 0.0000 | Station2_EB | | | x | | | | | | | | | | |
| 10 | P61x64 | P61x64 | 0.0000 | Station4_LH | | | | | | | | | | x | | | |
| 11 | P65x79 | P65x79 | 1:05.000 | Station2_EB | | | x | | | | | | | | | | |
| 12 | P80x83 | P80x83 | 0.0000 | Station2_EB | | | x | | | | | | | | | | |
| 13 | P84x85 | P84x85 | 13.0000 | Station2_EB | | | x | | | | | | | | | | |
| 14 | P86x87 | P86x87 | 11.0000 | Station1_EF | x | | | | | | | | | | | | |
| 15 | P88x102 | P88x102 | 35.5000 | Station2_EFR | | | | x | | | | | | | | | |
| 16 | P103x113 | P103x113 | 45.5400 | Station3_RH | | | | | x | | | | | | | | |
| 17 | P114x122 | P114x122 | 40.1100 | Station3_RH | | | | | x | | | | | | | | |
| 18 | P123x144 | P123x144 | 57.3000 | Station3_LH | | | | | | x | | | | | | | |
| 19 | P145x158 | P145x158 | 39.4000 | Station3_EB | | | | | | | x | | | | | | |
| 20 | P159x160 | P159x160 | 15.0000 | Station3_EF | | | | | | | | x | | | | | |
| 21 | P161x168 | P161x168 | 37.4000 | Station3_EF | | | | | | | | x | | | | | |
| 22 | P169x172 | P169x172 | 13.0000 | Station6_EF | | | | | | | | | | | | | |

Figure 4.13 The task assignment of Fortuner product model

The next process is to balancing the assembly line using the program object "method" in the software. The step is running the Do_Balancing object. Thus, line balancing process is done in accordance with the cycle time that has the maximum results based on time cycle time constraint. Each product model uses the same cycle time and balanced separately. Line balancing result can be seen in Figure 4.14.

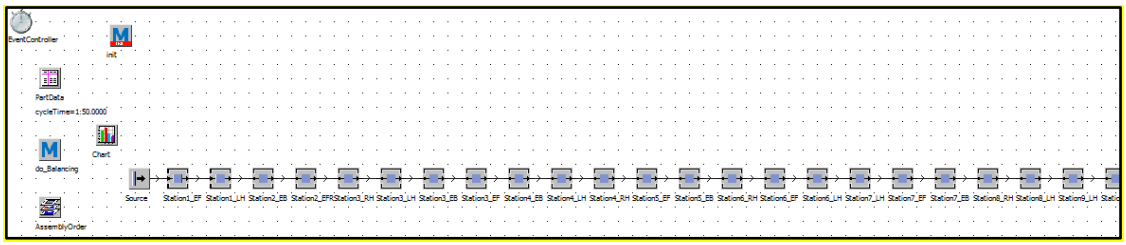


Figure 4.14 Line balancing result

Based on the cycle time constraint obtained from the current model, is 91 as minimum cycle time and 98 as maximum cycle time. The cycle time that would be used is 92 seconds. The result of station times can be seen on object “Chart” such in Figure 4.15 and Figure 4.16.

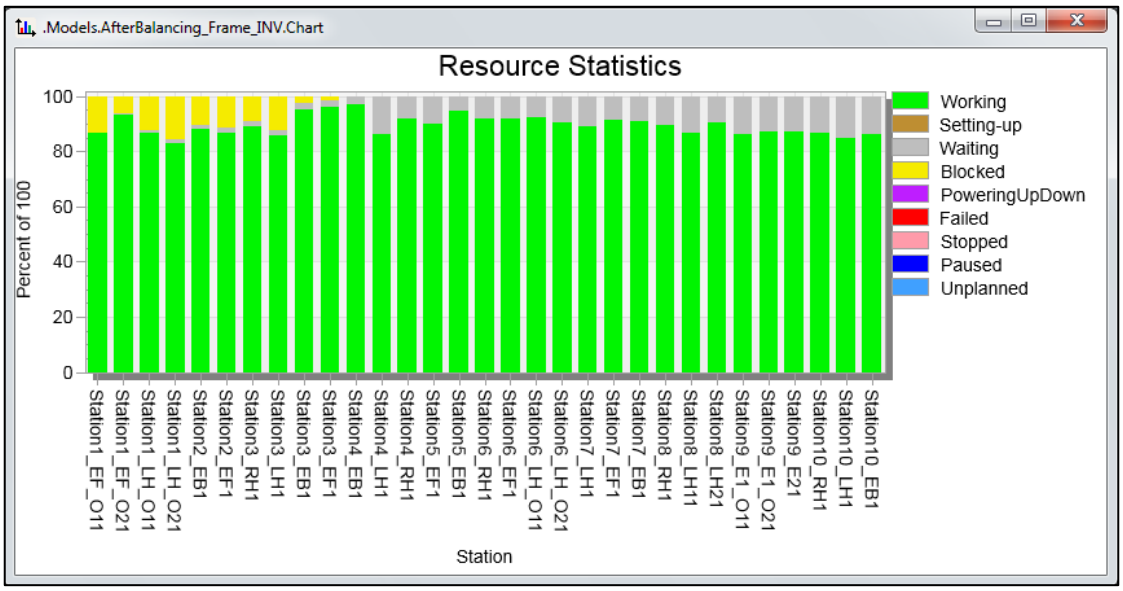



Figure 4.15 The station times chart of Innova product

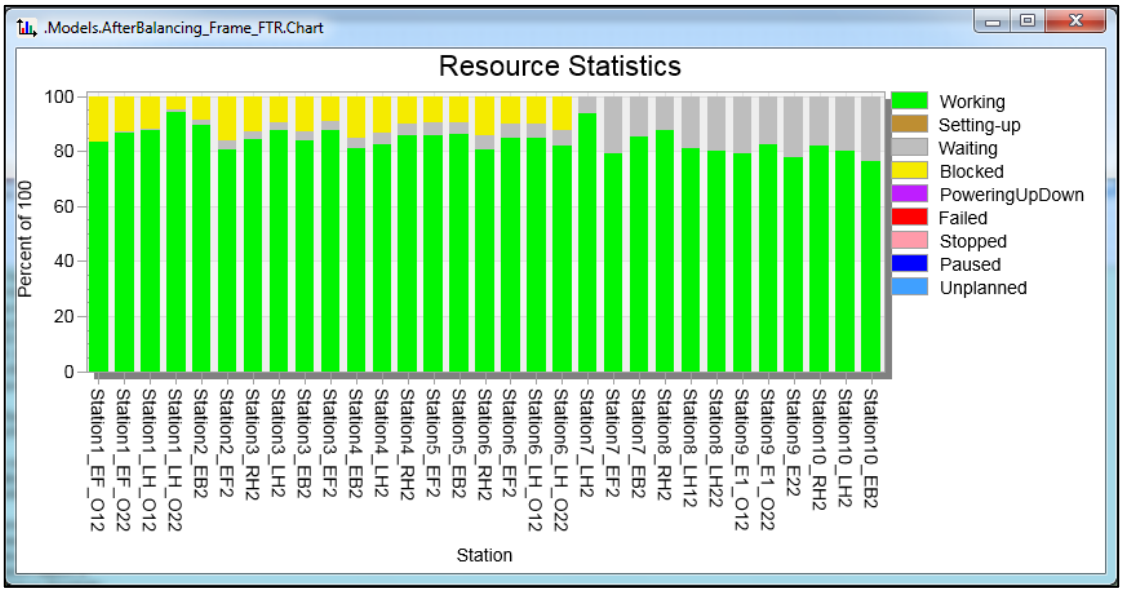



Figure 4.16 The station times chart of Fortuner product

The optimization result from all of the model is represented with the work element that can be seen in Table 4.5.

Table 4.5 Line balancing result

| No | Station name | Mated-station | Work Element | |
|---|---|---|---|---|
| | | | Innova | Fortuner |
| 1 | Stay hood | 1_EF_O1 | 1,14 | 1,14,44,112 |
| | | 1_EF_O2 | 2,3,4,20 | 2,3,4,111,113 |
| 2 | Patent Plate | 1_LH_O1 | 5,8,44 | 5,8,141 |
| | | 1_LH_O2 | 6,7,9,10,44 | 6,7,9,10,20,114,121 |
| 3 | Stay B/Door Insulator D. | 2_EB | 11,12,13 | 11,12,13,23 |
| 4 | panel Wire Floor | 2_EF | 15,47 | 15,36,47 |
| 5 | RH | 3_RH | 16,17 | 16,17 |
| 6 | Wire Floor LH | 3_LH | 18 | 18,41,116 |
| 7 | Wire B/Door Wire E/G | 3_EB | 19,23 | 19,117,120,146 |
| 8 | Room | 3_EF | 21 | 21,22,118,119,136,137 |
| 9 | Setting G/N | 4_EB | 24,25,26,27,28,45 | 24,25,26,27,28,122 |

| No | Station name | Mated-station | Work Element | |
|---|---|---|---|---|
| | | | Innova | Fortuner |
| | B/Door | | | |
| | Sealt Belt RR | | | |
| 10 | LH | 4_LH | 32,33,77 | 32,33,123,124 |
| | Sealt Belt RR | | | |
| 11 | RH | 4_RH | 34,72 | 34,115,126,127,128 |
| 12 | Insulator Hood | 5_EF | 22,35,37,38 | 35,37,38,129,130,131 |
| | RR Hose | | | |
| 13 | Washer | 5_EB | 29,30,40,42 | 29,30,40,42,132 |
| 14 | CSA RH | 6_RH | 43,50,54 | 43,50,54,133,134,139 |
| | Setting | | | |
| 15 | Booster | 6_EF | 36,39,46,48 | 46,48,58,138 |
| 16 | CSA LH | 6_LH_O1 | 41,53,58,59,80 | 45,53,56,125,140 |
| | | 6_LH_O2 | 51 | 51,80 |
| 17 | Pedal LHD | 7_LH | 55, | 55 |
| 18 | Actuator | 7_EF | 49,56,60,61,62 | 49,59,60,61,62,135 |
| 19 | Rear Lamp | 7_EB | 31,63,64,65,66 | 63,64,65,142,143,144,145 |
| 20 | Plug Floor RH | 8_RH | 67,68,69,70,71 | 67,68,69,70,71 |
| | Cabel Fuellid | | | |
| 21 | LHD | 8_LH1 | 57,74,75,76 | 57,74,75,76 |
| | Shield Fuel | | | |
| 22 | Tank | 8_LH2 | 73,78,81,83 | 73,78,81,83,,147,148,149 |
| 23 | Lamp Room | 9_E1_O1 | 52,79,85,86,88,90 | 86,87,88,89,90,91,92,93,105 |
| | | 9_E1_O2 | 87,89,102,105 | 66,77,79,85,104 |
| | Setting | | | |
| 24 | H/Linning | 9_E2 | 82,91,93 | 52,72,82 |
| 25 | Sunvisor RH | 10_RH | 94,95,96,97,98 | 94,95,96,97,98,150 |
| 26 | Sunvisor LH | 10_LH | 84,92,99,100,101,103 | 99,100,101,102,103,100 |
| 27 | RR Cooler | 10_EB | 104,106,107,108,109,110 | 31,106,107,108,109 |

### 4.2.3.1 Simulation of Proposed Model with Tecnomatix

The result of program simulation is mentioned that weighted line efficiency is 98.4% and weighted smoothness index is 7.5% with the total waiting time is 24.15 seconds (Innova) and 62.2 seconds (Fortuner). The simulation results in Figure 4.17 and Table 4.6.

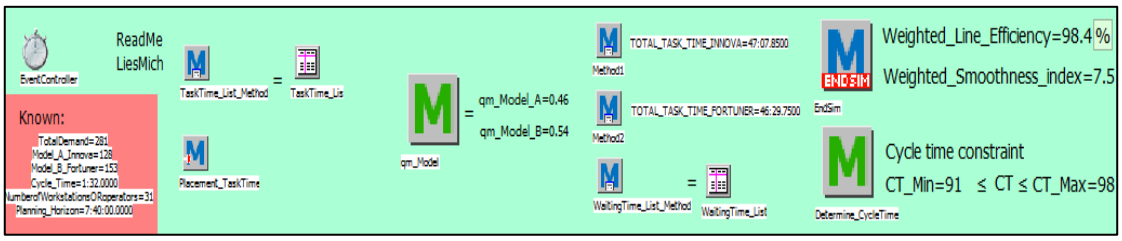



Figure 4.17 The result of program simulation at proposed model

Table 4.6 The result of Waiting time simulation program

| No | Workstation | Task Time (INV) | Task Time (FTR) | Waiting Time (INV) | Waiting Time (FTR) |
|---|---|---|---|---|---|
| 1 | Station1_EF_O1 | 01:23.8 | 01:24.9 | 8.2 | 7.1 |
| | Station1_EF_O2 | 01:30.6 | 01:28.3 | 1.4 | 3.7 |
| 2 | Station1_LH_O1 | 01:24.7 | 01:29.5 | 7.3 | 2.5 |
| | Station1_LH_O2 | 01:21.3 | 01:36.6 | 10.7 | -4.6 |
| 3 | Station2_EB | 01:26.7 | 01:31.9 | 5.3 | 0.1 |
| 4 | Station2_EFR | 01:25.6 | 01:23.5 | 6.4 | 8.5 |
| 5 | Station3_RH | 01:28.1 | 01:27.7 | 3.95 | 4.35 |
| 6 | Station3_LH | 01:25.0 | 01:31.2 | 7 | 0.8 |
| 7 | Station3_EB | 01:34.5 | 01:27.8 | -2.5 | 4.2 |
| 8 | Station3_EF | 01:35.6 | 01:32.0 | -3.6 | 0 |
| 9 | Station4_EB | 01:36.9 | 01:25.2 | -4.9 | 6.8 |
| 10 | Station4_LH | 01:26.7 | 01:27.3 | 5.3 | 4.7 |
| 11 | Station4_RH | 01:32.8 | 01:30.8 | -0.8 | 1.2 |
| 12 | Station5_EF | 01:31.1 | 01:31.4 | 0.9 | 0.6 |
| 13 | Station5_EB | 01:35.9 | 01:31.8 | -3.9 | 0.2 |
| 14 | Station6_RH | 01:33.5 | 01:26.5 | -1.5 | 5.5 |

| No | Workstation | Task Time (INV) | Task Time (FTR) | Waiting Time (INV) | Waiting Time (FTR) |
|---|---|---|---|---|---|
| 15 | Station6_EF | 01:33.9 | 01:31.0 | -1.9 | 1 |
| 16 | Station6_LH_O1 | 01:34.8 | 01:31.5 | -2.8 | 0.5 |
| | Station6_LH_O2 | 01:33.3 | 01:28.7 | -1.3 | 3.3 |
| 17 | Station7_LH | 01:32.0 | 01:42.0 | 0 | -10 |
| 18 | Station7_EF | 01:34.9 | 01:26.6 | -2.9 | 5.4 |
| 19 | Station7_EB | 01:34.4 | 01:33.3 | -2.4 | -1.3 |
| 20 | Station8_RH | 01:33.3 | 01:36.5 | -1.3 | -4.5 |
| 21 | Station8_LH1 | 01:31.0 | 01:29.5 | 1 | 2.5 |
| 22 | Station8_LH2 | 01:35.2 | 01:28.6 | -3.2 | 3.4 |
| 23 | Station9_E1_O1 | 01:31.1 | 01:28.3 | 0.9 | 3.7 |
| | Station9_E1_O2 | 01:32.4 | 01:31.9 | -0.4 | 0.1 |
| 24 | Station9_E2 | 01:32.5 | 01:27.0 | -0.5 | 5 |
| 25 | Station10_RH | 01:32.7 | 01:32.2 | -0.7 | -0.2 |
| 26 | Station10_LH | 01:31.0 | 01:30.1 | 1 | 1.9 |
| 27 | Station10_EB | 01:32.6 | 01:26.2 | -0.6 | 5.8 |
| | Total | 47:08.0 | 46:29.7 | 1:34.55 | 01:43.5 |

Next on the summary of the model simulation results can be seen in Figure 4.18. It is mentioned that the result of Innova and Fortuner model simulation on mean life time or time throughput is 17:41.2146 and 17:42.6290. The production amount of each model is 178 and 100. The throughput of each hour produces 23 and 13 units for Fortuner and Innova product.

**Simulation time:** 7:40:00.0000

**Cumulated Statistics of the Parts which the Drain Deleted**

| Object | Name | Mean Life Time | Throughput | TPH | Production | Transport | Storage | Value added | Portion |
|---|---|---|---|---|---|---|---|---|---|
| Drain | FTR | 17:42.6290 | 100 | 13 | 100.00% | 0.00% | 0.00% | 0.00% | |
| Drain | INV | 17:41.2146 | 178 | 23 | 100.00% | 0.00% | 0.00% | 0.00% | |

Figure 4.18 The simulation result of proposed model

#### 4.2.3.2 Comparison of the Current and Proposed Situation

The result of comparison between the situation of two models is needed to know whether there is any improvement or not. The results are based on the performance measurements of the assembly line such as total waiting time, weighted line efficiency, weighted smoothness index and throughput. The comparison results are given in Table 4.7. Based on the table, the current situation simulates the model with the cycle time is 110 seconds. Because the goal is to minimize the cycle time so that in the model of the proposed situation, the cycle time should be minimized. The results can be seen from all test problem of performance measurement especially in the proposed situation show the improvement significantly with the minimum cycle time.

Table 4.7 The comparison results between both of the model's situation

| Comparison of each situation | Total of waiting time | | Weighted line efficiency | Weighted smoothness index | Throughput |
|---|---|---|---|---|---|
| | Innova | Fortuner | | | |
| Current model | 09:18.55 | 10:04.25 | 98.40% | 60.5 | 175 |
| Proposed model | 1:34.55 | 01:43.5 | 98.40% | 7.5 | 278 |