FD RX7 Auto to Manual Conversion

Wiring

11/9/2020

1 Overview

1.1 Manual Transmission Wiring Overview

The manual transmission has the following sensors / switches:

- Speed sensor (Auto harness speed sensor directly connects without modification)
- Reverse light switch (2 pin connector)
- Neutral switch (2 pin connector)
- First & second gear switch (4 pin connector)

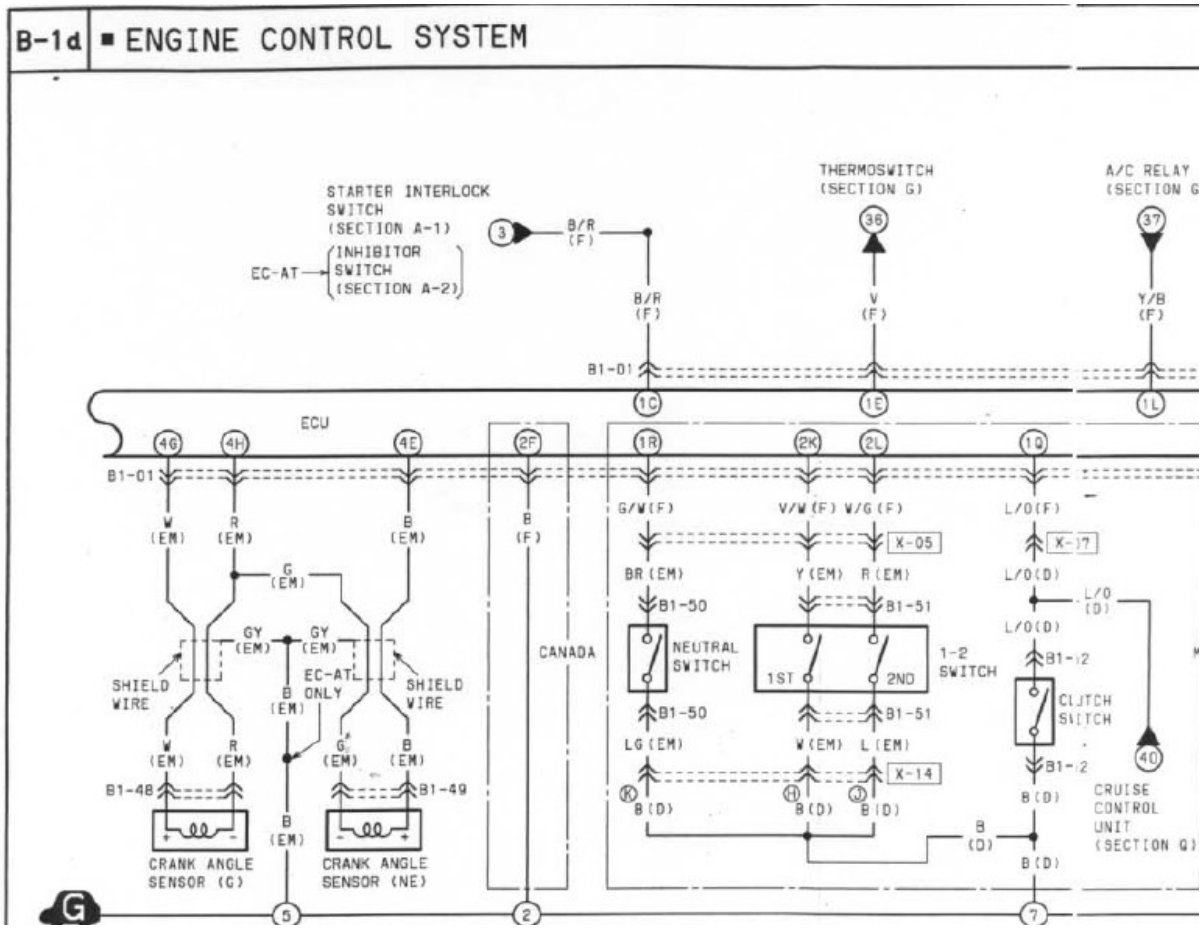
1.2 FSM Wiring Diagrams Applicable to the Conversion

The following pages in the Wiring Diagram FSM may be helpful to understand the suggested wiring instructions.

1.2.1 Starter Interlock Switch (Clutch Safety Switch): Section A-1, page Z-24

1.2.2 AT Starting system: Section A-2, page Z-26

1.2.3 Neutral Switch, 1st/2nd Switch, Clutch Switch to Cruise Control: Section B-1d, Page Z-34



Page Z-34 above:

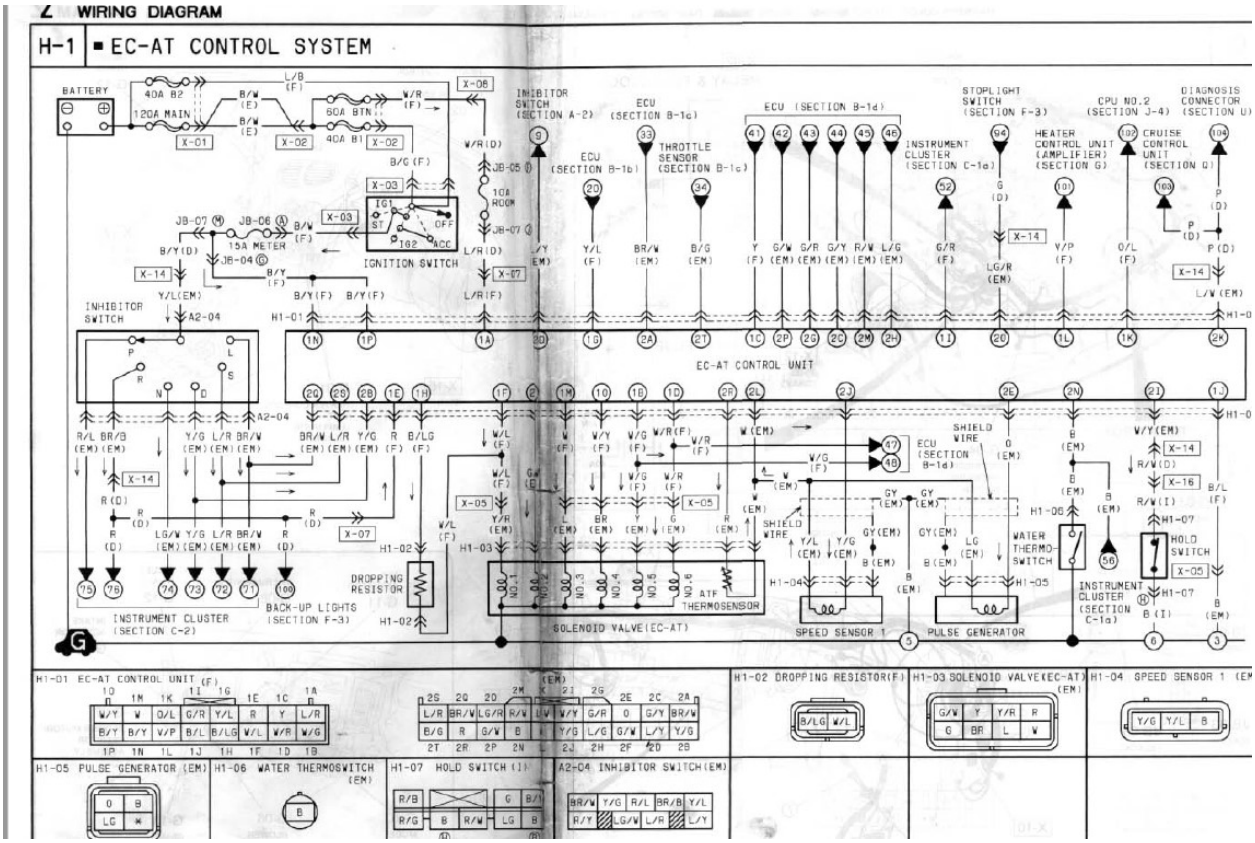
Neutral switch to ECU pin 1R (Green/White)

1st gear switch to ECU pin 2K (Violet/White)

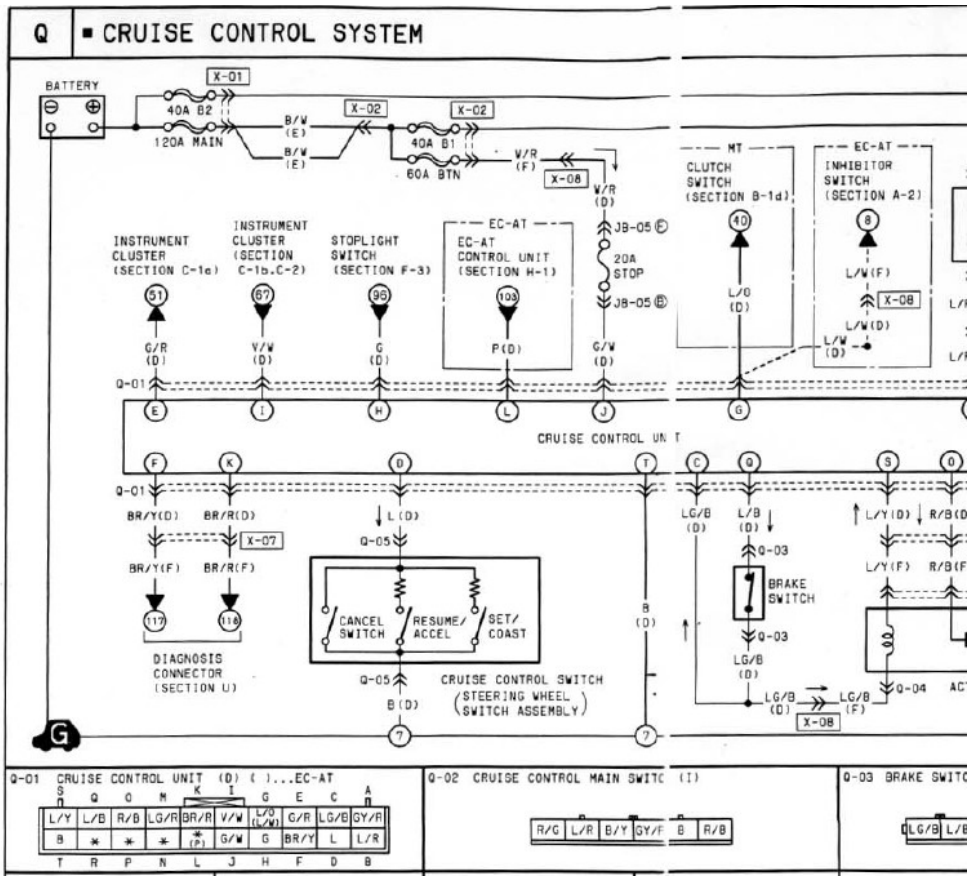
2nd gear switch to ECU pin 2L (White/Green)

Engine clutch switch connection to cruise control unit (Section Q)

1.2.4 AT ECU (EC-AT) signals: Section H-1, page Z-70



1.2.5 Cruise Control ECU: Section Q, FSM page Z-104



Page Z-104 above: Cruise Control pin G (cancel cruise) wires to clutch switch (manual) or inhibitor switch (auto).

2 Wiring Instructions

2.1 Automatic Speed sensor (No change)

The auto speed sensor connector plugs directly into manual transmission speed sensor.

2.2 Automatic Inhibitor connector (gray 9 pin) with 4 connections to change

1. **Starter Inhibitor Bypass**: On the 9 pin gray connector, cut the lower gauge (thicker) Blue/Yellow and Red/Yellow (2 outside pins lower row) wires from the connector (wiring harness side) and crimp together with a 14-16 gauge butt crimp for starter inhibitor bypass. Note that auto transmission prevented the starter from working unless it was in Park or Neutral.

   Test the starter inhibitor bypass by seeing if the car starts.

2. **Reverse Switch for backup lights**: Cut gray 9 pin connector (car side) Brown/Black wire and the Yellow/Blue wire. Extend these wires to the same length as the 8 pin yellow connector that went to the back of the auto transmission (nearly same length as the speed sensor connector). Connect these two wires to the crimp pins of the Tyco 174354-2 connector.

Test the reverse lights by placing the gear shifter into reverse and verifying the reverse lights work.

2.3 Automatic 8 pin Yellow connector (2 pins for neutral)

3. **Neutral Switch**: Locate the 8 pin yellow connector that connected to the back of the auto transmission. Remove the red (formerly ATF thermosensor but will be rerouted to ECU neutral input) and white (Ground) pins using pin removal tool or very tiny eyeglass screwdriver. Insert these two pins into the new connector Sumitomo 6195-0006 using 24-26 AWG pins.

2.4 Automatic 8 pin Yellow Optional changes (2 more pins for 1st/2nd)

For overachievers looking to retain the minimal 1st/2nd gear emissions functions:

Test fit the 4 pin connector into the 1st/2nd switch on the manual transmission. The 1st/2nd switch has two blue wires (1st gear switch) and two green wires (2nd gear switch). One green wire and one blue wire require ground to function. The other two are signal. Note which side of the new connector connects to the green (2nd gear) and blue (1st gear).

4. **1st Gear:** Remove green pin from the 8 pin yellow connector. Note that this already routes to 1st gear input on ECU pin 2K (Violet/White), but needs to connect to one of the 2 blue wires (1st gear) on the 4 pin neutral connector on the manual transmission.
5. **2nd Gear:** Remove the yellow pin from the 8 pin yellow connector. Note that this already routes to 2nd gear input on ECU pin 2L (White/Green), but needs to connect to one of the 2 green wires (2nd gear) on the 4 pin neutral connector on the manual transmission.
6. Connect the remaining green and blue wire from the 4 pin 1st/2nd connection to the white wire (ground) already feeding ground of the neutral switch. This means we have 3 ground connections sourced by the white wire of the 8 pin yellow connector. I used a 16 AWG butt connector with 2 connections on each side to connect these 4 wires together (white ground from car, and N/1st/2nd ground).

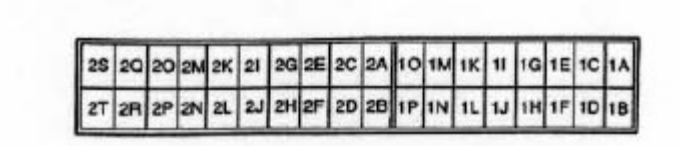
This can be tested after connecting the ground wire below. Test by looking for 0V at ECU pins 2K and 2L when car is put into 1st and 2nd respectively.

2.5 ECU Neutral Connection

7. Inside the car by the ECU: At the EC-AT 20 pin connector, cut red wire pin 2R (2nd pin from the end), but leave enough for any future conversion back to auto.
8. By the ECU, cut Yellow wire pin 1C from the 16 pin connector on the Front wiring harness leaving at least 4-5" of wire on the ECU side. Connect the wiring harness side of the cut red wire to the ECU side of the yellow wire. Use a connector so someone could pull the engine out and engine harness out without cutting this wire.

You can test this after making the ground wire connection below by measuring 0V at yellow pin 1C on the ECU when the car is in neutral and 5V when not in neutral.

2.6 ECU Ground Connection for Neutral/1st/2nd



EC-AT 2L- **Ground**

9. At the 20 pin auto ECU (AT-EC) connector cut the white wire at pin 2L and leave enough for a future reversion to automatic. Connect the wiring harness side of the white wire to a ground lug to supply ground to the white wire that routes into the engine bay to the neutral switch.

2.7 Clutch Switch (Necessary for smooth engine operation)

B-1

V_B: Battery voltage

Terminal	Input	Output	Connected to	Test condition	Correct voltage	Remark
1Q	○		Clutch switch (MT)	Clutch pedal: released	V_B	gnition switch ON
				Clutch pedal: depressed	Below 1.0V	
			EC-AT control unit (AT)	Idle	V_B	leduce torque ignal
				When shifting from 1st to 2nd or from 2nd to 3rd with the throttle opening above 1.5/8	Below 1.0V	
				Idle	V_B	ilip lock up signal
				When slip lockup with the throttle opening below 0.5/8	Below 1.0V	
1R	○		Neutral switch (MT)	Neutral	Below 1.0V	gnition switch ON
				In gear	V_B	
			EC-AT control unit (AT)	For N range	Below 1.0V	Inhibitor signal Ignition switch ON
				Other	V_B	

Clutch Pedal switch (B1-52), Page Z-35

On the AT cars, the EC-AT signals the ECU that the car is changing gears. On the MT cars, the clutch pedal switch signals the ECU that the car is changing gears.

10. Cut wire at pin 2P (Green/White) on the ECU-AT (3rd pin from the end on the 20 pin black connector) and connect the wiring harness side of this wire to one side of the clutch sensor. This works because pin 2P is already wired to ECU pin 1Q black/orange (shifting / clutch pedal pressed).
11. Run the other pin of the clutch switch to ground.

    You can test the clutch switch by turning the car on and measuring the voltage at ECU pin 1Q (Auto car Black/Orange / Manual car Blue/Orange) which should change to 0V when the clutch is depressed.

2.8 Cruise Control

12. For cruise control operation, first cut the wire to pin G on the cruise control ECU (Blue/white for auto cars and blue/orange for manual cars). Leave at least 4-5 inches on the ECU side since this is what we will be connecting to. Do not cut right at the ECU.
13. Run a wire from the pin G cruise control ECU side that was just cut to the clutch switch signal wire ECU-AT pin 2P (green/white) that was just connected to the clutch switch. If done properly, the cruise control ECU pin G is now connected to the clutch switch signal side and is longer connected to the inhibitor switch Blue/Yellow wire.

After this change, you should be able to read non-0V at pin G when the car is turned on. Pin G should be grounded when you press the clutch in which signals the cruise control to cancel. If this is not done, the cruise won't work when you try to turn it on because it appears to constantly be in Park/Neutral given the starter inhibitor bypass wiring above.

Note: The cruise on my car didn't work in the first, place so I never tested this information, but it appears that it will work based on the wiring diagrams.

If the cruise control won't operate, check for 0V at pin G which would prevent it from working.

2.9 Clutch Safety Switch

The starter signal wire on a manual car is routed through the clutch safety switch. Depressing the clutch switch allows the starter signal wire to send +12V to the starter solenoid.

The K24 starter cut relay Blue H302 relay is in the driver footwell and is also in the path of the starter solenoid control wire. You should be able to insert the clutch safety switch into the path of one of the K24 larger wires. Note that the K24 relay fails on many FD RX7s and may already be completely bypassed by connecting the two larger wires together. These could be disconnected and then routed through the clutch safety switch.

3 Connector Detail (Harness Side)

For all of the connectors except clutch safety switch, order as 20-24 AWG and 1.4-2.4mm.

3.1 Reverse Switch connector on the wiring harness side:

https://www.corsa-technic.com/item.php?item_id=553

3.2 Neutral Switch connector on the wiring harness side

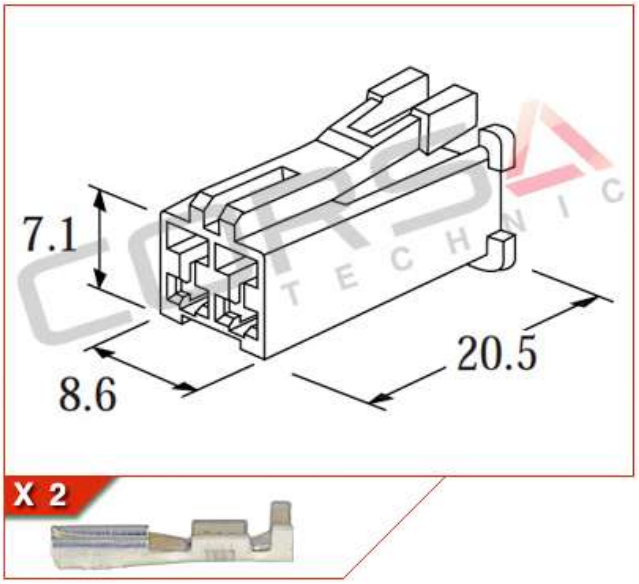
https://www.corsa-technic.com/item.php?item_id=700

3.3 1st-2nd gear connector on the wiring harness side

https://www.corsa-technic.com/item.php?item_id=554

3.4 Clutch Switch Connector on Wiring Harness Side

MTU.IL-2S-2 2-Way Kit



Kit Contents: Housing, 2 socket contacts

Mfg: Aftermarket Sumitomo, Yazaki
Series: MT Unsealed Interlocking, 090 Unsealed
OEM P/N: 7123-7721, 7123-7722 (w/clamp)
Mating Part: MTU.IL-2P-2

Sumitomo 7123-7721 above is the connector that plugs into the clutch switch.

https://www.corsa-technic.com/item.php?item_id=966&page=3&category_id=125

3.5 Clutch Safety Switch Connector on Wiring Harness Side

Wire Size:

18 guage

2.1 mm insulation

https://www.corsa-technic.com/item.php?item_id=345&category_id=126

Home - Connectors - BY # OF WAYS - 3-Way

250.ARM-3S 3-Way Kit

Kit Contents: Housing, 3 socket contacts

Mfg: Aftermarket Sumitomo, Yazaki
Series: 250 Armlock series, CN(A) Tang Type Terminal
OEM P/N: Color | Sumitomo | Yazaki
Black | () | 7123-2137-30 (PA66), 7123-2237-30 (PP)
Natural | 6111-2557 (PA66), 6070-3391 (PP) | 7123-2137 (PA66), 7123-2237 (PP)
Mating Part: 250.ARM-3P
Cross Reference List:

- Hero B-38R (female half)

4 Additional Part Information

4.1 Clutch Switch

Mazda LA01-66-490A

Autozone JA4375

4.2 Clutch Safety Switch

The clutch safety switch is no longer available, but the Miata safety switch part number FB01664D0 shown above will fit with some modification. The wires come out the wrong side and interfere on the LHD cars, so one must clip the plastic post the wires are tie strapped to and fold them down and glue them with epoxy.

4.3 Speed sensor

The Manual Transmission speed sensor drives the speedometer and it can plug directly into the AT vehicle harness.

Replacement Sensor Part #

$168.64 from RealMazdaParts.com R505-17-400B

$2560 Standard Motor Vehicle Speed Sensors SC280 for around $260 from Summit Racing

Replacement connector is same as the wiring harness neutral connector.

https://www.corsa-technic.com/item.php?item_id=700

4.4 Neutral Switch (Orange)

Orange 2 pin connection on the switch side.

See FSM page J-29, number 4.

4.4.1 Sensor Connector DL090-2S-1

If the neutral switch connector is damaged, purchase the following part to repair the switch:

https://www.corsa-technic.com/item.php?item_id=654&category_id=147

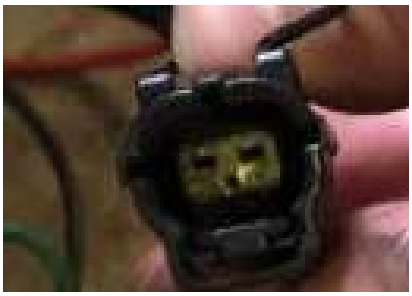
This connector is also the same as the wiring harness side of the speed sensor connector.

4.5 Reverse Switch

Replacement Sensor Part #

R508-17-640 from Mazda around $35

Standard Motor Neutral and Backup Safety Switches LZS319 $54.19 from Summit Racing



Connector appears yellow or white.

See FSM page J-15, number12. The reverse switch is located on the left hand side of the car (US driver side) on the rear of the transmission. It is a 2 pin connector that is whitish, greyish, or yellow.

Shorts in reverse, open in neutral or 1st.

4.5.1 Connector Detail ESJ-2S

If the reverse switch connector is damaged, purchase the following part to repair the switch:

https://www.corsa-technic.com/item.php?item_id=549&category_id=125

4.6 1-2 Switch (First/second gear sensor), 4 pin Neon Yellow

This sensor has 4 wires on it, 2 blue (1st gear)and 2 green (2nd gear)

See FSM page J-29, number 5.

Located on passenger side (US) rear of transmission.

1st gear switch connections are the two blue wires.

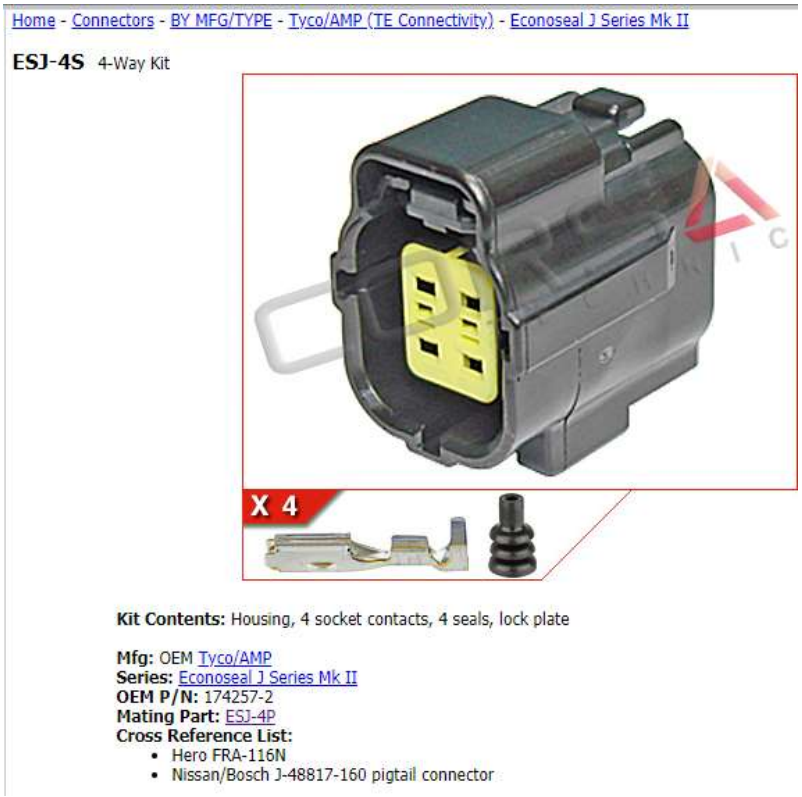
2nd gear switch connections are the two green wires.

Note that what appears as a middle row is the keying and is not connected to anything.

Auto trans speed sensor 1 (unique speed sensor for TCU) uses same connector but only has 2 wirs out of 4.

4.6.1 Sensor Connector ESJ-4S

If the 1st/2nd switch connector is damaged, order the replacement part below.



https://www.corsa-technic.com/item.php?item_id=551&category_id=109

5 Auto Transmission Sensors

Speed sensor 2 – page K-43 #17, this is similar to the speed sensor on the manual transmission and uses a matching connector. Note that auto speed sensor has an integrated connector, but the manual speed sensor has a pig tail connector.

Pulse sensor – page K-43, # 15. This is unique to the automatic transmission, but it has the same style neon yellow 6 pin connector that is utilized by the manual first/second gear sensor (only 4 of 6 possible connections are used on the 1st/2nd switch connector)

Speed sensor 1 – page K-43 #14, this is unique to the automatic transmission, and likely used by the automatic TCU.