Turbo Control Solenoid Rack Upgrade by Jacob Erwin

I am not the first to do this. I merely am compiling the information I found on rx7 club from the AZKnight Solenoid rack and the DIY Solenoid Rack by RedRevolver.

First things to know is what we are replacing. 2 turbo control solenoids. One is supplied Vacuum (**TCV**) and the other is supplied pressure (**TCP**). Then we have charge control (**CC**) and charge relief (**CR**) solenoids. (I also replaced the Fuel Pressure Regulator solenoid, it's the solenoid in the very back of the stock solenoid location)

The TC solenoids both work towards moving the turbo control actuator. It uses the vacuum to pull and the pressure to push the actuator open. The TCV is normally mounted to the side of the Air Control valve on the Lower intake manifold. The TCP is mounted with the rest of the solenoids in the rats nest.



TCV is outlined in yellow here, TCP Hidden under red box, CC blue box, CR purple box.

Charge relief dumps boost pressure back to the air box until it is needed. Charge Control operates a valve in the stock y pipe that blocks the outlet of the secondary turbo until the transition around 4500 rpms. You can also see the location of the valves in the stock vacuum diagram. On the stock diagram we will be replacing solenoids listed as E, F, H, and "Turbo Control Solenoid" (bolted to the ACV).

Stock Diagram



The stock solenoids are Normally Closed 3-way valves. They have 3 ports A, B, and C. When closed (not powered) ports B and C are connected which allows the output to vent which allows actuators to return to rest. When the solenoid is open, ports A and B are connected and C is blocked off.



These all look a little different but they all operate the same. Why am I telling you this? Because when you connect the new solenoids it will be very easy to just connect your hoses to A, B, or C.

Let's look at the new Solenoids. These are Fabco-Air 103SMG-2-M-V-12VDC you need 4 of them.



The Solenoids do not come with fittings so you will need to get some. You need two filters and either 8 barbed fittings or 8 90 degree fittings. They are 10-32 thread for all three ports. I used all thread size 10-24 to mount them all together with nuts on either end. Please look at the parts list for the exact part numbers of each and where you can buy them.

I also chose to replace my Fuel pressure Regulator solenoid. If you have an after market FPR then you probably don't use this anyways. I chose to remains as stock as possible so I decided to replace it while I was at it. The Solenoid operates the same as all the others except the filter is located on port A, whilst the vacuum lines go on ports B and C. You must decided where to mount it. Some of you have more room in your engine bay than someone with a bone stock motor like me. I will be mounting mine behind the ABS unit.

PARTS LIST

Solenoids

4 x Fabco-Air 103SMG-2-M-V-12VDC

If you are replacing the FPR solenoid you need 5

You can buy these on <u>www.Radwell.com</u> just search the part number. However, it took about 3 weeks for me to get them. Most places do not stock these. But if you have a source for them you can try there. They are \$49 each.

www.coastpneumatics.com also has them but they are \$59

http://tecotechnology.com is a distributor but do not list a price you must email

You cannot buy them directly from Fabco-Air, I tried.

Barbed Fittings From www.mcmaster.com

Straight barbed fitting

5454K62 Brass Threaded Fitting, Low-Pressure, 1/8" Tube ID x 10-32 Male Pipe, 5/8" Long, Packs of 10

You can buy all straight barbed fittings for ports A and B total of 8 this is a ten pack.

90 degree fittings, for port C on CC and CR solenoids. You can also use these for ports A and B if you want to, just order the proper amount. Just be aware that for these elbow fittings you must use 3mm vacuum hose 3.5mm is too loose and will leak.

2844K73 Brass Low-Pressure Barbed Tube Fitting, Nickel-Plated, Elbow, for 1/8" Tube ID x 10-32 Male Pipe

Filter Breathers, you need 2 total unless you are replacing FPR solenoid then you need 3

9833K18 Breather Vent, Zinc-Plated Brass, 10-32 Thread UNF Male

Connector for wiring. You can get any connector you deem fit. This is the one I used. Just make sure you have 2 pins per solenoid.

9552T24 Compact Push-In Signal/Power Connector Set, Plug x Socket with 48" Wire Leads, 9 Poles

Blade Connectors need 10.250 blade. This is a pack of 100 with male and female for \$7.59

https://www.amazon.com/Hilitchi-100pcs-Insulated-Terminals-Connectors/dp/B01D9C8PYS/ref=sr_1_6?ie=UTF8&qid=1520786661&sr=8-6&keywords=blade+connector

Vacuum hose- you need about 25-30 ft of 3mm vacuum hose. For the charge relief valve you may want to use 3.5mm because it has a larger nipple on the valve itself.

I bought mine on Amazon from a company called NXS motorsport. Get black if you don't want to see them.

https://www.amazon.com/High-Performance-Silicone-Vacuum-Hose/dp/B009PYEDDW/ref=sr_1 3?s=automotive&srs=7500554011&ie=UTF8&qid=1520750990&sr=1-3&th=1

It's the high quality thick walled stuff that won't collapse

INSTALLATION:

The solenoids have two holes through them so that you can mount them all together using a long bolt or all thread. Purchase at local hardware store.





Attach your solenoid pigtails to your wiring and make a wiring diagram for your new connector. This is what mine looks like. All the solenoids receive an ignition power and are grounded by the ECU to activate. You will see that my CR and FPR solenoids share a power wire, this is due to my connector being only 9 pins. I decided to replace the FPR solenoid after I bought the connector already. The connector I bought had 48" leads. I believe I cut them to be 7-8" This length puts the connector just out past the ABS unit when the solenoids are mounted but is not crucial. Since you can make the other side as long or short as needed.

Solder, heat shrink wrap, and taped for extra protection. BTW the cold heat soldering thing sucks. Don't use it.





Solenoid Rack Wiring Diagram

PIN Number	Wire Color	Function
	1 Red	TCP +
	2 White	TCV +
	3 Black	TCV-
	4 Blue	TCP -
	5 Yellow	CC +
	6 Green	CC -
	7 Brown	CR -
	8 Orange	CR/FPR +
	9 Purple	FPR -

Connector	View	
1	4	7
Red	Blue	Brown
White	Yellow	Orange
Black	Green	Purple
3	6	9

TCP- Turbo Control Pressure TCV- Turbo Control Vacuum CC- Charge Control CR- Charge Relief FPR- Fuel Pressure Regulator

Decide where you want to mount your solenoid rack. A good spot is behind the ABS unit. Just detach this connector from the fender well and push it down out of the way.



I used some simple L brackets from a local hardware store and used pre-existing bolt holes in the body to mount it. With some bending and rotating it works. More elegant solutions could be fabbed up if you are clever.



Disregard the ports on my FPR soleniod (closest to the front bracket) Radwell sent me a slightly different solenoid I had to make it work, the port layout was a little different.

Now that the rack is mounted you must remove your upper intake manifold to access the "rats nest" and stock solenoids.



Until your engine bay looks like this. Then remove the coils for ease of access





Connect your other connector pig tail and route the wires along the firewall with the factory engine harness and determine the lengths of your wires going to the solenoid connectors. Best to make it a little extra long to avoid putting any tension or stress on the connection. Once you cut the ends you need to crimp and heat shrink wrap .250" blade connectors on the ends. This will work for all but the TCV solenoid which uses a different connector type as you can see in the picture. Lucky for you this connector is exactly the same as the male connector for the stock fog lights. So if you don't use them, you can steal it from there. Otherwise you can order them on amazon, they come from china and you have to assemble it. It's not too difficult with a crimp tool. Here is a link. https://www.amazon.com/gp/product/B01LZYKN8Z/ref=oh_aui_detailpage_o01_s00?ie=UTF8&psc=1

Once all your blade connectors are crimped on, plug them into the proper plugs at the rats nest. If you do the wiring EXACTLY as I have (with only 9 wires) the FPR will only have the purple wire to connect. It is VERY important that you connect this to the correct socket on the plug. Which is the wire that goes to the ECU, that triggers the ground. This wire is Blue with Orange stripe. The black/white wire that goes to each solenoid connector is ignition power. Once they are all plugged in properly wrap them up tight with electrical tape to make sure they stay put. Wrap and secure your harness in a place that won't get it smushed when you re-install the UIM.



Vacuum Routing

Remove the stock TCP, TCV, CC, and CR solenoids

Note or mark the ports for the vacuum lines based on the solenoid port diagram from earlier. (Remember A, B, and C? Told you it was important)

Typically your A port is going to be a source, either vacuum or boost pressure. B is your output, controls the device. C is vented. However this is not always the case, so pay attention.

Here is the Charge Control and Turbo Control Pressure solenoid routing

Remove the solenoids by disconnecting the connector and removing these five vacuum lines.

Note Charge Relief Solenoid already removed in this picture, it sits on top of the rats nest where the empty space is.



TCP Vacuum lines just route them from your NEW solenoid port A and B along the firewall and wiring loom to the locations designated in this picture. Trim to length and zip tie the ends if you feel the need.

From your NEW Charge control Solenoid port B you can go directly to the charge control actuator, located on the y pipe outlet (Charge Pipe) from the secondary turbo.





Charge Relief port A tees to Charge Control Port C and to this vacuum nipple on the secondary charge pipe. The nipple is right next to the 1" hose for the charge relief valve located on the Y pipe

Charge Relief Port C tees to Charge control Port A and to the vacuum chamber source from the rats nest





Vacuum Summary for CC, CR, and TCV (Microsoft Paint Style)



FUEL PRESSURE REGULATOR Vacuum routing

Port A is filtered vent

Port B Goes directly to the vacuum nipple on the fuel pressure regulator

Port C connects to vacuum source on lower intake manifold under Air Control Valve. If you have the stock FPR solenoid I suggest connecting to that hose with a straight barbed connection because it's a bitch to get to the nipple on the Lower intake manifold if your ACV is on. If not, it's easier to access but still kind of annoying.



Fuel pressure regulator is located on the back of the secondary fuel rail. The blue hose pictured is when it was connected to the stock solenoid. Run this to Port B on your new solenoid. Your FPR will have a fuel line attached to it where mine does not. This picture is from when I replaced my FPR recently.

Wrap up all your wiring with loom and electrical tape. Zip Tie to factory engine harness along with your vacuum lines. Put UIM and intercooler piping back on. Job done. Go for a test drive.

