Quick Start Manual

(Version – I)

Magnetron Sputtering System (DaON) 1000S

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September 11th, 2013 (Updated - January 9th, 2017)

List of abbreviations

Name	Abbreviation	Name	Abbreviation
Rotary pump	RP	Rotary valve	RV
Fore valve	FV	Turbo molecular pump	TMP
Gate valve	GV	Capacitance Diaphragm Gauge	CDG
Voltage adjustment	V.Adj	Current adjustment	C.Adj

Magnetron Sputtering System

1. Turn on the chiller (a), compressor (b) and transformer (c) as shown in fig. 1.

   Turn on the compressor and wait to achieve the required pressure. It will turn off automatically after achieving required pressure.
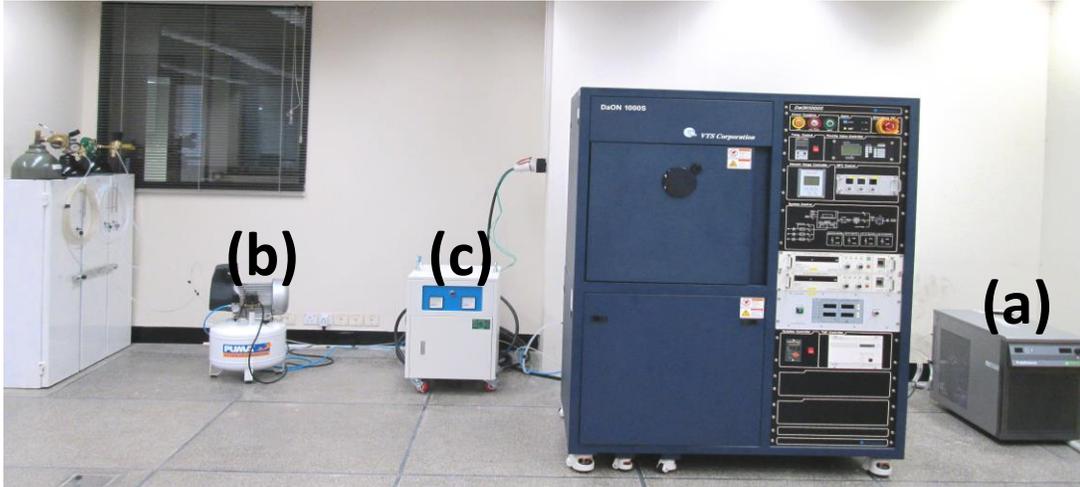

Fig. 1

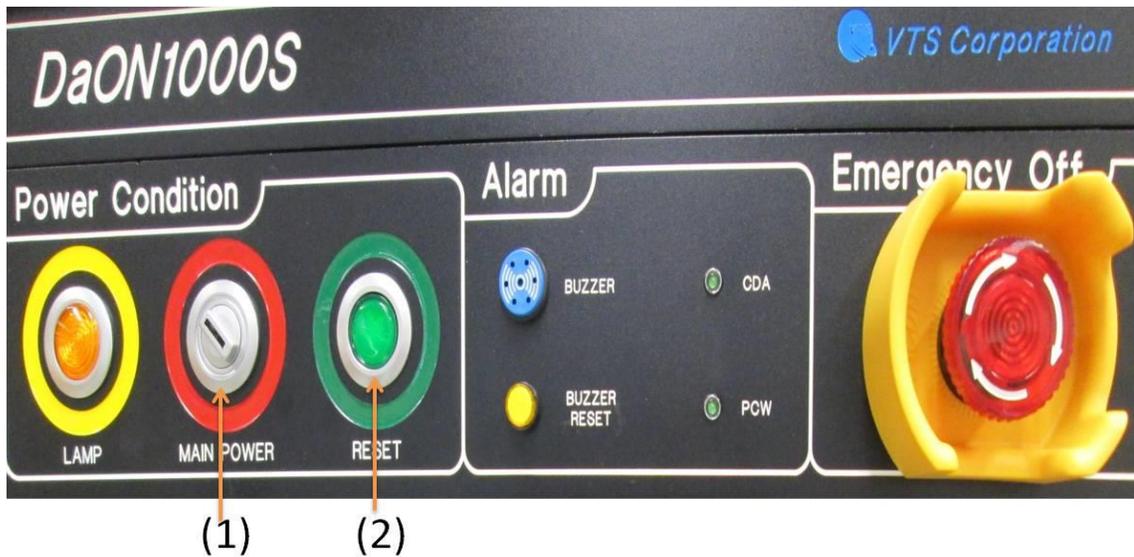2. Switch On the main power from (1) and press Reset button from (2)

Fig. 2

3. Open chamber vent valve from (3) and check that all other valves are closed

4. Open the door of chamber and close chamber vent valve

5. Open substrate shutter from (4) and mount the substrate accordingly as described in the brief manual. Substrate holder is located on the upper side in the chamber.

   Note: Substrate should be cleaned in ultrasonic bath using distilled water, acetone and methanol for 3-5 minutes each and again in distilled water for 3-5 minutes in the end. Then it should be dried using dry air or pure nitrogen blow.

   Note: Substrate can be used of any size but adjustable according to the substrate holder.

6. Open target shutters (SP1, SP2 or SP3) from (5, 6 or 7) and mount the sputter targets accordingly as described in the brief manual. Sputter guns are located on the lower side in the chamber.

7. Check the resistance between target and ground floor sheet. It should be greater than 0.5 MΩ.

   Note: SP1 is used for RF while SP2 and SP3 for DC sputtering.

   Note: Dimensions of target should be 2 inch diameter and 0.25 inch thickness.

   Note: Chamber vent and all other valves should be closed during substrate and targets mount except substrate shutter and sputter gun valves.

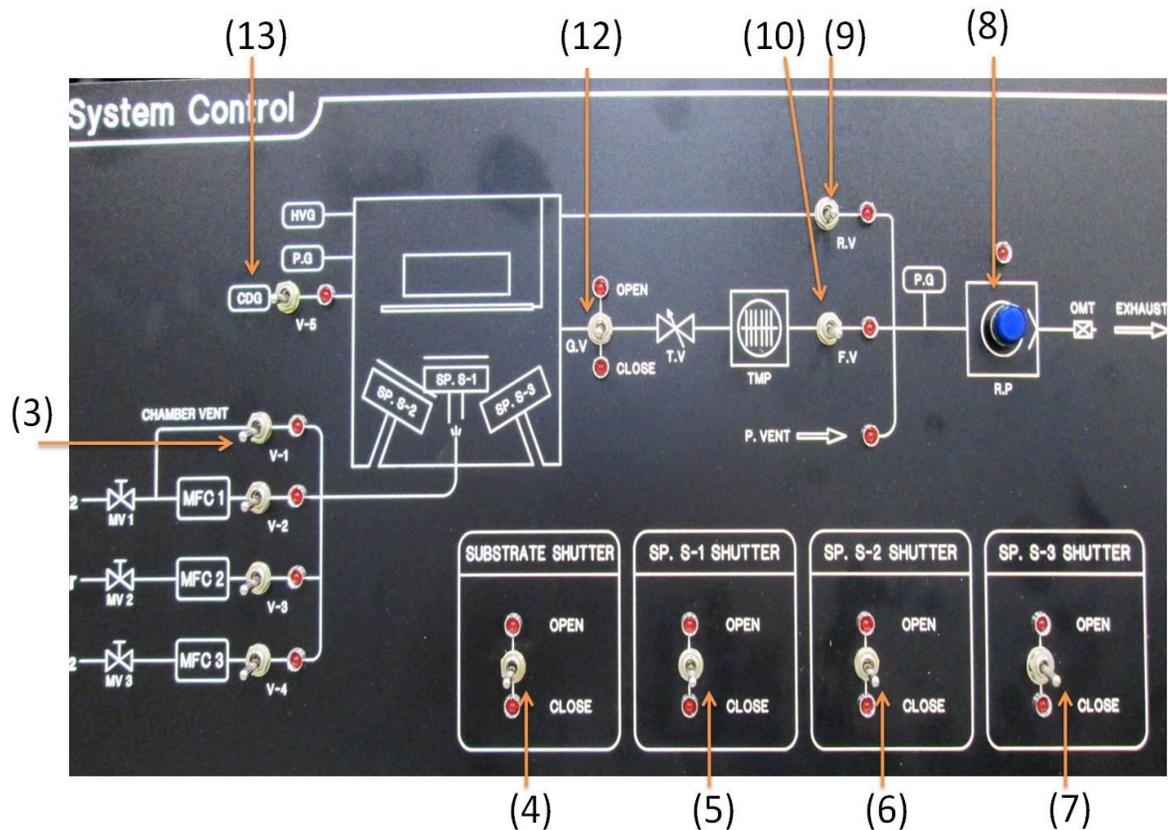8. Close the substrate and sputter guns shutters.

Fig. 3

9. Then push the chamber door and Turn ON the RP (Rotary Pump) from (8).

> **Precaution:** Please make sure that vent valve (3) is closed before Turning on the RP (8).

1. Open RV (Rotary Valve) from (9)

> **Note:** All other valves should be closed during roughing (specially chambered vent valve).

2. Wait to achieve vacuum 5×10^{-2} Torr.

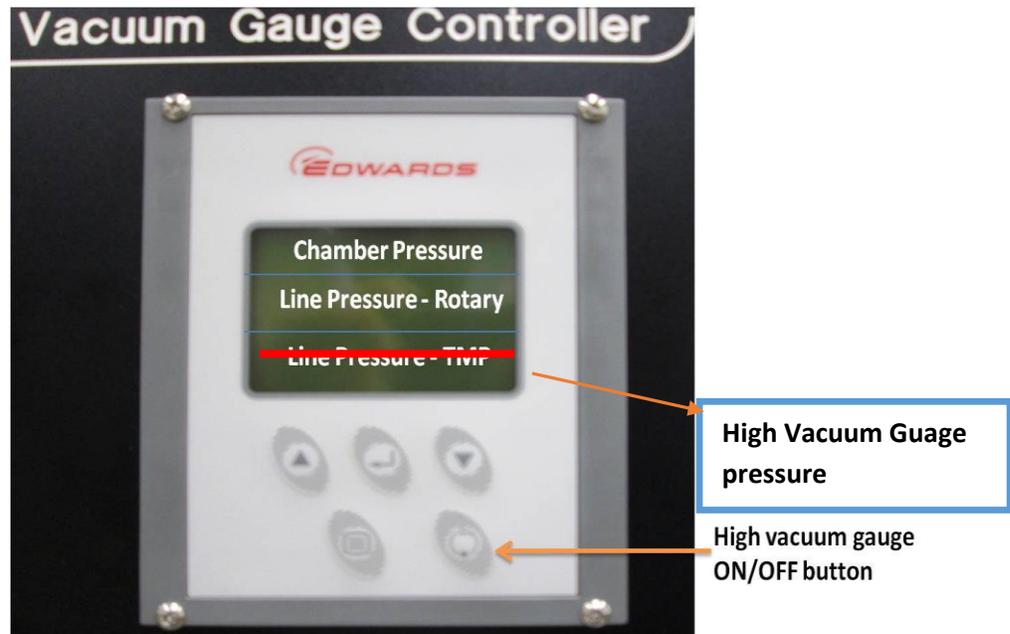> **Note:** The range of the vacuum will be displayed on the following vacuum gauge control panel.

Fig. 4

3. After achieving the vacuum 4×10^{-2} Torr, close RV (rotary valve) from (9). Do not turn off the RP.

4. Now Open FV (Fore valve) from (10).

> **Precaution:** RV (9) and FV (10) should not be open at same time; otherwise TMP is prone to severe damage.

5. Turn ON the TMP from TMP controller (11).

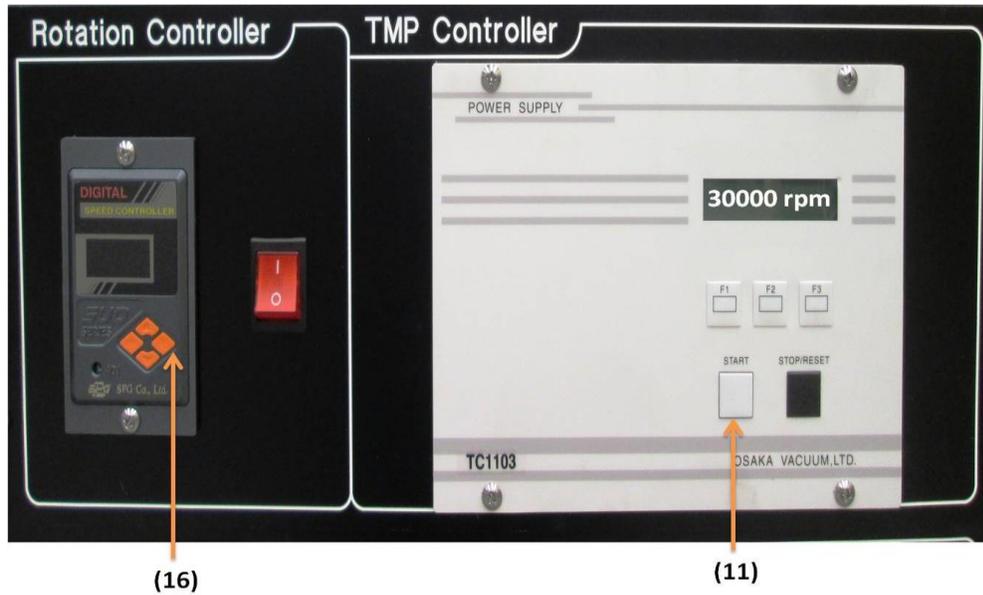> **Note:** Whenever TMP is ON, RP should also be ON.

Fig. 5

6. TMP controller display shows rotation in RPM. Wait till the RPM reaches 33600 on the TMP controller display.
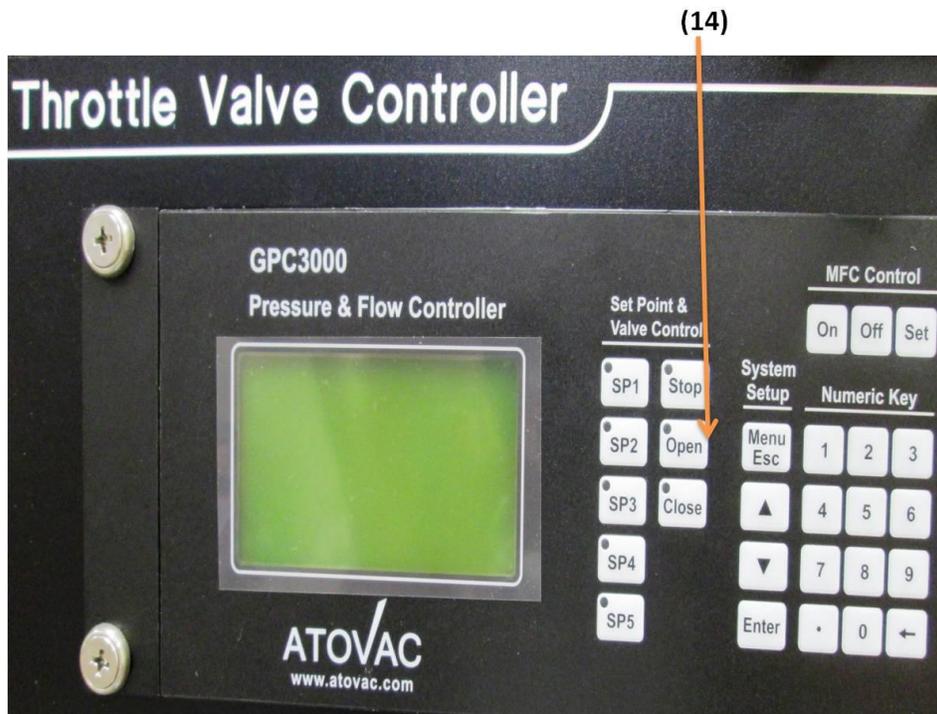
7. Open throttle valve controller from (14).

Fig. 6

Caution: Please note the reading on throttle valve controller display. It should be less than 0.0001Torr. Otherwise, avoid turn on the High Vacuum Gauge

8. After achieving 33600 RPM, Check the chamber pressure from vacuum gauge controller. If it is not 5×10^{-2} Torr, then close FV from 10 and Open RV again from (9). Then wait to achieve 5×10^{-2} Torr. Then close RV and then open FV and GV. However, if it is 5×10^{-2} Torr, then open GV (Gate valve) from (12).

9. Open CDG (Manometer Gauge) from (13).

    Note: Check that throttle valve controller (14) is also Open at this stage now.

10. Wait to achieve stable reading of chamber pressure on vacuum gauge controller.

11. After achieving stable reading, turn on the high vacuum gauge from vacuum gauge controller.

12. Wait to achieve 5×10^{-6} Torr on high vacuum gauge. (it will take 1- 2hrs)

13. After achieving 5×10^{-6} Torr, Turn off the high vacuum gauge from vacuum gauge controller. (Fig. 4)

14. Adjust the temperature of substrate on temperature controller up to 500 °C (according to requirement) from (15).

    Note: Wait for 2 or 3 minutes for every 100 °C.

(15)

Fig. 7

15. Turn ON the rotation from (16) to usually 10 rpm.

Fig. 8

16. Open the required gas valves (Ar, N_2, or O_2) shown respectively as V_2, V_3 and V_4.

17. Press Enter on the MFC controller shown below to start the flow of the required gases (Ar, O_2, or N_2). Turn ON the flow for required gas on its panel and adjust it usually to 100 sccm for Ar and under 10 sccm for oxygen or nitrogen.

(Flow ON/OFF)   Adjust the values   (Enter to change
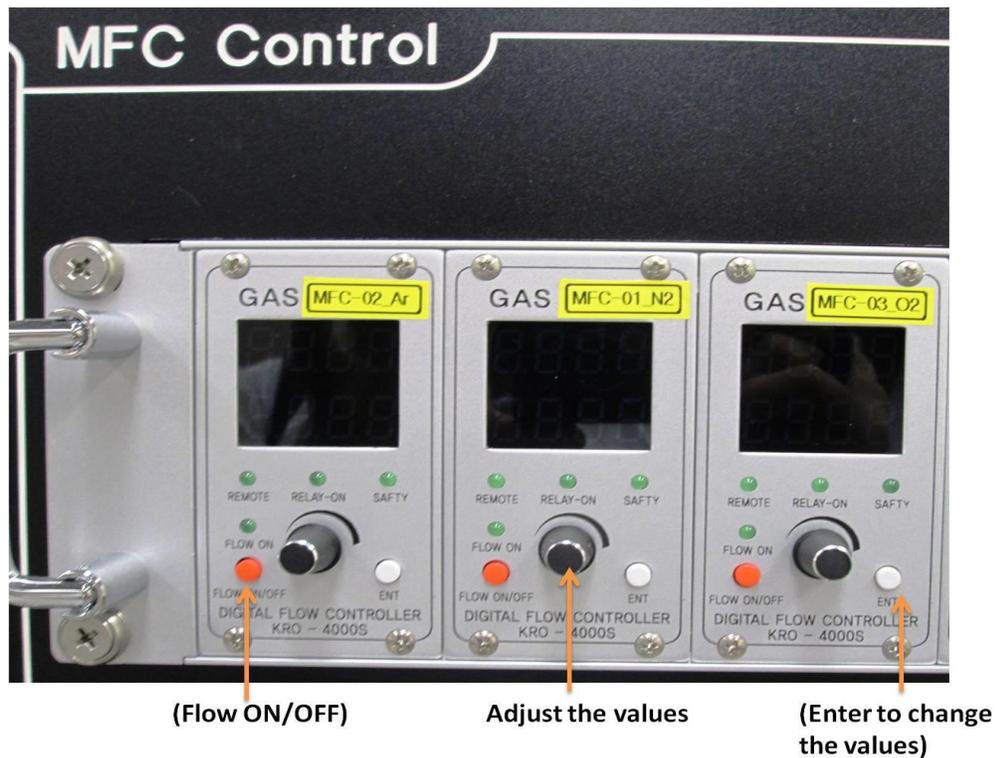   the values)

Fig. 9

18. Wait to achieve the adjusted working pressure from (SP1-SP5) from (14) on Throttle valve display.

    Note: Set points SP1-SP5 can be adjusted according to the lowest pressure to highest pressure. Usually working pressure adjusted at 0.002 sccm.

    Note: RF sputtering is used during oxide or nitride formation.

For DC sputtering

1. Open the shutter SP2 or SP3 from (6) or (7) (where the target was mounted) and Turn ON the corresponding power supply from (17) or (18).

2. Press OUTPUT button on power supply from (19) or (20) accordingly.

3. Adjust the voltage and current by first increasing voltage from (23) or (24) and then current using (21) and (22), it will generally be generated plasma at 250-300 V and 20-50 mA.
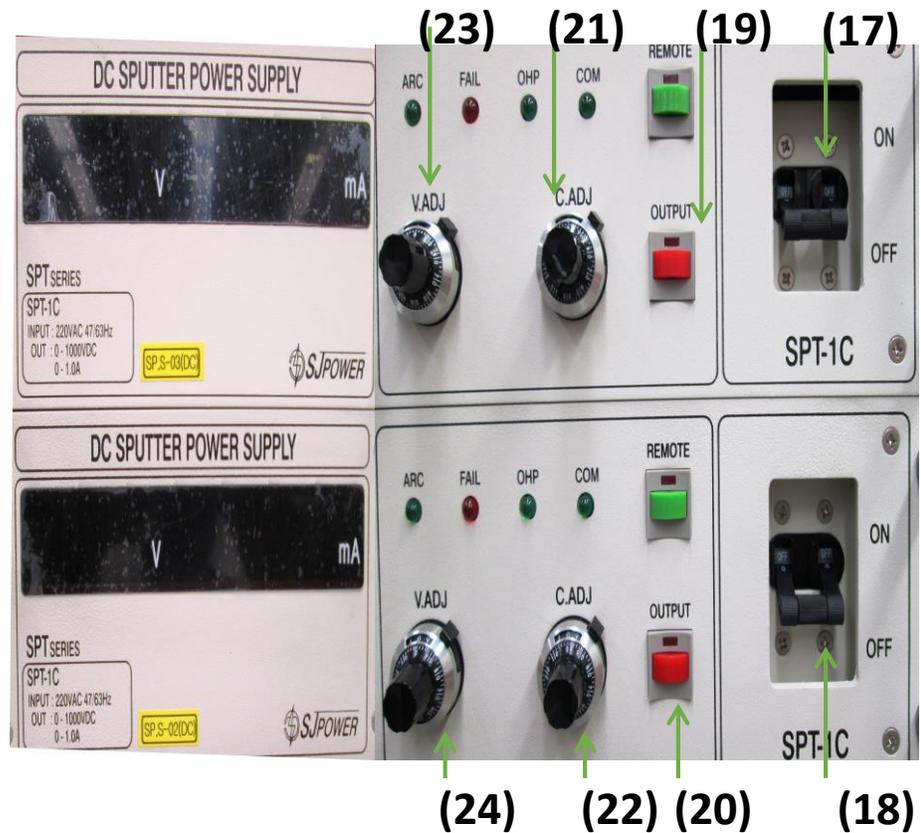

Fig. 10

4. Now press Open on the Throttle valve controller (the pressure drops and adjust at the set point position automatically, usually kept at 20 mTorr working pressure).

5. Wait to generate plasma and wait for 20 seconds of pre-sputtering.

6. Then Open the substrate shutter from (4) and sputter for 3 minutes or as required.

7. After deposition, make C.Adj to zero from (21) or (22) and switch OFF the supplies from (17) or (18), accordingly.

For RF sputtering

1. Open the shutter SP1 from (5) (where the target was mounted) and Turn ON the RF power supply AC line from (25).

2. Press the ON button from (26).

3. Increase the RF power using RF power controller from (27) and adjust it at 36 (forward power).
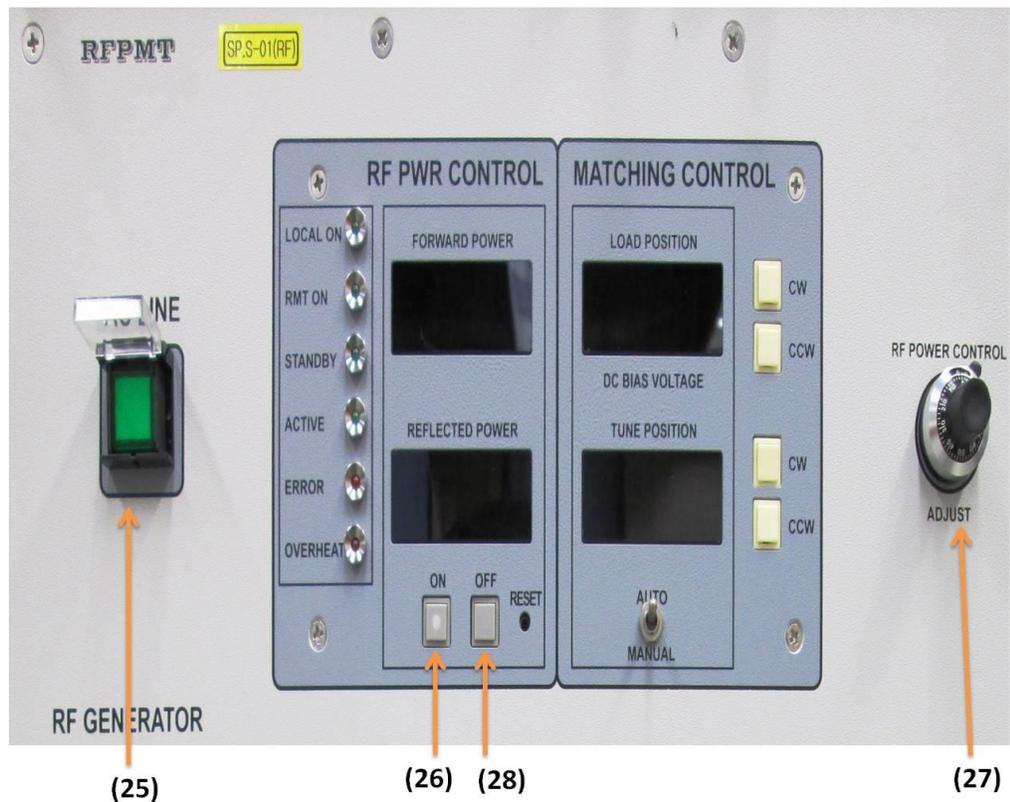

Fig. 11

4. Now press Open on Throttle valve (pressure drops and adjust at set point   position automatically usually kept at 20 mTorr working pressure).

5. Wait to generate plasma and wait for 20 seconds of pre-sputtered.

6. Then Open the substrate shutter from (4) and sputter for 30 minutes or as required.

7. After deposition, make the zero RF power controllers from (27) by rotating anti-clockwise.

8. Turn OFF from (28).

9. Then press OFF AC line (25).

Shutting Down Procedure

1. Turn off power supplies i.e. Sp_1, Sp_2, SP_3 etc.

2. Turn off glass flow from red button on MFC.

3. Close the gas valve, e.g. N_2, Ar, O_2 etc.

4. Turn off the rotation.

5. Make temperature Zero.

6. Close the substrate and gun shutters.

7. Close the CDG.

8. Close GV.

9. Close throttle Valve.

10. Close TMP and wait till break comes to zero.

11. Then close FV from (10).

12. Close RP from (8).

13. Wait to unmount the samples till substrate temperature comes to room temperature.

14. Turn on in the same way and vent the system for unmounting.

15. Then shut down again or restart according to requirement.

Note: If thin film are deposited on room temperature, then more substrates and targets can be changed or mounted without stopping TMP.