

## Operation of the Process Gas System

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This document contains the following procedures and figures

Rough out and fill the process gas supply line

Rough out the needle valve system

Rough out the process gas delivery line

Fill process gas delivery line

Fill accumulator 1

Fill accumulator 2

Figure 1. Process Gas Accumulator

Figure 2. Process Gas Delivery

### Typical procedure

Rough out and fill the process gas supply line

Rough out the needle valve system

Rough out the process gas delivery line

Fill accumulator 1

Fill accumulator 2, if needed

Fill process gas delivery line

## Rough out and fill the process gas supply line

Supply valve closed. (HYD SPLY)

Pump out closed (PUMP OUT TO ATM)

Fueling system pump on

H2 tank valve closed

H2 tank regulator - freely turning

Open pumpout valve. There is no gauge to verify that line between pump out and AD1 or AD2 is pumped down. Listen to the pump. Let it settle down -- no gurgling

Open AD2 and verify that pressure drops to 0

Open AD1 and verify that pressure drops to 0

Open AF1

Open AF2

Open supply valve and verify that supply pressure drops

Check regulator and verify that it drops into negative range

Close supply

Open H2 tank valve

Adjust regulator to 20 psi

Close H2 tank valve

### Rough out the needle valve system

Assumes that MC pressure starts at about  $1e-8$

Close needle valve

Close flow valve

Open needle shutoff valve

This will evacuate the small volume between the needle valve and the plasma arc chamber using pumping from the main chamber

Expect an excursion in the main chamber pressure. May go to  $1e-06$

Should recover in a few minutes to  $3e-8$

Slowly open the needle valve to full open. About 15 marks on barrel. Do this in stages. Check pressure excursions in MC. Should not go above  $2e-6$ . After final opening, MC pressure should drop to  $4e-8$  range

Return needle valve to operating range. 1 to 7

Note that flow valve is left closed during this procedure. There is significant pressure in the supply line. Do not open the flow valve with the needle valve out of its operating range. MC will not pump down if flow valve is open.

Rough out the process gas delivery line

Check

- DNB delivery valve closed
- Pump out closed (PUMP OUT TO ATM)
- Fueling system pump on
- Flow valve to source closed
- Flow valve to neutralizer closed

Close AD1 and AD2

Fully open delivery regulator on Hydrogen Dispenser Panel in DNB vacuum rack

Open pump out valve

Open delivery valve to DNB

Observe pressure to drop on accumulator pressure gauge on Hydrogen Dispenser Panel in DNB vacuum rack

Pump for a few minutes or until accumulator pressure panel meter reads zero.

Close DNB delivery

Back out delivery regulator until it turns freely

## Fill accumulator 1

### Check

supply line pumped out and backfilled to 20 psi.

H2 tank valve is open.

H2 tank regulator is set to 20 psi

DNB delivery valve closed

Accumulator 2 isolated by closing AF2 and then AD2

Supply valve closed. (HYD SPLY)

Pump out closed (PUMP OUT TO ATM)

Fueling system pump on

Open pumpout valve. There is no gauge to verify that line between pump out and AD1 is pumped down. Listen to the pump. Let it settle down -- no gurgling

Open AD1 and verify that accumulator pressure drops to 0

Open AF1 and assure that the accumulator pressure does not rise

Close AD1

Close pump out valve

Open supply valve and verify that supply pressure drops into the -20 psi range. Accumulator 1 will fill to 20 psi in a few minutes. If it is thought necessary to assure that gas is flowing, then close supply valve and observe an increase in the supply pressure

Allow accumulator to fill to 20 psi

Close AF1

Close supply valve

Close H2 tank valve

Fill process gas delivery line

Open AD1

Open process gas delivery valve

Observe pressure on accumulator pressure gauge on Hydrogen Dispenser  
Panel in DNB vacuum rack

Adjust delivery regulator to 10 psi

## Fill accumulator 2

Assure supply line pumped out and backfilled to 20 psi. Assure that H2 tank valve is open. Assure H2 tank regulator is set to 15 psi

Close DNB delivery valve

Isolate accumulator 2 by closing AF2 and then AD2

Supply valve closed. (HYD SPLY)

Pump out closed (PUMP OUT TO ATM)

Fueling system pump on

Open pumpout valve. There is no gauge to verify that line between pump out and AD2 is pumped down. Listen to the pump. Let it settle down -- no gurgling

Open AD2 and verify that pressure drops to 0

Open AF2 and assure that the pressure does not rise

Close AD2

Close pump out valve

Open supply valve and verify that supply pressure drops into the -20 psi range. Accumulator 2 will to 20 psi in a few minutes. If it is thought necessary to assure flow, then close supply valve and observe the supply pressure to rise.

Allow accumulator to fill to 20 psi

Close AF1

Close supply valve

Close H2 tank valve

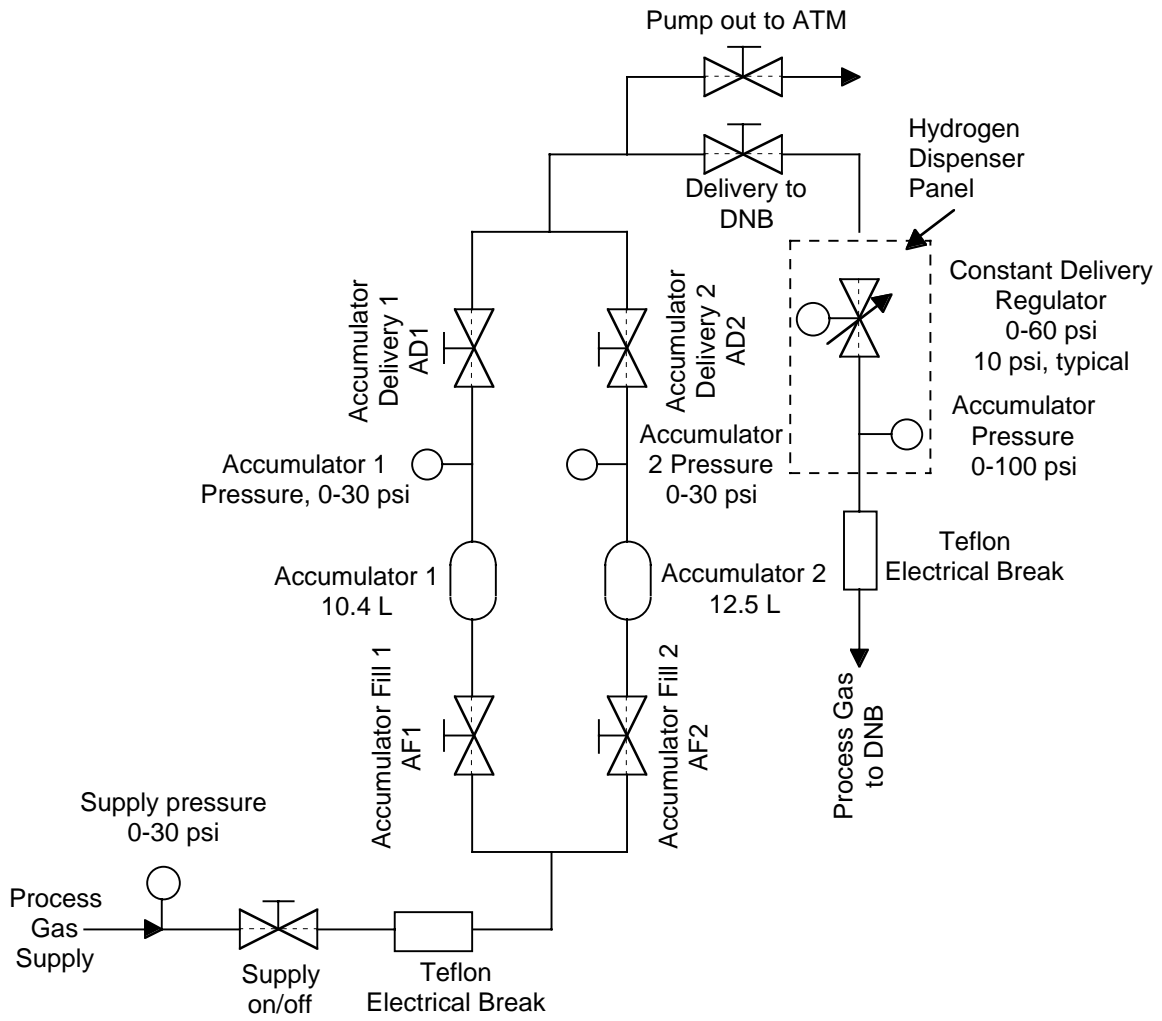
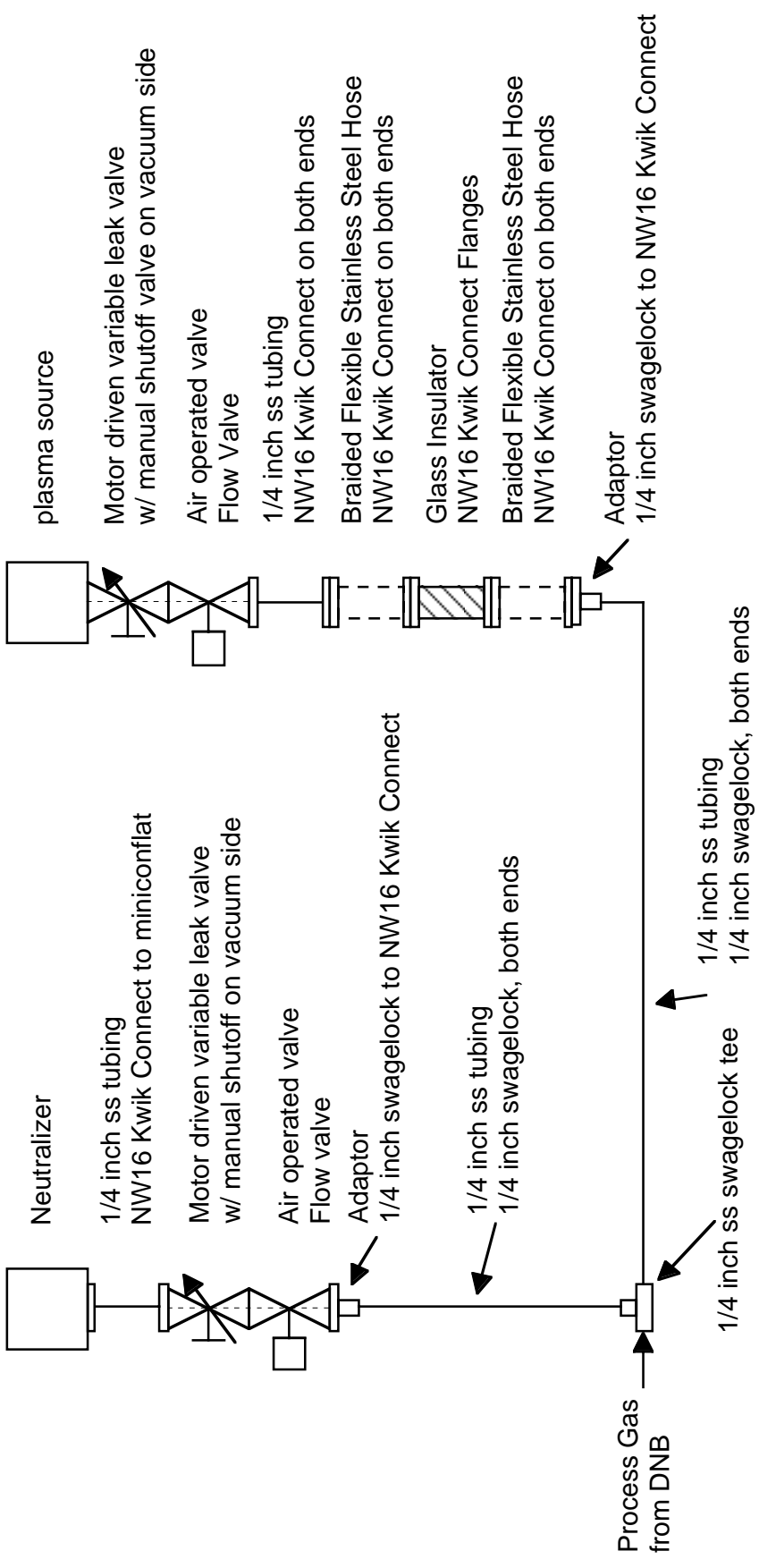


Figure 1. Process Gas Accumulator



Neutralizer

1/4 inch ss tubing  
NW16 Kwik Connect to miniconflat

Motor driven variable leak valve  
w/ manual shutoff on vacuum side

Air operated valve  
Flow valve

Adaptor

1/4 inch swagelock to NW16 Kwik Connect

1/4 inch ss tubing

1/4 inch swagelock, both ends

Process Gas  
from DNB

1/4 inch ss swagelock tee

1/4 inch ss tubing

1/4 inch swagelock, both ends

plasma source

Motor driven variable leak valve  
w/ manual shutoff valve on vacuum side

Air operated valve  
Flow Valve

1/4 inch ss tubing  
NW16 Kwik Connect on both ends

Braided Flexible Stainless Steel Hose  
NW16 Kwik Connect on both ends

Glass Insulator  
NW16 Kwik Connect Flanges

Braided Flexible Stainless Steel Hose  
NW16 Kwik Connect on both ends

Adaptor  
1/4 inch swagelock to NW16 Kwik Connect

Figure 2. Process Gas Delivery

