Recognized States
(Note: devices in brackets may be either open/on or closed/off in the given state)

State: All Off
Open: None
On: None

State: Chamber Open
Open: V4, V5, VM3, [VABSSCI], [VABSSCO]
On: TP1, TP2, TP3, [IPEE], [IPEV], [IPSV], [IPSE]

State: Vacuum Normal (maglev/annulus only)
Open: V1, V4, V5, VA6, VAEE, VAEV, VABS, VASV, VASE, VABSSCI, VABSSCO, [VM1]
On: TP1, TP2, TP3, [IPEE], [IPEV], [IPSV], [IPSE]

State: Turbopumps + Cryopump
Open: V1, V4, V5, VC1, VA6, VAEE, VAEV, VABS, VASV, VASE, VABSSCI, VABSSCO, [VM1]
On: TP1, TP2, TP3, CP1, [IPEE], [IPEV], [IPSV], [IPSE]

State: Turbopumps + Ion Pumps
Open: V1, V4, V5, VC1, VA6, VAEE, VAEV, VABS, VASV, VASE, VABSSCI, VABSSCO, VM1, VIPEE, VIPEV, VIPSV, VIPSE
On: TP1, TP2, TP3, IPEE, IPEV, IPSV, IPSE

State: Maximum Pumping Speed (all pumps running)
Open: V1, V4, V5, VC1, VA6, VAEE, VAEV, VABS, VASV, VASE, VABSSCI, VABSSCO, VM1, VIPEE, VIPEV, VIPSV, VIPSE
On: TP1, TP2, TP3, CP1, IPEE, IPEV, IPSV, IPSE

State: Vibration-Free (ion pumps only)
Open: VM1, VIPEE, VIPEV, VIPSV, VIPSE
On: IPEE, IPEV, IPSV, IPSE
A: ALL OFF → VACUUM NORMAL

A001 IPEE ON
A002 IPEV ON
A003 IPSV ON
A004 IPSE ON
A005 OPERATOR: Connect N2 cylinder to vent line
A006 VV1 OPEN
A007 CONDITION: Wait until P1 > 25 torr
A008 OPERATOR: Close N2 cylinder, replace with dry air cylinder
A009 CONDITION: Repeat until P1 = atmospheric pressure
A010 VV1 CLOSE
A011 V7 OPEN
A012 CONDITION: RGA filament must be OFF.
A013 VM3 OPEN
A014 VA6 OPEN
A015 TP2 ON
A016 OPERATOR: Switch TP2 controller to STANDBY
A017 CONDITION: Wait until TP2 rotation frequency > 950 Hz
A018 TP3 ON
A019 OPERATOR: Switch TP3 controller to STANDBY
A020 CONDITION: Wait until TP3 rotation frequency > 950 Hz
A021 V7 CLOSE
A022 VA6 CLOSE
A023 VM3 CLOSE
A024 OPERATOR: Connect roughing pump line
A025 RP1 ON
A026 RP2 ON
A027 RP3 ON
A028 CONDITION: Wait until PRP < 0.35 torr
A029 VC2 OPEN
A030 V6 OPEN
A031 CONDITION: Wait until P3 < 0.5 torr
A032 V6 CLOSE
A033 V5 OPEN
A034 CONDITION: Wait until CC3 < 10\(^{-4}\) torr
A035 VC2 CLOSE
A036 V5 CLOSE
A037 V7 OPEN
A038 V6 OPEN
A039 CONDITION: Wait until P2 < 0.5 torr
A040 V6 CLOSE
A041 V7 CLOSE
A042 V4 OPEN
A043 TP1 ON
A044 VM3 OPEN
A045  V6 OPEN
A046  CONDITION: Wait until P3 < 0.5 torr
A047  V6 CLOSE
A048  VM3 CLOSE
A049  VA6 OPEN
A050  V6 OPEN
A051  CONDITION: Wait until PAN < 0.5 torr
A052  V6 CLOSE
A053  V5 OPEN
A054  V3 OPEN
A055  RV1 OPEN
A056  CONDITION: Wait until P1 < 0.5 torr (about 3 hours)
A057  V3 CLOSE
A058  RV1 CLOSE
A059  VA6 CLOSE
A060  V7 OPEN
A061  V1 OPEN
A062  VM1 OPEN
A063  RP1 OFF
A064  RP2 OFF
A065  RP3 OFF
A066  OPERATOR: Disconnect roughing pump line
A067  CONDITION: Wait until P2 < 0.05 torr (about 1 hour)
A068  V7 CLOSE
A069  VA6 OPEN
A070  VAEE OPEN
A071  CONDITION: Wait until PAN < 1 torr
A072  VAEV OPEN
A073  CONDITION: Wait until PAN < 1 torr
A074  VABS OPEN
A075  CONDITION: Wait until PAN < 1 torr
A076  VABSSCI OPEN
A077  CONDITION: Wait until PAN < 1 torr
A078  VABSSCO OPEN
A079  CONDITION: Wait until PAN < 1 torr
A080  VASV OPEN
A081  CONDITION: Wait until PAN < 1 torr
A082  VASE OPEN
A083  CONDITION: If CC3 < $10^{-5}$ torr, turn RGA filament ON
B: VACUUM NORMAL → ALL OFF

B001  OPERATOR:  Turn RGA filament OFF
B002  V1 CLOSE
B003  VM1 CLOSE
B004  V4 CLOSE
B005  V5 CLOSE
B006  TP1 OFF
B007  OPERATOR:  Wait until TP1 indicates “OFF” (about 8 minutes)
B008  VA6 CLOSE
B009  VAEE CLOSE
B010  VAEV CLOSE
B011  VABSSCO CLOSE
B012  VABSSCI CLOSE
B013  VABS CLOSE
B014  VASV CLOSE
B015  VASE CLOSE
B016  TP2 OFF
B017  TP3 OFF
B018  OPERATOR:  Make sure calibrated leaks are closed
B019  IPEE OFF
B020  IPEV OFF
B021  IPSV OFF
B022  IPSE OFF

C: VACUUM NORMAL → CHAMBER OPEN

C001  VM1 CLOSE
C002  VM3 OPEN
C003  V1 CLOSE
C004  OPERATOR:  Connect N2 cylinder to vent line
C005  OPERATOR:  Set regulator to 30 psi
C006  OPERATOR:  Make sure interferometer high voltages are off
C007  VV1 OPEN
C008  CONDITION:  Wait until P1 > 25 torr
C009  OPERATOR:  Replace N2 cylinder with dry air cylinder
C010  CONDITION:  Add air cylinders until P1 = atmospheric pressure
C011  VAEE CLOSE
C012  VAEV CLOSE
C013  VABS CLOSE
C014  VASV CLOSE
C015  VASE CLOSE
C016  VAV** OPEN (** corresponds to chamber you wish to open)
C017  CONDITION:  Wait until PA** = atmospheric pressure
C018  VAV** CLOSE
C019  OPERATOR:  Repeat C016-C018 for each chamber to be opened
D:  CHAMBER OPEN → VACUUM NORMAL

D001 OPERATOR: Turn RGA filament OFF
D002 VM3 CLOSE
D003 VABSSCI CLOSE
D004 VABSSCO CLOSE
D005 VAEV OPEN
D006 CONDITION: Wait until PAN < 1 torr
D007 VAEV OPEN
D008 CONDITION: Wait until PAN < 1 torr
D009 VABS OPEN
D010 CONDITION: Wait until PAN < 1 torr
D011 VABSSCI OPEN
D012 CONDITION: Wait until PAN < 1 torr
D013 VABSSCO OPEN
D014 CONDITION: Wait until PAN < 1 torr
D015 VASV OPEN
D016 CONDITION: Wait until PAN < 1 torr
D017 VASE OPEN
D018 CONDITION: Wait until PAN < 1 torr
D019 VV1 CLOSE
D020 OPERATOR: Connect roughing pump line
D021 RP1 ON
D022 RP2 ON
D023 RP3 ON
D024 CONDITION: Wait until PRP < 0.35 torr
D025 V3 OPEN
D026 RV1 OPEN
D027 CONDITION: Wait until P1 < 0.5 torr (about 3 hours)
D028 V3 CLOSE
D029 RV1 CLOSE
D030 VA6 CLOSE
D031 V7 OPEN
D032 V1 OPEN
D033 RP1 OFF
D034 RP2 OFF
D035 RP3 OFF
D036 OPERATOR: Disconnect roughing pump line
D037 CONDITION: Wait until P2 < 0.05 torr (about 1 hour)
D038 V7 CLOSE
D039 VA6 OPEN
D040 CONDITION: If CC3 < 10⁻⁵ torr, turn RGA filament ON
E: VACUUM NORMAL → TURBOPUMPS + CRYOPUMP

E001 OPERATOR: Switch cryopump compressor and controller ON
E002 CONDITION: Wait until CP1 reads COLD
E003 OPERATOR: Reset CP1 interlock to turn CP1 ON
E004 VC1 OPEN

F: TURBOPUMPS + CRYOPUMP → VACUUM NORMAL

F001 VC1 CLOSE
F002 VC2 OPEN
F003 OPERATOR: Switch cryopump compressor and controller OFF
F004 CONDITION: Wait until cryopump fully warms up
F005 CONDITION: Wait until CC3 < 10^{-4} torr
F006 VC2 CLOSE

G: VACUUM NORMAL → TURBOPUMPS + ION PUMPS

G001 CONDITION: Wait until CC1 < 4*10^{-6} torr
G002 VIPEE OPEN
G003 VIPEV OPEN
G004 VIPSV OPEN
G005 VIPSE OPEN

H: TURBOPUMPS + ION PUMPS → VACUUM NORMAL

H001 VIPEE CLOSE
H002 VIPEV CLOSE
H003 VIPSV CLOSE
H004 VIPSE CLOSE

I: TURBOPUMPS + ION PUMPS → VIBRATION FREE

I001 V1 CLOSE
I002 TP1 OFF
I003 CONDITION: Wait until TP1 indicates OFF (about 8 minutes)
I004 V4 CLOSE
I005 TP2 OFF
I006 V5 CLOSE
I007 TP3 OFF
J: VIBRATION FREE → TURBOPUMPS + ION PUMPS

J001 TP2 OFF
J002 OPERATOR: Switch TP2 controller to standby
J003 CONDITION: Wait until TP2 rotation frequency > 950 Hz
J004 TP3 ON
J005 OPERATOR: Switch TP3 controller to standby
J006 CONDITION: Wait until TP3 rotation frequency > 950 Hz
J007 V4 OPEN
J008 TP1 ON
J009 CONDITION: Wait until TP1 indicates ON
J010 V5 OPEN
J011 V1 OPEN

K: TURBOPUMPS + CRYOPUMP → MAXIMUM PUMPING SPEED

K001 CONDITION: Wait until CC1 < 4*10^-6 torr
K002 VIPEE OPEN
K003 VIPEV OPEN
K004 VIPSV OPEN
K005 VIPSE OPEN

L: MAXIMUM PUMPING SPEED → TURBOPUMPS + CRYOPUMP

L001 VIPEE CLOSE
L002 VIPEV CLOSE
L003 VIPSV CLOSE
L004 VIPSE CLOSE

M: MAXIMUM PUMPING SPEED → TURBOPUMPS + ION PUMPS

M001 VC1 CLOSE
M002 VC2 OPEN
M003 OPERATOR: Switch cryopump compressor and controller OFF
M004 CONDITION: Wait until cryopump fully warms up
M005 CONDITION: Wait until CC3 < 10^-4 torr
M006 VC2 CLOSE

N: TURBOPUMPS + ION PUMPS → MAXIMUM PUMPING SPEED

N001 OPERATOR: Switch cryopump compressor and controller ON
N002 CONDITION: Wait until CP1 reads COLD
N003 OPERATOR: Reset CP1 interlock to turn CP1 ON
N004 VC1 OPEN
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