

Pre-flight Start Up: (at least 2 hours before flight)

- Remove plastic caps from inlets**
- Make sure additional power strip at fore facing side of rack is ON
- Open KVM, push ON button, password = 00000000, switch to channel 2
- DAQ Main Power switch ON (leave on KVM ch.2 during CPU boot)
- Make sure USB thumbdrive is inserted in DAQ (> 2 GB)
- Open Labview program "NOxyO3" from desktop shortcut, start program in "manual" mode
- Set/Check heater setpoints:

Watlow Tab	Ch	Mode	Set point Temp. (°C)
Thermocouple	1	Manual	Unused
RV Heat	2	Auto	35
FCP Heat	3	Auto	35
NV (ss-MV) Heat	4	Auto	35
RTD – Pump	5	Manual	50
RTD – CV	6	Manual	20-30 (reads close to ambient T)
RTD – PWR Supply	7	Manual	30-50
RTD – CPU	8	Manual	30-50

- Open N₂ or Zero Air "cylinder" and "delivery" valves
- Check delivery P settings once flow starts (50 psig for SAF, 20 psig for all others)

_____:_____:____ fast-O3 start-up:

- Start ISP-90 Pump (f-O3 RV) at 5 amp breaker on top panel of CO2 rack
- OPEN the "ZA" switch in MAIN tab, check for flow (AIdev tab, "sFCP_tylan" = 4 Vdc)
- OPEN "safety" valve via MAIN tab in program.
- Check MKS tab, make sure unit is in control mode and set point is 50 (50% of FS = 10 torr).
- Check signal channels are reading reasonable values

Signal Channel Name	Description	DC Voltage	Quantity
sRVP	Rxn Vessel Pressure	5 V	10 torr
sNO_tylan	NO tylan in O3 instrument	1 V	2 sccm
sCV_high_PT	High pressure transducer in CV (0-10V = 0-2000 psia) (Check valve set to 600 psig)	2 V	400 psia
sCV_low_PT NEVER EXCEED 40 psig, 50 psia	Low pressure transducer in CV (0-10V = 0-100 psia) (Check valve set to 50 psig)	4 V	40 psia
sNO_monitor	NO monitor (s/n: 1004)	0.009 V 0.160 V	0 ppm 25 ppm
sFCP_Sierra	MKS 640 pressure control valve (Bypass line)	1 V	200 torr
sFCP_Tylan	ZA tylan on inlet	4 V	800 sccm
sMFM	Sierra MFM signal	1.25 V	500 sccm
sTECO_49	TECO analyzer signal	floating	For ground cal only
sTECO_49PS	TECO calibrator signal	floating	For ground cal only
sInlet_baro	Inlet Baratron (reads P _{ambient})	0-10 V	0-1000 torr
3.3 VDC	Computer Voltage Monitor	3.3 V	
5 VDC	Computer Voltage Monitor	5 V	
+12 VDC	Computer Voltage Monitor (trimpot /2)	6.01 V	
-12 VDC	Computer Voltage Monitor (trimpot /2)	-6.01 V	
+15 VDC	Pwr Supply Monitor (trimpot /2)	7.5 V	
-15 VDC	Pwr Supply Monitor (trimpot /2)	-7.5 V	
+24 VDC (A)	Pwr Supply Monitor (trimpot /4)	6.02 V	
+24 VDC (B)	Pwr Supply Monitor (trimpot /4)	6.02 V	

- Just before adding dry ice: Turn on "PMT HV" switch at user side of f-O3 instrument
 - Record warm counts = _____ cps

Date/Flight #: _____/_____

Operator (Pre-Flight/Flight): _____/_____

- __:__:__ Add crushed dry ice to instrument, make sure ice gets around all sides of PMT (~ 45 minutes for PMT to cool to ~ 200 cps background)
- NO containment vessel set up:
 (Check “sCV_PT_hi” and “sCV_PT_lo” in AI dev tab after each step)
 (watch for “sCV_PT_lo” to stabilize to ~4 Vdc = 40 psia = 30 psig)
 Check outputs of NO monitors and NO monitor signal in AI dev tab (Alarm setpoint is 25 ppm or 0.15 VDC – should be showing close to zero ppm and 0 V)
- Turn NO warning beacon switch ON if not already on
 - In main tab, Turn ON “NO_in” switch
 - Open the NO nupro on the reaction vessel (aft side) labeled (NO Inlet)
 - Open manual nupro delivery valve at face of vessel (bottom shaft)
 - In main tab, Turn ON “NO_CV_lo” switch
 - Check low side of pressure regulator in vessel is set to ≤ 30 psig
NEVER EXCEED 40 PSIG
 - In main tab, Turn ON “NO_CV_hi” switch
 - Open main bottle valve at face of vessel (middle shaft)
 - Check NO flow (V&Q tab, “sNO_tylan” = 1 Vdc)
 - In main tab, Turn OFF all three “NO” switches

All instruments are now up and running (except NO flow to fO3 RV)

Just before aircraft doors closes (at least 15 mins before GPU to APU transfer):

- Check dry ice levels, refill if needed, install dry ice lids and thumbscrews
- Make sure “ZA” switch is ON to flush RV for a few minutes
- CLOSE “SAFETY” switch in MAIN tab of O3 program
- Turn off ISP-90 at 5 amp breaker
- Wait for MFM to backfill with ZA (drop to 0 VDC), then CLOSE “ZA” switch
- STOP Program, and exit LabView
- Shutdown computer from Start menu
- When safe, shutdown MAIN Power Switch on DAQ
- Power OFF KVM

After transfer to aircraft power (plenty of time during taxi to fuel station):

- Power ON KVM
- DAQ Main Power switch ON
- Open Labview program “NOxyO3_VOCALS” from shortcut, start program in “manual” mode
- Set/Check f-O3 heaters
- Check signal channels are reading reasonable values
- Start ISP-90 Pump (f-O3 RV) at 5 amp breaker on top panel on CO2 rack
- OPEN the “ZA” switch in MAIN tab, check for flow (AIdev tab, “sFCP_tylan” = 4 Vdc)
- OPEN “safety” switch via MAIN tab in program.
- Check signal channels are reading reasonable values (cps should be ≤ 200)
- In main tab, Turn ON “NO_CV_lo” and “NO_CV_hi” switches
- During taxi, Turn ON “NO_in” switch
- Just before T.O. turn OFF “ZA” switch
- Check signal channels are reading reasonable values, (typical ambient O3 is ~20 ppbv or 40 kcps)

During Flight:

- Make fO3 background measurements while CO instrument is doing a cal: OPEN “ZA” switch for 30 seconds then CLOSE. O3 cps should drop to ~200.
- Top off dry ice once every 4 hours: __:__:__ __:__:__

Shutdown (10 mins before landing):

- OPEN "ZA"
- Record: sCV_high_PT = _____ volts, and sCV_low_PT = _____ volts
- CLOSE "cCV_low_in", "cCV_high_in", and "NO_in" switches in program
- CLOSE the manual cylinder and bellows valves at the face of the containment vessel
- CLOSE the NO Nupro on the reaction vessel (aft side) labeled (NO Inlet)
- sNO_tylan will take a few minutes to drop to zero
- Let ZA flush O3 instrument RV for a few minutes
- CLOSE "Safety" valve
- Turn off ISP-90 at 5 amp breaker on top panel of CO2 rack
- Make sure s MFM has dropped to zero (RV has been filled with ZA), then CLOSE "ZA" switch
- STOP Program, and Exit LabView
- Shutdown DAQ computer via Start menu
- When computer announces safe to turn off: Turn OFF f-O3 DAQ Main Power switch

Emergency Shutdown Procedures: (in case of NO detection, or f-O3 instrument malfunction)

1. CLOSE the two Containment Vessel manual valves (Cylinder and Delivery).
2. CLOSE the bellows valve at the user side of the O3 instrument (Green knob).

Other Desirable Steps for Quick Shutdown:

1. CLOSE "cCV_low_in", "cCV_high_in", and "cNO_in" switches in program
2. Open "ZA" to flush RV
3. CLOSE "SAFETY"
4. Turn off ISP-90 at 5 amp breaker on top panel of CO2 rack
5. CLOSE "ZA"
6. STOP Program, and Exit LabView
7. Shutdown DAQ computer via Start menu
8. When computer announces safe to turn off: Turn OFF DAQ Main Power switch

On ground after landing (after doors open, greeters arrive):

- CLOSE all manual valves on N2 and/or Zero Air “cylinder” and “delivery” valves (leave pressure regulators set)
- Record all gas cylinder pressures:
 - a. N2 purge: _____psig
 - b. NO: _____psig
- Turn OFF “PMT HV” switch on O3 instrument
- Open lid to f-O3 dry ice bin, remove any big excess chunks of ice
- Replace plastic caps on inlets**

Data download procedures (post-flight, essential for fO3):

- Remove USB thumb drive from fO3 DAQ
- Copy O3 flight data to a backup drive (on group field laptop)
- Replace thumb drive so it's there for next flight after you copy the data

Post-flight tasks at ops center:

- Send raw O3 data file by email to entire CARI group