TOGA instrument—Recommend spares and replacement criteria 15-Feb-11

The list which follows covers recommended spares and limited lifetime components in TOGA. A column of this table also contains inspection criteria to use in assessing when the component must be replaced.

Brand/ Vendor	Model number	Description	Inspection/failure criteria	Approx cost/each
Omega	STH051-040LSE	Heater for the CAG catalyst	This must be replaced each time the CAG catalyst is opened, ~once/5 years	$50
Omega	PX176-100A5V	P transducer for pneumatic pump	If complete failure, replace, zero or negative pressures will be read at failure	$410
Omega	KMQSS-020U-12	Type K thermocouple probe, for traps and general use	Reads open circuit upon failure	$60
Omega	TMQSS-062U-12	Type T, 1/16” thermocouple probe, for LN2 liquid measurement	Reads open circuit upon failure	$60
Swagelok	SS-4FW-2	2 μm sintered stainless filter	Contamination or excessive pressure drop	$40
Swagelok	SS-4BK-1C	pneumatic valve, normally closed	Valve failure, intermittent behavior or failure to open or seal completely	$200
Swagelok	SS-4BK-1O	pneumatic valve, normally open	Valve failure, intermittent behavior or failure to open or seal completely	$200
Swagelok	SS-4C-EP-10	Poppet valve	Failure to open or seal completely	$50 ea
Restek	MXT 10mm, 0.18mm id	Metal gas chromatographic column	Poor GC performance, peak tailing	$400
Scott Specialty	Calibration standard and GC column flow	2-stage gas regulator, two in use	Pressure fluctuations at the regulator gauge	$500
General Air	He purge and makeup air	2-stage gas regulator, two in use	Pressure fluctuations at the regulator gauge	$250
NCAR	--in house at NCAR--	Water trap, custom made, stainless steel, includes thermocouple probe and heater wire	Open circuit at thermocouple, short circuit between heater wire and TC or tubing, or open circuit of heater	1-day of NCAR time
NCAR	--in house at	Sample trap, custom made, stainless	Open circuit at thermocouple,	1-day of

	NCAR--	steel, includes thermocouple probe, glass packing and heater wire	short circuit between heater wire and TC or tubing, or open circuit of heater	NCAR time
NCAR	--in house at NCAR--	Cryofocus trap, custom made, stainless steel, includes thermocouple probe and heater wire	Open circuit at thermocouple, short circuit between heater wire and TC or tubing, or open circuit of heater	1-day of NCAR time
Valco	various	Valco hardware, unions, ferrules, etc	New hardware needed at disassembly of traps, 10-port valves and SSV valves	$500
Lenox laser	various	Several critical orifices	Blockage	$150
Aldrich	23,211-4	Platinum catalyst compound, Aldrich, 100 grams	When clean air generator loses catalytic function (fails to generate adequate zero air) the catalyst must be replaced in the CAG	$292
Intel	DG43NB ATX	775 motherboard, exact form factor is critical for TOGA electronics box	PC board failure/breakage	$295
Intel	Core 2 Duo E8400 3 GHz 6MB 1333FSB CPU and fan	PC processor and fan	Processor failure due to heat stress or physical impact, exact match needed for DG43NB motherboard	$200
Ituner	M4-ATX	Power supply for ATX PC, 250W output, 6-30VDC input; provides all PC power voltages, uses 24 VDC TOGA power	Voltage output failure to PC. Unique form factor	$90
Astrodyne	LFM100-24	100 W ultraminiature, 24 VDC open frame switching power supply for the Ituner, uses UPS AC input makes 24 VDC for Ituner supply	Voltage output failure, miniature power supply	$150
National Inst	PCIe-6343	PCIexpress, x-series DAQ card, ~20W spec	Board failure would show up as a communication problem with LabVIEW or erroneous	$1049

r u m e n t s			input/output values	
National I n s t r u m e n t s	PCI-8430/4	PCI bus to 4 channel serial I/O	Board failure would show up as missing COM ports or eratic serial behavior	$449
National I n s t r u m e n t s	PCI-6713	PCI bus to 8 channel D/A	Erroneous or missing analog output signals	$1399
National I n s t r u m e n t s	CB-68LPR	A/D breakout racks, 777145-02 Or is it: 184700D-01L	Impact breakage or stripped threads in the wire fastening screws, exact form factor critical	$99
Murata	BMP-15/1.3-D24	24 VDC to +/- 15 VDC for FCs 1.3 A @+ and – 15VDC, 85% eff	Failure would show up as a loss of all flow controller operation	$150
Adixen	ACT 100 OEM	Adixen controller for molecular	Molecular drag pump would	$1000

	board	drag pump	not operate. This board and the 5011 pump are critical for TOGA operation.	
Vicor	V1-J1H-CW	100 W Vicor DC-DC power supply to be custom fit onto ACT 100 OEM board	Molecular drag pump would not operate. This supply powers the ACT 100 OEM board (above)	$125
Valco	EPCA-CE “Two position actuator control module”	Drive electronics module for 10 port valve, serial, 24 VDC, 48W	If this fails TOGA will not aspirate sample, no organics will be measured	$400
Valco	EMTCA-CE	Drive electronics module for SSV, serial, 24 VDC, 48W, 10 pin double row connector to drive motor	If this fails TOGA will not aspirate sample, no organics will be measured	$400
Valco	EPC10WE	Valco 10 port valve, primary valve used in sample preconcentration	When/if the valve begins to wear/fail leaks will develop visible with mass spectrometer. TOGA performance will be horrible	$1070
Valco	HPM	Electronic helium purifier	The purifier is a consumable with regular replacement necessary. ~every 6 months of Hiaper operation it should be replaced. Failure is seen as poor TOGA blanks	$450
KNF	Pump rebuild kit for model 828	Pump is model 828, brushless, 24VDC, the clean air generator pump	Rebuild is indicated when CAG cannot reach 3 slpm at altitudes below 25kft	$150
Senior flexonics	Bellows rebuild kit	The internal pumping components	Bellows failure will be catastrophic with performance normal until the bellows breaks in one side of the pump	$1000
KNF	Rebuild kit for MPU 1091-N84.0-8.99	Diaphragm and valve pieces for the rough pump	Pump will not achieve operational pressure (pump down below 20 Torr) during TOGA powerup cycle. Software should alert user of rough pump failure	$150
KNF	Rebuild kit for UNPK09 BLDC 24VDC	High P pneumatic pump, generates air for Clippard actuators and pneumatic valves	Pump will not achieve operational pressure (P > 40 psig) during TOGA powerup cycle. Software should alert user of rough pump failure	$150
Clippard	EC-3M-24-E	Actuator valves, EPR seals,	Valve can fail at high cycle	$50 ea

Rep is at 303 377 2736		24VDC	number or if liquid water contaminates system. Silica gel may be red (saturated) and TOGA performance will be erroneous, indicative of particular flows not switching correctly	
Clippard	11923-pkg	Manifold to 1/8" tubing connectors	Normally won't fail unless overtightened during valve servicing	$30
Tylan	FC-280	10 sccm mass flow controller for GC column flow	Chromatography will be "off" or inoperative if this MFC fails	$1000
Tylan	FC-280	100 sccm flow controller, general use MFC	TOGA sample preconcentration will be erroneous	$1000
Tylan	FC-280	10 slpm flow controller, cooling N2 flow	One or more of the traps will not cool	$1000
Unit	8160	10 slpm flow controller for primary inlet air control	Primary sample inlet airflow will be too low, even at low altitudes	$1000
SOLA	S1K650	650 VA, 390 W output UPS	If PC can't boot due to no input AC signal at the LFM100-24 power supply the UPS battery or main board may have failed. This is a stressed component. Exact form factor of battery and board critical.	$300
Varian	TV-301 Navigator	turbo pump, the primary high vacuum pump for the mass spectrometer	As the bearings age or other fault occurs the pump won't operate and mass spectrometer pressure will be too high (>10^-4 Torr), may initially be accompanied by whining noise	$11,000
Agilent	G-0861	5973N chamber side board electronics	MS high voltage or MS ion transmission won't occur. Agilent software should notify user	$2000
Agilent	G-3170-60050	Ionization filaments	Agilent software will tell the user when the filaments fail	4@$124 ea

Agilent	G-6150	Electon multiplier	Count signal becomes too high	$1500
Granville - Phillips/Brooks Automation	Mini-ion 342	Ion gauge module, incl. electronics, Granville Phillips, power 24VDC @12W max Output: 1-8VDC where P=10^(volts – 9)	10 V (invariant) signal results when the ion gauge is inoperable. The signal may be a blown filament or more likely, high pressure in the MS chamber	$1000
Adixen	MDP 5011	Molecular drag pump, provides the second stage MS pumping in TOGA	The MDP tends to audibly whine and cause vibration to the hand prior to complete failure. At failure the loss of TOGA second stage pumping will result in the turbo pump not operating	$5000
Agilent	RMSH-2	He purifying cartridge To reside in aircraft cabin, not rack area	Contaminants evident if this cartridge needs replacing	$230
Delta adsorbents	SG48B5 or other	Silica gel trap and fittings for drying Clippard air	Indicator silica gel goes from blue to red upon saturation with water vapor	$49