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5227 OFFICE PARK BLVD. • BRADENTON, FLORIDA • 34203
PHONE (941) 751-6485 • FAX (941) 751-6439
ENGR.BUSINESS #8909
"Striving to Make Your Facility Energy Efficient"
www.atpengineeringsouth.com
atpengrsouth@verizon.net

Ms. Kayse Hasiak
Laboratory Manager
Manatee County
Central Waste Water Laboratory
4751 66th St. W.
Bradenton, FL 34210

May 28, 2013

Ms. Hasiak,

Thank you for allowing us to come in and review the existing laboratory systems and discussing future requirements. The observations were made during the site visit that the existing Chloride UPS is having faults and is showing an overload; which causes the system to switch to battery power in some instances. This is proof of either the UPS is failing or the UPS is way undersized. Typically when an instrument starts and inrush of current occurs; this inrush is what is pushing the UPS over the demand limit. The laboratory equipment connected to the UPS system is somewhat imbalanced but circuits can be moved to balance the existing equipment. We always suggest that the power is read during a typical analysis day to balance out the system. The values as observed in the Figure 1 below are phase A: 14A, phase B: 18A, and phase C: 25A on the existing UPS system.

Figure 1: Existing Chloride UPS System

The total demand load per the observations made for the instrumentation should be around 18.6kW with a power factor of 0.8 brings the total demand of around 25KVA. Typically you do not want to run a UPS at 100% - only around 75-80% peak. This sizing criteria would give a UPS size of around 40KVA. The current UPS per the plans is a 20KVA system. This would indicate why there are overloads on the system.

With the discussions that we had on Tuesday May 14th, 2013, there was a statement to double the amount of instrumentation and equipment. This direction would double the size of the UPS with some room to grow. See figure 2 for the UPS calculations.

Figure 2: UPS Calculations

66th Street Facility UPS Size		
Instrumentation	Power Required per Manufacturer	
PE Optima 7300 DV	2400 Watts	
PE AA Analyst 800	5000 Watts	
Agilent 5973/6890 with Pump & Comp	3700 Watts	
Thermo Model 30400 Oven	1800 Watts	x2
Thermo/Lindburg Oven	2100 Watts	
Getinge 422LS Autoclave	1800 Watts	
Total	18600 Watts	
Increase Capacity 2x Times	37200 Watts	
Growth Factor (Increase in Power)	13950 Watts	
Total Demand Capacity	51150 Watts	
Typical (125%) Standard Capacity	63938 Watts	64KW
Total Size with Power Factor	79922 VA	80KVA

Volt x Amps = Watts
KVA = Watts/1000 x Power Factor = Kilo-Volt-Amps
Typical PF = 0.8

Breaker size: 125A @ 480V-3P
or 250A 208V-3P

The Getinge AutoClave may also have a 30kW boiler unit on it; which would increase the UPS by an additional 40KVA. The total size of the UPS system is 80KVA; which includes all of the equipment but the boiler unit. It would not be suggested to place the boiler unit on the UPS due to the high amount of demand. Typically the UPS system without the battery cabinet is around 3' wide by 4' deep by 5.5' tall and the battery cabinets can be up to 5' wide by 4' deep by 5.5' tall for a Toshiba 4100 series. The dimensions may vary depending upon the manufacturer and model.

See the attached sheets for equipment data and UPS information. Also please see the 8.5"x11" sheets for the UPS design for bidding purposes. The cost of a UPS can vary depending upon the manufacturer and amount of battery requirements. A 480V to 208V UPS system would be suggested for the systems because of the instrumentation load, the cost of replacing switchgear, and the cost of replacing an existing transformer. A 225A 208/120Y Voltage panel board should replace the existing LU panel for future use and coverage.

The new UPS system will put out a significantly larger amount of heat in the space. It is suggested that a new 3.5-4 ton DX HVAC unit or chilled water unit be placed for the heat removal of the UPS system. The heat output of the unit will depend upon the manufacturer of the UPS system. There are also requirements for the exhaust of the space due to the possible lead-acid batteries. Coordination of these items should be discussed with the manufacturer and the contractor.

Summary:
It is suggested that an 80KVA UPS with a 480V-3P input/208V-3P output be placed on panel MDP for the input and a new output panel (replacing panel LU) (225A) with a main breaker (225A) be place for the new loads. This should support at least a doubling of the existing equipment. The locations of the batteries may have to be placed in alternative location due to the size of the UPS system. The design is based upon plans that were provided. The location of the UPS may vary due to existing conditions.

If there are any further questions, please feel free to contact us.

Thank you for the opportunity to provide this service.

Matthew Camden, E.I.
FL# 1100014876

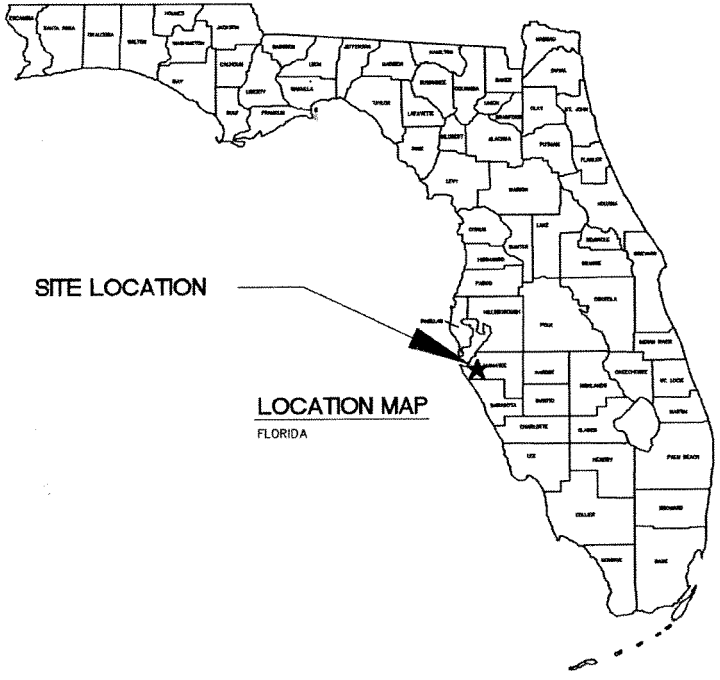
JOHN D. CAMDEN
LICENSE
No. 53458
STATE OF FLORIDA
PROFESSIONAL ENGINEER

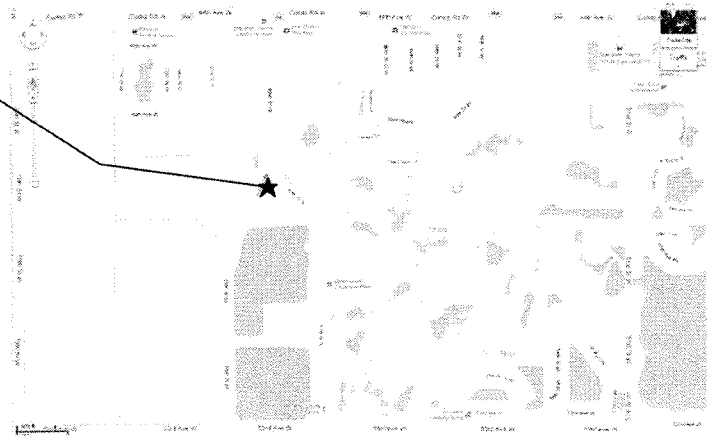
John Camden, P.E.
FL# 53458

6/3/2013

UPS System Example Design

66TH STREET LAB
UPS SYSTEM REPORT
BRADENTON, FLORIDA





SITE MAP

To the best of the engineer's knowledge, said plans and specifications comply with the applicable building codes and the applicable minimum fire safety standards as determined in accordance with Chapters 553 and 633, Florida Statutes.

SHEET SCHEDULE

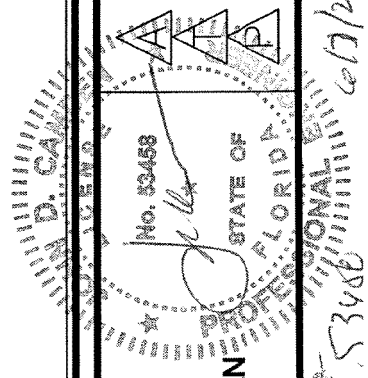
SHEET	DESCRIPTION
E0.0	PROJECT NAME, LOCATION and SITE MAPS, SHEET SCHEDULE
E0.1	LEGEND SHEET
E2.0	DEMOLITION PLAN
E3.0	POWER AND SYSTEMS PLAN
E5.0	ELECTRICAL ONE-LINE DIAGRAM
E6.0	PANEL SCHEDULES
E7.0	SPECIFICATIONS

ATP ENGINEERING SOUTH, PL
BRADENTON, FLORIDA
ENGR. BUSINESS #8908
941-751-6485

DRAWING TITLE:
66TH STREET LAB
UPS STUDY
SITE LOCATION PLAN

DATE: 05/30/13

SHEET No.: E0.0



ELECTRICAL SYMBOLS AND ABBREVIATIONS

NOTE:
THESE ARE STANDARD SYMBOLS AND MAY NOT ALL APPEAR ON THE PROJECT DRAWINGS; HOWEVER WHEREVER THE SYMBOL APPEARS ON THE PROJECT DRAWINGS, THE ITEM SHALL BE PROVIDED AND INSTALLED.

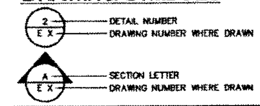
EQUIPMENT

SYMBOL	DESCRIPTION
	DISTRIBUTION PANELBOARD AND CABINET – RECESSED MOUNT
	DISTRIBUTION PANELBOARD AND CABINET – SURFACE MOUNT
	BRANCH PANELBOARD AND CABINET – RECESSED MOUNT
	BRANCH PANELBOARD AND CABINET – SURFACE MOUNT
	LOAD CENTER – SURFACE MOUNT
	LOAD CENTER – RECESSED MOUNT
	DENOTES PANEL/PANELBOARD DESIGNATION
	MOTOR "X" INDICATES HORSEPOWER "Y" INDICATES PHASE
	CAPACITOR "X" INDICATES KVAR
	DISCONNECT SWITCH – FUSED "X"= RATING, "Y" = FUSE SIZE
	DISCONNECT SWITCH – NON–FUSED
	DISCONNECT SWITCH – CIRCUIT BREAKER
	MOTOR STARTER
	COMBINATION MOTOR STARTER
	DRY TYPE TRANSFORMER – "XX" INDICATES KVA
	METER SOCKET
	CURRENT TRANSFORMER METER SOCKET
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
	GENERATOR
N E ATS/MTS L	TRANSFER SWITCH ATS = AUTOMATIC TRANSFER SWITCH MTS = MANUAL TRANSFER SWITCH N = NORMAL POWER E = EMERGENCY POWER L = LOAD
	WIREWAY
	BUSWAY
	GROUND CONNECTION
S_x	HORSEPOWER RATED MANUAL MOTOR STARTER TOGGLE SWITCH WITH THERMAL OVERLOAD PROTECTION "X" INDICATES AS FOLLOWS NONE – SINGLE POLE 2 – 2 POLE 3 – 3 POLE
S_xP_y	HORSEPOWER RATED MANUAL MOTOR STARTER TOGGLE SWITCH WITH THERMAL OVERLOAD PROTECTION WITH PILOT LIGHT "X" INDICATES AS FOLLOWS: NONE – SINGLE POLE; 2 – 2 POLE; 3 – 3 POLE "Y" INDICATES AS FOLLOWS: Y – YELLOW LENS; G – GREEN LENS; R – RED LENS; W – WHITE LENS; B – BLUE LENS; A – AMBER
A	LOW VOLTAGE DRAWOUT TYPE CIRCUIT BREAKER "X" INDICATES AS FOLLOWS A – AIR TYPE S – SF6 TYPE V – VACUUM TYPE
	MOLDED CASE CIRCUIT BREAKER
	FUSE
	DRAW OUT MOTOR STARTER ASSEMBLY

ABBREVIATIONS

A	AMPERE
AC	AIR CONDITIONING OR ALTERNATING CURRENT
ACC	ACCESS
AF	AMPERE FRAME
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLER UNIT
AM	AMMETER
ARCH	ARCHITECT
AT	AMPERE TRIP
ATC	AUTOMATIC TEMPERATURE CONTROL
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CAT	CATEGORY
CB	CIRCUIT BREAKER
CH	CHILLER
CKT	CIRCUIT
CL	CENTER LINE
CLF	CURRENT–LIMITING FUSE
CM	CEILING MOUNTED
CNTL	CONTROL
CU	COPPER
DWG(S)	DRAWING(S)
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EM	EMERGENCY
EMS	ENERGY MANAGEMENT SYSTEM
EMT	ELECTRICAL METALLIC TUBING
EPO	EMERGENCY POWER OFF
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EX	EXISTING TO REMAIN
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FACC	FIRE ALARM COMMAND CENTER
FATC	FIRE ALARM TERMINAL CABINET
FLR	FLOOR
FMC	FURNISHED BY MECHANICAL CONTRACTOR
FO	FIBER OPTIC
FOTC	FIBER OPTIC TERMINAL CABINET
FSS	FIRE SUPPRESSION SYSTEM
FWE	FURNISHED WITH EQUIPMENT
GFI	GROUND FAULT INTERRUPTER
GND,G	GROUND
GRS	GALVANIZED RIGID STEEL CONDUIT
HOA	HAND–OFF–AUTO
HACR	HEATING/AIR CONDITIONING–RATED
HID	HIGH INTENSITY DISCHARGE
HPF	HIGH POWER FACTOR
HPS	HIGH PRESSURE SODIUM
HZ	HERTZ
HP	HORSEPOWER
IG	ISOLATED GROUND
IMC	INTERMEDIATE METALLIC CONDUIT
JB	JUNCTION BOX
KAIC	KILO AMPERE INTERRUPTING CAPACITY
KCMIL	THOUSAND CIRCULAR MILS
KVA	KILOVOLT AMPERE
KW	KILOWATT
LC	LIGHTING CONTACTOR
MC	MECHANICAL CONTRACTOR
MCC	MOTOR CONTROL CENTER
M–G	MOTOR GENERATOR
MDP	MAIN DISTRIBUTION PANEL
MH	METAL HALIDE
MOD	MOTOR OPERATED DAMPER OR DOOR
MTD	MOUNTED
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NON–FUSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OCPD	OVER CURRENT PROTECTIVE DEVICE
PNL	PANEL
ϕ	PHASE
PB	PUSHBUTTON
PE	PHOTOELECTRIC CONTROLLER
PC	PLUMBING CONTRACTOR
PVC	POLYVINYL CHLORIDE CONDUIT
R	RELOCATED
RTU	ROOF TOP UNIT
SCH	SCHEDULE
SEC	SECURITY
SW	SWITCH
SWGR	SWITCHGEAR
TEL,T	TELEPHONE
TBB	TELEPHONE BACKBOARD
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TC	TIME CLOCK
XFMR	TRANSFORMER
XFR	TRANSFER
TYP	TYPICAL
UG	UNDERGROUND
UH	UNIT HEATER
UL,U.L.	UNDERWRITERS LABORATORIES
UPS	UNINTERRUPTIBLE POWER SUPPLY
U.O.N.	UNLESS OTHERWISE NOTED
VT	VAPORTIGHT
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
VSD	VARIABLE SPEED DRIVE
V	VOLT
VM	VOLTMETER
W	WATT
WHM	WATTHOUR METER
WM	WATTMETER
WP	WEATHER PROOF

DRAWING SYMBOLS



(1) REFER TO LIKE NUMBER NOTES.
(1) REFER TO LIKE NUMBER NOTES.

RACEWAY SYSTEM

SYMBOL	DESCRIPTION
	CONCEALED CONDUIT
	4" CONDUIT SLEEVE WITH BUSHINGS THRU WALL ABOVE CEILING
—XX—	LETTER DESIGNATION REFERS TO SYSTEM (SEE ABBREVIATIONS)
A–XX, F50; PHASE CONDUCTORS, GROUND, SWITCH LEG, NEUTRAL	QUANTITY OF CONDUCTORS OR CABLES IN CONDUIT "F50" DENOTES THE FEEDER SIZE "A–XX" DENOTES PANEL AND CIRCUIT #
	CONDUIT TURNED UP
	CONDUIT TURNED DOWN
	JUNCTION OR PULL BOX
	CABLE TRAY
	U/G CONDUIT TURNED UP
	U/G CONDUIT TURNED DOWN

GENERAL NOTES (APPLY TO ALL DRAWINGS):

1. THE WORK INDICATED ON THESE DRAWINGS IS DIAGRAMMATIC AND IS INTENDED TO CONVEY THE SCOPE OF WORK AND INDICATE THE GENERAL ARRANGEMENT OF EQUIPMENT AND DEVICES FOR A COMPLETE SYSTEM IN EVERY RESPECT AND DETAIL, TESTED AND LEFT READY IN PERFECT OPERATING CONDITION FOR THE OWNER'S USE. MATERIALS AND EQUIPMENT SHALL BE LISTED BY UNDERWRITERS' LABORATORIES AND SHALL BE INSTALLED IN ACCORDANCE WITH SUCH LISTINGS. INSTALLATIONS SHALL BE MADE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. WORK SHALL MEET THE REQUIREMENTS OF THE SPECIFICATIONS AND CONFORM TO THE NEC (NFPA 70 & 72) AND ALL APPLICABLE CODES, AND BE COMPLETED BY A QUALIFIED, EXPERIENCED, LICENSED ELECTRICAL CONTRACTOR.
2. THE ENGINEER HAS MADE AN EFFORT TO COORDINATE WORK WITH OTHER TRADES AND IDENTIFY ANY AND ALL CONFLICTS. THE CONTRACTOR IS RESPONSIBLE TO COORDINATE FIELD WORK BETWEEN TRADES AND TO IDENTIFY FIELD CONDITIONS PRIOR TO INSTALLATION AND REPORT ANY CONFLICTS TO THE ENGINEER.
3. WHEN A CONFLICT OCCURS BETWEEN THE SPECIFICATIONS AND DRAWINGS, THE ITEMS OF GREATER QUANTITY AND/OR COST SHALL BE PROVIDED.
4. CONTRACTOR SHALL VERIFY THE LOCATION AND ELECTRICAL REQUIREMENTS OF ALL EQUIPMENT FURNISHED BY OTHER TRADES PRIOR TO INSTALLATION. COORDINATE ROUGH–IN INSTALLATION WITH EQUIPMENT DETAILS.
5. ALL OPENINGS IN FIRE AND SMOKE PARTITIONS SHALL BE SEALED AS REQUIRED BY THE NEC/ FLORIDA BUILDING CODE. PROVIDE UL LISTED COMPOUND TO MATCH PARTITION RATING.
6. DO NOT SCALE DRAWINGS. VERIFY FIELD CONDITIONS PRIOR TO AND DURING CONSTRUCTION FOR EXACT DEVICE / EQUIPMENT LOCATION.
7. DEMOLITION WORK: PROVIDE DEMOLITION AND REMOVAL WORK AS INDICATED OR NEEDED. EQUIPMENT THAT IS TO BE REMOVED INCLUDES ALL ASSOCIATED WIRING, BOXES AND CONDUIT BACK TO SOURCE. CLOSE ALL UNUSED OPENINGS IN JUNCTION BOXES THAT REMAIN WITH SUITABLE PLUG OR COVER. WHEN REMOVING OR RELOCATING LIGHT FIXTURES OR OTHER DEVICES, FIELD VERIFY REMAINING DEVICES IN THE SAME CIRCUIT AND RECONNECT FOR CONTINUED SERVICE. EXISTING ELECTRICAL WORK INTERFERING WITH NEW CONSTRUCTION SHALL BE RELOCATED OR REROUTED TO SUIT FINAL INSTALLATION. CUTTING AND PATCHING REQUIRED SHALL BE DONE TO RESTORE AREAS TO ORIGINAL CONDITION.
8. CONTRACTOR SHALL PROVIDE TO LOCAL AHJ OR PERMITTING AGENCY A COPY OF ALL MAJOR EQUIPMENT CUT SHEETS AT TIME OF APPLICATION IF REQUESTED.

THESE DOCUMENTS HAVE BEEN PREPARED BASED ON INFORMATION PROVIDED BY OTHERS. THE CONSULTANT HAS NOT VERIFIED THE ACCURACY AND/OR COMPLETENESS OF THIS INFORMATION AND SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS THAT MAY BE INCORPORATED AS A RESULT OF ERRONEOUS INFORMATION PROVIDED BY OTHERS. NOTIFY THIS ENGINEER IMMEDIATELY OF ANY DISCREPANCIES FOUND.

ATP ENGINEERING SOUTH, PL
BRADENTON, FLORIDA
ENGR. BUSINESS #8908
941-751-6485

6/13/2013
No. 53458
STATE OF
PROFESSIONAL
53458

DRAWING TITLE:
66TH STREET LAB
UPS STUDY
LEGEND SHEET

DATE:
05/30/13

SHEET No.:
E0.1

DEMOLITION PLAN

1 / E2.0 — 1/8" = 1'-0"

N

PLAN NOTES:

1. REMOVE EXISTING UPS SYSTEM.
2. REMOVE EXISTING PANEL LU – TRY TO RE-USE BREAKERS, CONDUITS, AND WIRE TO EXISTING EQUIPMENT ON THE NEW PANELBOARD "LU".
3. REMOVE CONDUIT AND CONDUCTORS FOR THE UPS SYSTEM ON PANEL LLA. MARK EXISTING 80 AMP BREAKER AS SPARE.

STATE OF FLORIDA
JOHN D. CAMPBELL
No. 53459
ENGINEER

DRAWING TITLE:
66TH STREET LAB
UPS STUDY
DEMOLITION PLAN

DATE: 05/30/13

SHEET No.: **E2.0**

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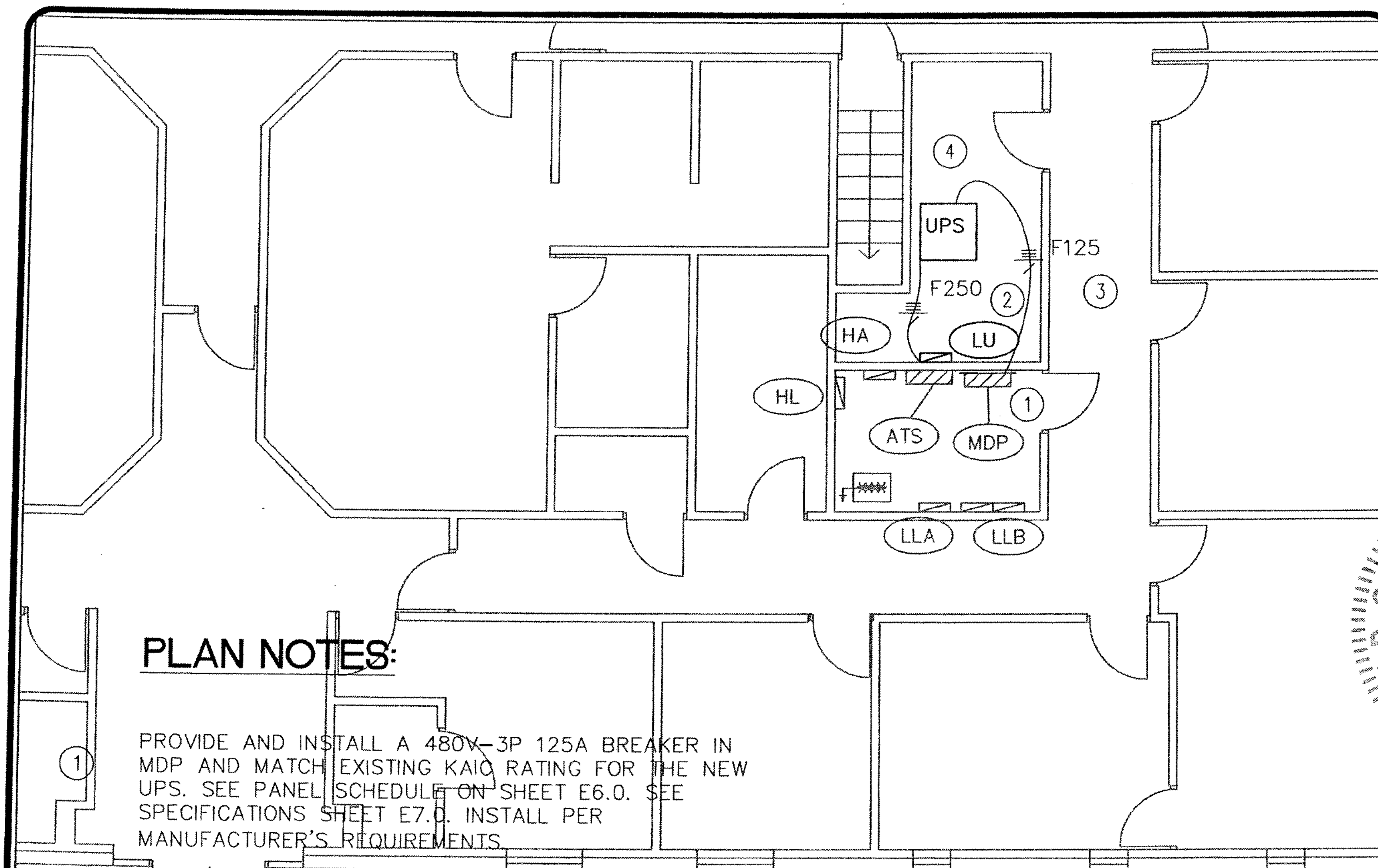


PLAN NOTES:

1. PROVIDE AND INSTALL A 480V–3P 125A BREAKER IN MDP AND MATCH EXISTING KAIC RATING FOR THE NEW UPS. SEE PANEL SCHEDULE ON SHEET E6.0. SEE SPECIFICATIONS SHEET E7.0. INSTALL PER MANUFACTURER'S REQUIREMENTS.
2. TRY TO RE–USE EXISTING DISTRIBUTION BREAKERS, CONDUCTORS, AND CONDUIT RUNS FROM THE OLD PANEL "LU".
3. PROVIDE A NEW SURGE SUPPRESSION DEVICE ON THE NEW PANEL WITH A 30A BREAKER. SEE SPECIFICATIONS SHEET E7.0.
4. PROVIDE AND INSTALL A NEW UPS SYSTEM PER MANUFACTURER'S REQUIREMENTS.

1 / E3.0 **NEW POWER PLAN**

1/8" = 1'–0"

N

DATE: 05/30/13

SHEET No.: E3.0

DRAWING TITLE:
66TH STREET LAB
UPS STUDY
POWER PLAN

JOHN D. GARRETT · No. 53458 · STATE OF FLORIDA · PROFESSIONAL ENGINEER · LICENSE

6/11/2013

53458

ATP ENGINEERING SOUTH, PL
BRADENTON, FLORIDA
ENGR. BUSINESS #8908
941-751-6485

FEEDER AND BRANCH CIRCUIT SCHEDULE

FEEDER/BRANCH CIRCUIT DESIGNATION	COPPER CONDUCTOR THHN, THWN, & THWN-2		CONDUIT SIZE AND QUANTITY [QUANTITY IS 1, UNLESS NOTED IN ( )]					
	PHASE & NEUTRAL	EQUIPMENT GROUND	1P, 1N, 1G, 2P, 1G	2P, 1N, 1G, 3P, 1G	3P, 1N, 1G	3P, 2N, 1G	3P, 3N, 1G	3P, 1N, 2G
F20	12	12	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
F30	10	10	3/4"	3/4"	3/4"	1"	1"	1"
F40-50	8	10	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/4"
F60	6	10	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
F70-F80	4	8	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"	1 1/2"
F90-F100	3	8	1 1/4"	1 1/4"	1 1/2"	1 1/2"	2"	1 1/2"
F110	2	6	1 1/4"	1 1/2"	1 1/2"	2"	2"	2"
F125	1	6	1 1/2"	2"	2"	2"	2 1/2"	2"
F150	1/0	6	1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"
F175	2/0	6	2"	2"	2 1/2"	2 1/2"	3"	2 1/2"
F200	3/0	6	2"	2 1/2"	2 1/2"	3"	3"	3"
F225	4/0	4	2"	2 1/2"	3"	3"	3"	3"
F250	250	4	2 1/2"	3"	3"	3 1/2"	3 1/2"	3-1/2"
F300	350	4	3"	3"	3 1/2"	3 1/2"	4"	3 1/2"
F350	2/0	3	(2) 2"	(2) 2 1/2"	(2) 2 1/2"	(2) 2 1/2"	(2) 3"	(2) 2 1/2"

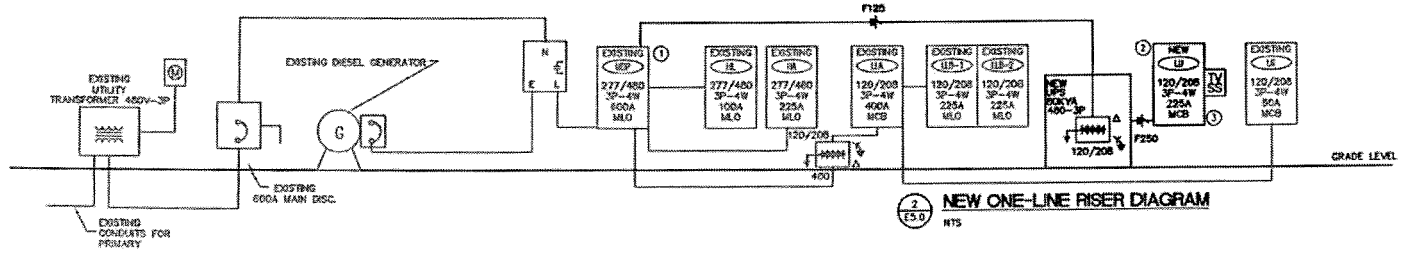
NOTES:
1. DO NOT COMBINE NEUTRAL CONDUCTORS FOR ALL CIRCUITS. USE SEPARATE INDEPENDENT NEUTRAL CONDUCTORS FOR ALL CIRCUITS.

VOLTAGE DROP FOR 1φ, 20A BRANCH CIRCUITS

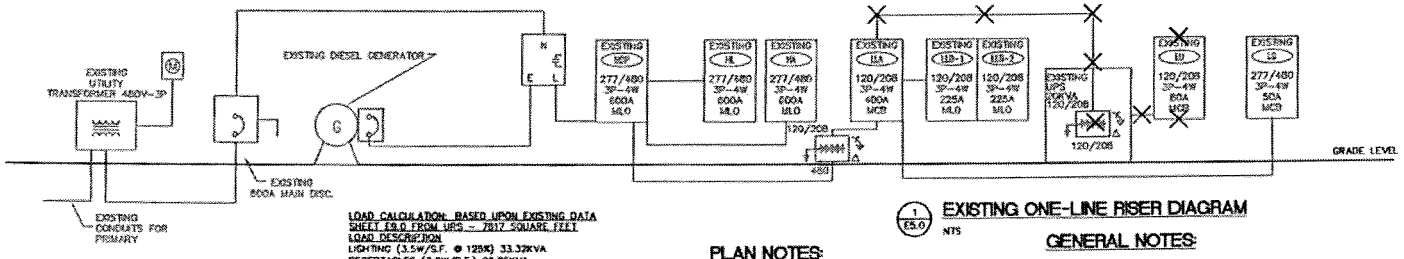
FEEDER SIZE TO USE	DISTANCE ALLOWED			
	120V	208V	277V	480V
F20	0 - 45 FEET	0 - 79 FEET	0 - 105 FEET	0 - 182 FEET
F30	45 - 72 FEET	79 - 126 FEET	105 - 168 FEET	182 - 290 FEET
F40-50	72 - 115 FEET	126 - 201 FEET	168 - 267 FEET	290 - 463 FEET
F60	115 - 183 FEET	201 - 318 FEET	267 - 423 FEET	463 - 733 FEET
F70-80	183 - 292 FEET	318 - 506 FEET	423 - 675 FEET	733 - 1169 FEET
F90-100	292 - 367 FEET	506 - 637 FEET	675 - 848 FEET	1169 - 1469 FEET
F110	367 - 464 FEET	637 - 804 FEET	848 - 1071 FEET	1469 - 1856 FEET
F125	464 - 584 FEET	804 - 1013 FEET	1071 - 1349 FEET	1856 - 2338 FEET
F150	584 - 738 FEET	1013 - 1279 FEET	1349 - 1703 FEET	2338 - 2951 FEET

NOTES:
1. 20 A BRANCH CIRCUITS SHALL BE SIZED FOR VOLTAGE DROP. WIRE SIZES ARE NOT INDICATED ON THE DRAWINGS TO COMPENSATE FOR VOLTAGE DROP FOR THESE CIRCUITS. CONTRACTOR SHALL UTILIZE WIRE SIZE SHOWN ABOVE FOR DISTANCES LISTED ABOVE.
2. VOLTAGE DROP WIRE SIZES WILL BE STRICTLY ENFORCED. CONTRACTOR SHALL SUBMIT A LIST OF CIRCUITS THAT WILL EXCEED THE DISTANCES ALLOWED AND INDICATE WIRE SIZE TO BE USED PRIOR TO ANY WIRE BEING INSTALLED.

JOHN D. CAMDEN LICENSE No. 52458 STATE OF FLORIDA PROFESSIONAL ENGINEER (6/3/13)



2 / E5.0 NEW ONE-LINE RISER DIAGRAM
NTS



1 / E5.0 EXISTING ONE-LINE RISER DIAGRAM
NTS

LOAD CALCULATION: BASED UPON EXISTING DATA SHEET E8.0 FROM URS - 7817 SQUARE FEET

LOAD DESCRIPTION	
LIGHTING (3.5W/S.F. @ 125K)	33.32KVA
RECEPTACLES (3.0W/S.F.)	22.65KVA
LAB EQUIPMENT	31.75KVA
FUTURE LAB EQUIPMENT	15.00KVA
90 TON CHILLER (166.5A @ 480V-3P)	140.02KVA
FANS	42.88KVA
PUMPS	14.48KVA
MISC MOTOR LOADS	4.32KVA
UPS REMOVED	(26.00KVA)
NEW UPS	80.00KVA
WATER HEATER	12.00KVA

376.6KVA @ 480V-3P = 452.98A
600A SERVICE

PLAN NOTES:

1. PROVIDE AND INSTALL A 480V-3P 125A BREAKER IN MDP AND MATCH EXISTING KAIC RATING FOR THE NEW UPS. SEE PANEL SCHEDULE ON SHEET E8.0.
2. TRY TO RE-USE EXISTING DISTRIBUTION BREAKERS, CONDUCTORS, AND CONDUIT RUNS FROM THE OLD PANEL "LU".
3. PROVIDE A NEW SURGE SUPPRESSION DEVICE ON THE NEW PANEL WITH A 30A BREAKER. SEE SPECIFICATIONS SHEET E7.0.

GENERAL NOTES:

X DENOTES ITEMS TO BE REMOVED.

ITEMS IN GRAYSCALE ARE EXISTING.

ITEMS BOLD ARE NEW.

ATP ENGINEERING SOUTH, PL
BRADENTON, FLORIDA
ENGR. BUSINESS #8908
941-751-6485

DRAWING TITLE:
66TH STREET LAB
UPS STUDY
ELECTRICAL ONE-LINE PLAN

DATE: 05/30/13

SHEET No.: E5.0

PANELBOARD SCHEDULE

DESIGNATION: PANEL LU
LOCATION: UPS ROOM
VOLTAGE: 208Y/120
PHASE: 3 PHASE, 4 WIRE

MAINS: 225 A MCB
BUS SIZE: 225 AMP
PANEL MOUNTING: SURFACE
ALL BREAKERS: 10,000 AIC

CKT NO.	LOAD DESCRIPTION	LOAD CODE	CONN. KVA	BREAKER AMPS	BREAKER POLE	CONNECTED LOAD A	CONNECTED LOAD B	CONNECTED LOAD C	BREAKER AMPS	BREAKER POLE	CONN. KVA	LOAD CODE	LOAD DESCRIPTION	CKT NO.
1	DBS 119	P	0.38	20	1	1.58			20	1	1.20	P	ION CHROM 123	2
3	TOC 123	P	0.76	20	1		1.96		20	1	1.20	P	ION CHROM 123	4
5	NUTR ANALYZER 123	P	1.20	20	1			2.10	20	1	0.90	P	GCMS 130	6
7	GCMS	P	0.90	20	1	1.35			20	1	0.45	P	FIMS 130	8
9	AA	P	1.56	20	2		3.90		30	2	2.34	P	ICP 131	10
11	INSTRUMENTATION	P	1.56								2.34	P	INSTRUMENTATION	12
13	RECEPTACLES	R	1.92	20	1	1.92			20	1			SPARE	14
15	SPARE			20	1		0.00		20	1			SPARE	16
17	SPARE			20	1	0.00		0.00	20	1			SPARE	18
19	SPARE			20	1		0.00		20	1			SPARE	20
21	SPARE			20	1			0.00	20	1			SPARE	22
23	SPARE			20	1	0.00			20	1			SPARE	24
25	SPARE			20	2		0.00		30	2			SPARE	26
27	SPARE			20	1			0.00	20	1			SPARE	28
29	SPARE			20	1	0.00			20	1			SPARE	30
31	SPARE			20	1		0.00		20	1			SPARE	32
33	SPARE			20	1			0.00	20	1			SPARE	34
35	SPARE			20	1	0.00			30	3			TVSS	36
37	SPARE						0.00							38
39	SPACE							0.00						40
41	SPACE													42
	TOTAL CONNECTED AMPS:		50.00 AMPS			40.42	48.83	50.00	KVA					
	TOTAL CONNECTED LOAD:		16.71 KVA			4.85	5.86	6.00	AMPS					
	TOTAL DEMAND AMPS:		50.00 AMPS											
	TOTAL DEMAND LOAD:		15.75 KVA											

SPARES ARE FOR FUTURE INSTRUMENTATION PER OWNER'S REQUEST.

LOAD CODES:

L= LIGHTING
R= RECEPTACLES
M= MECHANICAL/EQUIPMENT
C= COMPUTER
K= KITCHEN
P= PANELBOARD

1 / E6.0

NEW PANEL "LU" SCHEDULE

NTS

DATE: 05/30/13

SHEET No.: E6.0

DRAWING TITLE:
66TH STREET LAB
UPS STUDY
PANEL SCHEDULES

JOHN D. CAMPBELL — No. 53458 — STATE OF FLORIDA — PROFESSIONAL ENGINEER

6/12/2013 # 53458

ATP ENGINEERING SOUTH, PL
BRADENTON, FLORIDA
ENGR. BUSINESS #8908
941-751-6485

SPECIFICATIONS:

(APPLY TO ALL ELECTRICAL SHEETS)

1. PROVIDE AND INSTALL NEW GREEN INSULATED COPPER GROUNDING CONDUCTORS AS THE EQUIPMENT GROUNDING MEANS FOR ALL ELECTRICAL DEVICES AND EQUIPMENT.

2. ALL PANELBOARDS AND SWITCHBOARDS SHALL HAVE COPPER BUS, COPPER GROUND BAR, AND RATINGS AS SPECIFIED. REFERENCE STANDARDS SHALL BE GENERAL ELECTRIC "A" SERIES "PRO-STOCK" BRANCH PANELS AND SPECTRA SERIES DISTRIBUTION PANELS WITH BOLT IN TYPE CIRCUIT BREAKERS.

3. PROVIDE LABELING FOR ALL PANELBOARDS, SWITCHBOARDS, AND DISCONNECT SWITCHES TO INCLUDE AN ENGRAVED PLASTIC LABEL IDENTIFYING THE EQUIPMENT AND WHERE IT IS FED FROM.

   3.1. ALL BRANCH DEVICES IN THE MAIN SWITCHBOARD SHALL HAVE AN ENGRAVED PLASTIC LABEL.

   3.2. ALL PANELBOARDS SHALL INCLUDE A TYPEWRITTEN DIRECTORY. ALL RECEPTACLES SHALL HAVE CIRCUIT NUMBERS WRITTEN ON THE INSIDE OF THE COVERPLATE.

   3.3. ALL JUNCTION BOX COVERS SHALL BE IDENTIFIED TO INDICATE CIRCUITS CONTAINED. WHERE MULTIPLE SWITCHES ARE GANGED TOGETHER THE SWITCHES SHALL BE IDENTIFIED.

   3.4. PROVIDE (1) 3/4" SPARE CONDUIT FOR EACH 3 SPACES OR SPARES IN EACH FLUSH MOUNTED PANEL FROM PANEL TO ABOVE ACCESSIBLE CEILING FOR FUTURE USE.

4. ALL CONDUIT INSIDE THE BUILDING SHALL BE A ELECTRICAL METALLIC TUBING (EMT) AND SHALL BE A MINIMUM 1/2" UNLESS OTHERWISE NOTED. ALL CONDUIT INSTALLED UNDERGROUND SHALL BE SCHEDULE 40 PVC UNLESS OTHERWISE NOTED. ALL CONDUIT INSTALLED ABOVE GRADE OUTSIDE THE BUILDING SHALL BE GALVANIZED RIGID STEEL. NO PVC CONDUIT SHALL BE USED ABOVE THE FLOOR SLAB.

5. ALL ELECTRICAL CONNECTORS, LUGS, BREAKERS, EQUIPMENT, ETC. SHALL BE RATED AT A MINIMUM OF 75 DEG. C.

6. WIRING METHODS:

   ALL WIRING SHALL BE COPPER. NO ALUMINUM WIRING WILL BE ALLOWED.

   MC TYPE CABLE SHALL NOT BE USED.

7. SWITCHES SHALL BE 20 AMPERE RATED, 120/277 VOLT, LEVITON 1221-21 SERIES OR APPROVED EQUIVALENT, UNLESS OTHERWISE NOTED.
   7.1. SWITCHES CONTROLLING LIGHTING SHALL HAVE NEUTRAL CONDUCTOR.

8. RECEPTACLES SHALL BE 20A, 120V GROUNDING TYPE LIKE LEVITON T5820 SERIES, UNLESS OTHERWISE NOTED.
   8.1. RESIDENTIAL, TAMPER RESISTANT AS PER NEC 406.12
   8.2. WHITE IN COLOR
   8.1. PROVIDE GROUND FAULT CIRCUIT-INTERRUPTER (GFI) TYPE RECEPTACLE IF SHOWN OR AS REQUIRED BY NEC.

9. ALL COVERPLATES FOR INTERIOR WIRING DEVICES SHALL BE WHITE NYLON TYPE. DEVICES SHALL BE WHITE IN COLOR.

10. ALL EXTERIOR RECEPTACLES SHALL BE GFCI (GFI) TYPE AND HAVE IN-USE TYPE WEATHERPROOF COVERPLATES.

TVSS

PROVIDE AND INSTALL AT ALL SWITCHBOARD, DISTRIBUTION PANELBOARDS AND PANELBOARD LOCATION'S, TRANSIENT VOLTAGE SURGE SUPPRESSER'S (TVSS), FOR EACH SHOWN WITH THE FOLLOWING REQUIREMENTS: RATED AND TESTED FOR CATEGORY C (8 BY 20 MICROSECOND WAVE FORM) AS DEFINED BY ANSI/IEEE C62.41.
WITH SYSTEM VOLTAGE RATING: 120/208, & 277/480 (VERIFY VOLTAGES) 3 PHASE, 4 WIRE GROUNDED, 60HZ; PROTECTION MODES: EACH LINE TO NEUTRAL, EACH LINE TO GROUND, NEUTRAL TO GROUND,
MAXIMUM SURGE CURRENT CAPACITY (8 X 20 MICROSECONDS) FOR MULTIPLE OCCURRENCES: MINIMUM CAPACITY ALLOWED IS 160,000 AMPS PER PHASE FOR BRANCH PANELBOARDS AND 240,000 AMPS FOR SWITCHBOARDS AND DISTRIBUTION PANELBOARDS.
UL-1449 VOLTAGE SUPPRESSION RATING: L-N, 400, L-G = 400 AND N-G = 400 FOR 120/208 VOLT SYSTEMS, SUPPRESSION RATING: L-N, 800, L-G = 800 AND N-G = 800 FOR 277/480 VOLT SYSTEMS.
PROVIDE WITH INTEGRAL SURGE RATED FUSE ,THERMAL CUTOUT DEVICE, MODULE STATUS INDICATOR LIGHTS,
UNIT STATUS INDICATOR LIGHTS, AUDIBLE ALARM AND SILENCE SWITCH, AND TRANSIENT COUNTER, AND SHALL BE UL 1283 LISTED, AND COMPLY WITH UL 1449 2ND EDITION.
ACCEPTABLE MANUFACTURES: GE TRANQUELL, LEA, JOSLYN, INNOVATIVE TECHNOLOGY, AND SQUARE D SURGELOGIC. INTEGRATED OR EXTERNAL MOUNTED.

UPS SYSTEM:

PROVIDE AND INSTALL AN 80 KVA UPS SYSTEM EQUIVALENT TO: TOSHIBA 4200FA 80KVA XT TRANSFORMER/EXTERNAL BATTERY 480V INPUT/ 208-120V OUTPUT UPS SYSTEM. THE COUNTY REQUIRES A MINIMUM OF A 2 YEAR FULLY COMPREHENSIVE WARRANTY ON THE UPS SYSTEM. SEE THE MANUFACTURER'S SPECIFICATION IN THE REPORT. PROVIDE AND INSTALL ALL REQUIRED BATTERIES, ACCESSORIES, AN EXTERNAL BYPASS, ALL REQUIRED CONNECTIONS TO MAKE A COMPLETE UPS SYSTEM. MANUFACTURER'S REQUIREMENTS MAY VARY FROM THE PLANS. INSTALL THE UPS PER THE MANUFACTURER'S REQUIREMENT.

ATP ENGINEERING SOUTH, PL
BRADENTON, FLORIDA
ENGR. BUSINESS #8908
941-751-6485

DRAWING TITLE: 66TH STREET LAB
UPS STUDY
SPECIFICATIONS

DATE: 05/30/13

SHEET No.: E7.0

Example Manufacturer Specification for UPS system

(The UPS System will vary depending upon the manufacturer.)
Alternative products shall be equivalent to this equipment.

TOSHIBA International Corp

GUIDE SPECIFICATIONS
THREE PHASE UNINTERRUPTIBLE POWER SYSTEM

TOSHIBA 4200*FA*

80 kVA XT – Transformer / External Battery
480v Input / 208/120v Output

UPS GUIDE SPECIFICATIONS

(80 kVA XT1)

1.0 SCOPE

1.1 System

This specification describes a continuous duty, three-phase, on-line, solid-state uninterruptible power supply system, hereafter referred to as the UPS.

2.0 SYSTEM DESCRIPTION

2.1 Applicable Standards

The UPS shall be designed in accordance with and be compliant with the following sections of the current revisions of the following standards:

ANSI C62.41 (IEEE 587) – Standard for Surge Withstandability
UL 1778 (CUL)
National Electrical Code (NFPA-70)
NEMA PE-1
OSHA
ASME
ISO 9001, 14001

2.2 Components

The UPS shall consist of the following components:

A. Converter

B. Chopper / Charger

C. Pulse-Width Modulated (PWM) Inverter

D. Static Switch Bypass

E. Microprocessor Controlled Logic and Control Panel

F. Input Circuit Breaker

G. Battery System

2.3 System Operation

The UPS shall operate as an on-line, fully automatic system in the following modes:

A. NORMAL - Incoming AC power is boosted using a chopper circuit, and converted into DC power. The DC power is then used to charge the battery bank while at the same time providing clean, DC power to the inverter circuitry. The inverter converts DC power to regulated AC power which feeds the load.

B. EMERGENCY - Upon failure of commercial AC power, the UPS shall derive power from the battery bank and continue feeding the load with clean, regulated AC power. There is no interruption to the critical load upon failure or restoration of commercial AC power.

C. RECHARGE - Upon restoration of the commercial AC source, the rectifier/chopper powers the inverter while simultaneously recharging the battery bank. The UPS shall have the following recharge process:

a) a constant level of current is used to recharge the batteries (the process shall utilize a current-limit function to prevent overcharging batteries, thus extending the life of the batteries)
b) as the batteries reach the normal charge level, a constant-voltage control shall begin which causes the battery recharge current to gradually decrease
c) Under normal operation, the UPS battery bank "floats" at the 2.25-2.27 volts per cell DC level to stay fully charged and ready for the next discharge.

D. BYPASS MODE - Upon detection of an internal fault or output overload, the UPS shall automatically switch from inverter power to an internal bypass via the static switch. Transfer shall be within 4 milliseconds, causing no interruption to the critical load. While in bypass, the UPS shall protect against spikes and common/normal mode noise by utilizing a dual-winding output isolation transformer. “Return from Bypass mode” shall be an automatic function, without interruption to the critical load. Transfer to Bypass may also be performed as a manual operation via the UPS front panel.

E. POWER CONDITIONING MODE - Should the batteries be removed from the UPS, the UPS shall continue to function and still provide protection against spikes, common/normal mode noise, load steps and frequency shifts (without battery back-up capability).

3.0 SYSTEM PARAMETERS

A. UPS Input

1) Input Voltage	480VAC
2) Input Voltage Requirement	3 Phase, 3 Wire + Ground
3) Voltage Variation	+10% to -30%
4) Rated Frequency	50/60 Hz
5) Frequency Range	45 - 65 Hz
6) Power Factor	> 0.98 lagging
7) Input Capacity	110% of UPS Output Capacity
8) Walk-In Function	From 20% to 100% over 5 seconds
9) Input Current Limit	125% of nominal capacity
10) Inrush Current	< 600% under synchronous condition
11) Input Current THD	< 3% Total Harmonic Distortion (THD)
12) Surge Withstandability	Meets ANSI C62.41 (IEEE 587)
13) Input Phase Rotation (Protection/Detection)	Standard front-panel alarm panel shall notify user that unit has been supplied with incorrect phase rotation on input to allow for correct installation. The UPS shall be fully protected to prevent damage from this event.

B. UPS Output

1) Rated Voltage	208/120VAC
2) Output Voltage Requirements	3 Phase, 4 Wire + Ground
3) Output Capacity	80 kVA
4) Rated Load Power Factor	0.8 lagging
5) Voltage Regulation	+/- 2% nominal (balanced load) +/- 3% nominal (unbalanced load)
6) Voltage Adjust. Range	+/- 5% manually (by front panel user interface)
7) Phase Displacement	+/- 2 deg. (balanced load) +/- 4 deg. (100% unbalanced load)
8) Rated Frequency	50/60 Hz (jumper selectable)
9) Frequency Regulation	+/- 0.01% free running
10) Frequency Synch. Range	+/- 0.5/1.0/1.5 Hz (+/- 1.0 Hz Standard) User selectable
11) Frequency Slew Rate	1.0 Hz/second to 3.0 Hz/second
12) Voltage Transients	+/- 5% (100% step load change) +/- 3% (loss or return of input power) +/- 8% (bypass to inverter)
13) Transient Voltage Recovery	50ms maximum to within 2% of nominal

14) Overload Cap. (on inverter)	125% for 90 sec., 150% for 30 sec.
15) Overload Cap. (on bypass)	1000% for 10ms, 125% for 10 min.
16) Crest Factor	3.0
17) Harmonic Voltage Distortion	1.5% THD maximum, 1% maximum for any single harmonic (linear load)
18) Inrush Current Protection	Automatic transfer to bypass, then auto-return to inverter (retransfer may be inhibited by jumper)
19) Output Overcurrent	Hall-Effect Current Transformer and Fusing

C. Batteries

1) a. Battery Type: Sealed, Valve Regulated Lead Acid cells
b. Flooded Type: Wet Cell Jars
2) Protection Time: 10 minutes to 40 hours back-up time @ 80 kVA

3) DC Voltage Range:

UPS Capacity	80 kVA
Nominal Voltage	288 VDC
Alarms Voltage(V low)	252 VDC
Shutdown Voltage (V min)	216 VDC

4) Ripple Voltage: 2% RMS maximum

D. Environmental

1) Efficiency: 90% (AC/AC); 91% (DC/AC)
2) Operating Temperature: UPS: 32 to 104° F (0 to 40° C)
Battery: 68 to 77° F (20 to 25° C)
3) Storage Temperature: UPS: -4 to 140° F (-20 to 60° C)
Battery: prolonged storage above 104° F (40° C) causes rapid battery degradation
4) Relative Humidity: 30-90% (non-condensing)
5) Audible Noise: ~63 dB ('A' scale @ 1 meter
6) Altitude: < 6,000-ft. maximum (< 2,000 m)

4.0 FUNCTIONAL DESCRIPTION

A. Converter / Charger / DC Chopper

DESCRIPTION - The converter/charger shall consist of a solid-state three phase rectifier, DC to DC converter (chopper), output filter, and transient suppresser network to regulate and maintain DC power to the inverter.

1) TRANSIENT SUPPRESSER - The incoming AC utility shall first be connected to a molded case circuit breaker as a means of disconnecting power to the UPS. Power shall flow through a surge absorber to prevent large transients from passing through to the load or damaging the batteries. Power shall then flow through a line filter to prevent sags or surges from passing to the load.

2) CONVERTER/CHARGER - The converter shall serve to change incoming AC power to DC, which shall be supplied to the DC chopper. From this point, DC power is used to recharge the battery bank while simultaneously providing power to the inverter.

a) Input Frequency Range: 45-65 Hz, continuous, without battery operation
b) Capacity: Battery recharge shall be to within 90% of nominal from a fully discharged state in 10 times the discharge time.

3) DC CHOPPER - The chopper circuit shall consist of inductors, capacitors, diodes and IGBT's (Insulated Gate Bipolar Transistors). The chopper shall have the function of providing start-up protection (by checking phase rotation of incoming utility power), boosting the DC to the inverter (during low AC input voltage conditions), providing power factor enhancement, and reducing reflected harmonics to incoming utility power.

B. Pulse Width Modulated (PWM) Inverter

DESCRIPTION - The PWM (Pulse Width Modulated) inverter shall incorporate an advanced IGBT design, an output isolation transformer, and output overcurrent protection for clean, regulated output power to the critical load.

1) INVERTER - The inverter network shall consist of a high speed IGBT switching network designed to supply non-linear loads with a clean and steady voltage waveform. The inverter switching speed shall be fast enough to limit audible noise to 63 dBA at 3 feet (measured on 'A' scale).

2) INPUT ISOLATION TRANSFORMER - The inverter network shall incorporate a shielded isolation transformer to provide complete isolation of the load from utility AC, as well as providing attenuation for high frequency noise common mode). Additionally, the transformer shall have a set of windings to condition the internal static bypass line.

3) OVERCURRENT PROTECTION - The output circuitry shall be equipped with a Hall Effect Current Transformer to detect and protect the inverter from excessively high currents.

C. Static Bypass Switch

1) TRANSFER - The static bypass switch shall consist of thyristor switches in conjunction with an output contactor to permit manual switching from bypass to UPS and UPS to bypass without power interruption. The UPS shall instantaneously transfer to bypass should a component fail during normal operation (provided the UPS and bypass are in synchronization). Auto-retransfer to UPS after an overload condition shall be completed within one second after the bus has dropped to 100% of nominal.

2) REMOTE RUN/STOP - A set of normally open dry contacts shall be provided to remotely transfer the UPS on-line and off-line. When the UPS is in this mode of operation, the UPS front control panel shall be disabled to provide a secured configuration.

D. Microprocessor Control System

1) DESCRIPTION - The UPS system shall be provided with a highly reliable microprocessor internal control system to perform start-up, transfers, monitoring, and battery recharging. The microprocessor shall provide important information to the user (via a liquid crystal display) with such as system status, fault messages and input and output parameters.

2) LED INDICATORS - The following LED indicators shall be provided on the UPS front panel displays, which mimic power flow through the UPS:

a) AC INPUT (Green Lamp) - Lights when normal AC input power is being supplied to the unit.
b) INVERTER (Green Lamp) - Lights when the UPS unit's inverter is normal.
c) BATTERY (Green Lamp) - Lights when the batteries are discharging: flickers when the battery voltage is below minimum.
d) BYPASS (Green Lamp) - Lights when in circuit-bypass mode.
d) FAULT (Red Lamp) - Lights when a fault has been detected.

See "System Diagnostics" for specific fault.

3) SYSTEM METERING - The UPS shall be provided with a single read-out display which displays, upon request, the following information:

AC INPUT VOLTAGE (Line to Line)
AC OUTPUT VOLTAGE (Line to Line, Line to Neutral)
AC OUTPUT CURRENT
BATTERY VOLTAGE
BATTERY CHARGING CURRENT
INPUT FREQUENCY
OUTPUT FREQUENCY
INPUT/ OUTPUT kW
POWER FACTOR

4) SYSTEM DIAGNOSTICS - The following diagnostic information shall be provided to troubleshoot the UPS should a fault occur:

UPS Ok
Memory Error
Wrong Phase Rotation of AC Input
Internal AC Circuit Fault
Internal DC Circuit Fault
Heatsink Overheat
DC unbalanced
DC Circuit Over/Under voltage
DC Circuit Overcurrent
Chopper Input Overcurrent
Inverter Overcurrent
Inverter Over/Under voltage
Inverter Overload
UPS Overload (including Bypass)
Inverter Output Current Limit
Low Battery Voltage
I/O not Synchronized
Auto-transfer Mode
Fuse Open
Battery Discharging Mode
UPS Output Disabled

5.0 MECHANICAL DESIGN

A. UPS Enclosure

The UPS shall be in a freestanding, NEMA1 enclosure. The overall dimensions and weights shall be as follows:

UPS Size	Dimensions	Weight
80 kVA	44.0"W x 31.0"D x 74.0"H	2,200 lbs.

B. Battery Enclosure

The battery cabinet shall consist of a freestanding, NEMA1 enclosure. The maximum overall dimensions and weights shall be as follows:

UPS Size	Dimensions	Weight	Runtimes
80 kVA	30"L x 32"W x 59.8"H	~1,832 lbs.	4-15 Min
	60"L x 32"W x 59.8"H	~3,650-5,543 lbs.	18-40 Min

C. Cable Entry

The UPS shall be provided with cable entry from the top and bottom of the UPS enclosure.

D. Ventilation and Maintenance Requirements

The UPS shall require the following minimum space for ventilation and maintenance: 28" (front), 18" (top), 0" (rear), and 0" (side).

6.0 STANDARD FEATURES

A. Emergency Power Off (EPO)

Emergency Power Off (EPO) terminals which trip open the UPS and battery circuit breakers.

B. RS232 Communication Interface

Serial data link will enable the UPS to interface with a computer to provide power status and diagnostic information.

C. DB9 Dry Contact interface

The following normally open dry contacts shall be provided through a DB9 male connector located inside the front door:

1) UPS On
2) Bypass Active
3) Input Power Loss
4) Battery Voltage Low

D. Battery Test Function

The UPS shall be provided with a "Battery Test" pushbutton to periodically check the condition of the batteries. Upon detection of a battery problem, the UPS shall notify the user of this condition allowing the user to perform a detailed check of the battery string.

7.0 SERVICE AND WARRANTY

A. Reliability

System mission reliability 240,000** hours and including bypass MTBF (Mean-Time-Between-Failure) shall be in excess of 3,000,000**hours.

B. Maintainability

Calculated and demonstrated MTTR (Mean-Time-To-Repair) shall be 30 minutes including time to diagnose the problem and replace subassembly.

C. Warranty

The UPS system shall be provided with a comprehensive three-year on-site warranty (**when purchased with a Factory-Authorized Start-up**). The warranty shall cover parts, labor, travel and freight for the UPS. The battery system has a full 2 year warranty with 8 years prorata total of 10 years warranty. Typical on-site response time shall be 4 hours (24 hours maximum). The warranty period shall expire three years for UPS and two years for the battery system from date of shipment from manufacturer's facility.

*Specification subject to change without notices.
**Times are accurate provided normal Preventative Maintenance procedures are followed.

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Lindberg® Blue M® Deluxe Oven

Thermo Scientific Lindberg Blue M Ovens deliver the advanced performance, innovative functionality and superior accuracy required for a host of demanding applications – from chemical and pharmaceutical to electronics and automotive.

Featuring programmable controls and sophisticated functionality, our Lindberg Blue M deluxe ovens are ideal for highly sensitive drying and heating processes that require temperature sequences and exceptional accuracy with a temperature range from 50°C to 325°C.

Not available in Europe.

Models

71L [-] Hide Specifications

Attributes	
Internal Depth	18 in
Internal Height	13.5 in
Internal Width	18 in
Oven Orientation	Bench / Cabinet
Oven Type	Mechanical Convection
Number of Shelves	2 - 5
Chamber Volume	71 L
Shipping Dimensions	30
Shipping Weight	115 lbs
Temperature Range	50 to 325 °C
Construction	Stainless Steel
Depth	23.5 in
Height	26 in
Width	25.8 in
Power Requirements	120 V, 15 A
Peak Power	1800 W
Additional Specifications	**Temperature uniformity at 200°C:** ±2°C **Temperature sensitivity:** ±0.25°C **Recovery time to 200°C:** 1.5 minutes with 1 minute door opening **Max air changes:** 61/hour **BTU output:** 2650 All units are UL and cUL approved.

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Optima 7300 V ICP-OES

Oils Version

System configurations	SCD detector(s)	Cross-disperser(s)	Wavelength range
Optima 5300V	dual	dual	163-782 nm

Spectrometer specifications

Polychromator

The high-energy (f/6.7) echelle-based Optima™ polychromator utilizes two SCD detectors. The measured resolution of the system is 0.006 nm at 200 nm. The 80 by 160 mm echelle grating has 79 lines per mm and a blaze angle of 63.4 degrees. With the Optima 7300 V, a 60-degree fused-quartz prism is used as the cross disperser for the visible region (403-782 nm). The UV disperser incorporates Schmidt correction to eliminate aberration for the 400-mm radius camera sphere.

The entire optical system is enclosed in a purged and thermostatted optical enclosure. The optical enclosure is mounted on the same large optical bench as the sample introduction system. The optical bench is shock-mounted to the frame of the instrument so that normal floor vibrations do not affect system performance.

Plasma viewing

The Optima 7300 V comes standard with a classic, vertically-oriented radial-view torch. Viewing of the plasma is accomplished by computer control of a mirror located in the optical path and allows adjustment of the plasma viewing in the vertical plane. The software can optimize the viewing position.

Shutter and Hg recalibration system

The computer-controlled, pneumatically operated shutter automatically opens and closes for each sample. By closing the shutter between each sample, the first transfer mirror is protected from long exposures to the intense UV radiation of the plasma, thus extending the useful lifetime of the mirror. A mercury lamp is built into the shutter mechanism and can be viewed when the shutter is closed to monitor the mercury emission line at 253 nm and automatically update the system wavelength calibration. Frequency of the automatic recalibration is user-selectable between 0 and 1000 minutes and can be varied during an autosampler analysis.

Detectors

The patented PerkinElmer® segmented-array charge-coupled device (SCD) detectors (U.S. Patent No. 4,820,048) consist of 235 addressable subarrays, covering approximately 6000 wavelengths on a 13 by 19 mm silicon substrate. Typical readout noise is about 13 electrons RMS; dark current is less than 100 electrons/pixel/second; and readout speed is 50 µsec/pixel. Correlated double-sampling data-acquisition electronics further reduce electronic noise.

ICP system specifications

RF generator

The Optima 7300 V ICP-OES features a second-generation 40-MHz, free-running solid-state RF generator, adjustable from 750 to 1500 watts, in 1-watt increments. The power efficiency is greater than 81% with < 0.1% variation in output-power stability. The compact RF supply meets all FCC certification requirements for RF emission (Part 18 of FCC rules and regulations). It also complies with EC and VDE 0871 Class B requirements.

Ignition and power control	Plasma ignition is computer-controlled and totally automated. A unique software feature allows the plasma to be ignited automatically at a user-determined time and turned off automatically after an analysis. True Power Control maintains the plasma power at the set point, even when changing sample matrices.
Safety interlocks	For user safety and system protection, the system constantly monitors water flow, cooling gas pressure, argon pressures, sample-compartment door closure and plasma stability and displays the interlock status on the computer screen as graphic symbols. If an interlock is interrupted, the plasma will shut down safely and automatically.
Cooling water	A water-recirculating cooling system is required, with approximately 4 L/min flow capacity at 310 to 550 kPa and a temperature between 15 °C and 25 °C.

Gas flow controls

Argon flow	Computer-controlled solenoid valves are used to regulate the flow automatically within the range of 0-20 L/min in 1 L/min increments for plasma argon and 0 to 2.0 L/min in 0.1 L/min increments for auxiliary argon. A mass-flow controller is supplied with all systems for the nebulizer argon flow and is variable between 0 and 2.0 L/min in 0.01 L/min increments.

Sample introduction system

Torch	A unique demountable torch design using one-piece quartz tubing for plasma and auxiliary gas flow is supplied. The 1.2 mm alumina injector is recommended and supplied for oils analysis. A variety of other injectors is available.
Torch mount	The Optima 7300 V ICP-OES system features a unique internally mounted spray chamber on a quick-disconnect torch mount assembly. The mount can be adjusted for maximum performance in different matrices. No tools are required for torch or sample introduction removal.
Spray chamber	The glass baffled-cyclonic spray chamber is recommended and supplied for oil analysis.
Nebulizers	The Optima 7300 V Oils Version is supplied with a low-flow GemCone™ nebulizer. A variety of nebulizers is also available including high- and low-flow concentric types, high-flow GemCone types and a high-sensitivity MiraMist® design.
Peristaltic pump	A three-channel, computer-controlled pump is built-in with speeds variable from 0.2 to 5 mL/minute in 0.1 mL/min increments, using 0.76 mm (0.030 in.) i.d. tubing. Software features, including FastPump™ and SmartRinse™, dramatically improve the sample rinse-out and analysis time.
Spares kit	A spares kit of common replacement items is included.

System specifications

Power	One 200-240 V, 20A line, single phase, 50/60 Hz
Dimensions	150 × 76 × 89 cm (W × H × D), 200 kg
Environmental	The instrument will operate with a laboratory temperature between 15 and 35 °C (59-95 °F). For optimum instrument performance, the room temperature should be controlled at 20 ±2 °C.

PerkinElmer, Inc.
940 Winter Street
Waltham, MA 02451 USA
Phone: (800) 762-4000 or
(+1) 203-925-4602
www.perkinelmer.com

PerkinElmer®

For a complete listing of our global offices, visit www.perkinelmer.com/lasoffices

007013B_03

AAnalyst 700 and AAnalyst 800 Atomic Absorption Spectrometers

Specifications

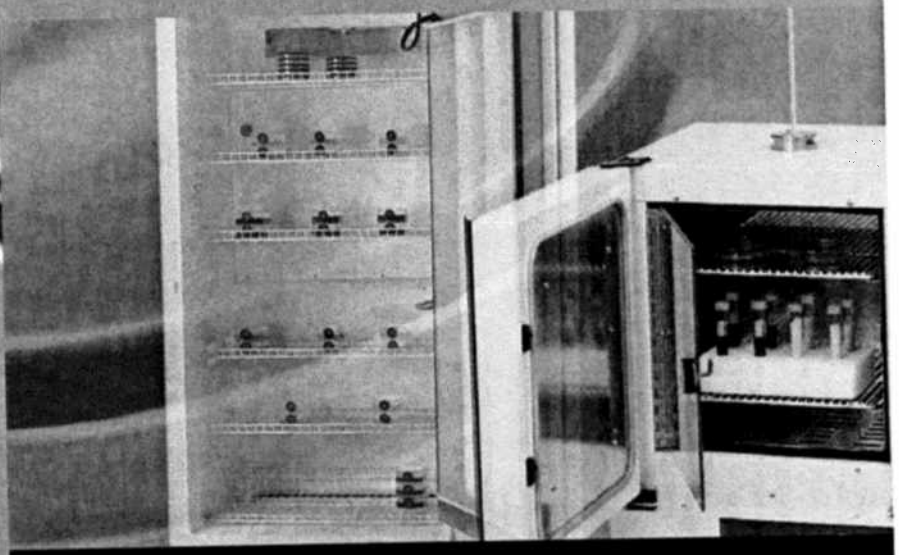
System	**Design:** The AAnalyst™ 700 and AAnalyst 800 are the first fully-integrated benchtop design atomic absorption spectrometers, incorporating all spectrometer, flame and graphite furnace components in a single instrument, offering fully automated exchange of flame and furnace atomizers at the touch of a button.
Optical System	**Photometer:** Real-time double-beam optical system (single-beam for Zeeman furnace operation with the AAnalyst 800). Front-surfaced, reflecting optics with protective coating. Optical system sealed within protective cover. **Monochromator:** Littrow design with motorized drive for automatic wavelength selection and peaking. Wavelength range: 190 - 870 nm. Diffraction grating: 1800 lines/mm blazed at 236 nm and 597 nm. Grating area: 64 x 72 mm. Reciprocal linear dispersion: 1.6 nm/mm (nominal). Focal length: 267 mm. Spectral bandwidths: 0.2, 0.7 and 2.0 nm, dual height; motorized slit drive for automatic slit selection. **Detector:** Wide-range segmented solid-state detector, including a built-in low-noise CMOS charge amplifier array. **Automatic Lamp Selection:** 8-lamp holder with built-in power supplies for hollow cathode and electrodeless discharge lamps. Computer-controlled lamp selection and alignment via AA WinLab™ software. Lamp elements and recommended operating currents are automatically recognized and set when using Perkin-Elmer Lumina™ hollow cathode lamps.
Flame System	**Gas Controls:** Fully computer-controlled with oxidant and fuel monitoring. Keyboard-actuated remote ignition system with air-acetylene. Acetylene flow is automatically adjusted prior to the oxidant change when switching to or from nitrous oxide-acetylene operation. TotalFlow™ control of the oxidant and fuel gases for constant fuel:oxidant ratio. **Safety Functions:** Interlocks prevent ignition if the proper burner head, the nebulizer/end cap, or the burner drain system is not correctly installed; the liquid level in the drain vessel is incorrect; or gas pressures are too low. Interlocks also will automatically shut down burner gases if a flame is not detected, or if any of the other interlock functions are activated. Provision is included for safe shutdown from all operating modes in the event of a power failure. **Burner System:** Premix burner design that can be moved automatically into the sample compartment via software control and a motorized carriage. Alignment of the flame in the light beam is fully automatic, using a motorized burner mount for vertical and horizontal burner adjustment and automatic software-controlled self-optimization of the burner position. The burner is equipped with a high-strength inert mixing chamber, angled to ensure proper drainage. Includes adjustable Universal GemTip™ corrosion-resistant nebulizer and an all-titanium, 10-cm, single-slot burner head for air-acetylene operation.
Background Correction	**AAnalyst 700:** Continuum source double-beam background correction using a high-intensity deuterium arc lamp. **AAnalyst 800:** Longitudinal AC Zeeman-effect background correction using a modulate 0.8 Tesla magnetic field oriented longitudinal to the optical path. The magnet is automatically switched on during the atomization step only. Rollover detection is built-in. Also built-in is continuum source double-beam background correction for uses with flame operation.
Graphite Furnaces	**AAnalyst 700:** Built-in fully computer-controlled Heated Graphite Atomizer (HGA™). **AAnalyst 800:** Built-in fully computer-controlled Transversely Heated Graphite Atomizer (THGA™). The graphite tube is transversely heated providing a uniform temperature profile over the entire tube. **AAnalyst 700 and 800:** The graphite furnace can be moved automatically into the sample compartment and positioned via software control and a motorized carriage. An external protective gas stream around the graphite tube prevents the entrance of outside air to maximize tube life. An internal purge gas goes through the graphite tube to remove the volatilized matrix vapors during drying and thermal pretreatment. The two gas streams are computer-controlled independently. Pneumatic opening and closing of the furnace for easy tube change.
Common Furnace Features:	**Program Flexibility:** Analytical programs with up to 12 steps can be set up. Each step can be programmed with the following parameters: ***Temperature:*** Ambient up to 2600°C (up to 3000 °C with AAnalyst 700) in steps of 10 °C. ***Ramp Time:*** 0 to 99 s in steps of 1 s. ***Hold Time:*** 0 to 99 s in steps of 1 s. ***Internal Gas Flow:*** 0 mL/min (gas stop), 50 mL/min (mini-flow), 250 mL/min (full flow); can be switched over to another type of gas (Alternate Gas). ***Furnace Opening and Closing:*** Pneumatically-operated by software command.

	Required Inert Gas: Argon. inlet pressure 300 kPa (3 bar) minimum. Maximum gas consumption is 700 mL/min with the AAnalyst 800, 1220 mL/min with the AAnalyst 700. **Water Coolant**: A circulatory cooling system is included with the AAnalyst 800, optional for the AAnalyst 700. When operating the AAnalyst 700 without the circulatory cooling system, cooling water meeting the following specifications should be used: Sediment-free drinking water; 20-40 °C; flow rate not less than 2 L/min; pressure between 2.5 and 4.5 bar; pH between 6.5 and 7.5; hardness not greater than 14°dH or 100 ppm.
Furnace Autosampler	Sampler Table: Installed in front of the furnace unit. Removable sample tray with 88 and 146 sampling positions for sample and reference solutions and 1 overflow container for pipet washing. Minimum sample requirement: Ca. 0.1 mL. **Dispensable Volume:** Sample and Reagent: 1...99 µL, selectable in increments of 1 µL. Max. dispensable Vol. 99 µL (sample volume + reagent volume). Flushing volume 1.3 mL, fixed. **Electronics:** The autosampler is powered from the spectrometer and is software-controlled.
Data Control System	Complete PC control using AA WinLab software operating under the Microsoft® Windows 95® operating environment. Provides complete control of the instrument and its major accessories plus data handling and storage. **Data Handling:** Instrument readings linear in absorbance (-0.500 A to +2.000 A), concentration or emission intensity with continuously variable scale expansion from 0.01 to 100 times. Integration times operator-selectable from 0.1 to 60 sec. in increments of 0.1 sec. Reading modes include time-averaged integration, non-averaged integration (peak area), and peak height measurement. Includes built-in statistics. Up to fifteen (15) standards and a choice of proven calibration equations. Reslope of the analytical curve using a single operator-selected calibration standard. Built-in IEEE-488 interface for computer connection and use of optional accessories. **Minimum PC Configuration:** Intel® Pentium® processor; 90 MHz; 16 MB RAM; 1 serial, 1 parallel (bidirectional) interfaces; 500 MB hard disk drive; 3.5" disk drive; CD-ROM drive; SVGA graphics board and compatible monitor; mouse pointer; MS Windows 95. A compatible printer is required for hard copy data display.
Dimensions	**AAnalyst 700 or 800:** 110 cm wide x 65 cm high x 70 cm deep (104 cm deep with furnace autosampler).
Weight	**AAnalyst 700:** 147 kg (without controller and cooling system). **AAnalyst 800:** 187 kg (without controller and cooling system).
Power Requirements	230 V (+5%/-10%), 50/60 Hz; 3600 VA (AAnalyst 700) or 5000 VA (AAnalyst 800). **Electrical Protection:** As defined in EN 61010-1-1993 (IEC 1010-1); insulation class I; insulation category (overvoltage category) II; pollution degree 2.
Technical Standards	**Certification:** Designed and tested to be in compliance with the legal requirements for technical instruments including IEC 348 and VDE 0411 and CSA 22.2 No. 151 and the U.S. Federal Communications Commission standards for radio frequency interference. Also complies with German legal requirements for radio interference suppression (better than grade A/0871). The instrument is developed and produced in compliance with ISO 9001. The AA WinLab software provides required control parameters for GLP and instrument performance validation. **Safety and EMC standards:** EN 61010-1-19993 (IEC 1010-1: 1990 + A1, A2, modified). Electromagnetic compatibility: EN 50 081-1:92 for emission, EN 50 082-1:92 for immunity.
Environmental Requirements	Ambient temperature: +15 °C to +35 °C. Relative humidity: 20 to 80% non-condensing.
Cooling System	Self-priming recirculatory system with fan-assisted heat exchanger (standard with the AAnalyst 800, optional with the AAnalyst 700) for constant cooling of the graphite furnace. Water temperature during operation approx. 36 °C; water flow 2.5 L/min. **Power requirements:** 230 V (+5%/-10%), 50/60 Hz; approx. 140 VA. **Dimensions:** 20 cm wide x 375 cm high x 50 cm deep, 18 kg with coolant.

PERKIN ELMER

The Perkin Elmer Corporation 761 Main Avenue, Norwalk, CT 06859-0010, USA, Tel: 1-800-762-4000 or 203-762-1000, Fax: 203-762-6000.
Bodenseewerk Perkin-Elmer GmbH, Postfach101761, D-88647 Überlingen, Germany, Tel: (07551) 810, Fax: (07551) 1612,
Internet: http://www.perkin-elmer.com

Order No. D-5385 **B050-4431A/11.97**



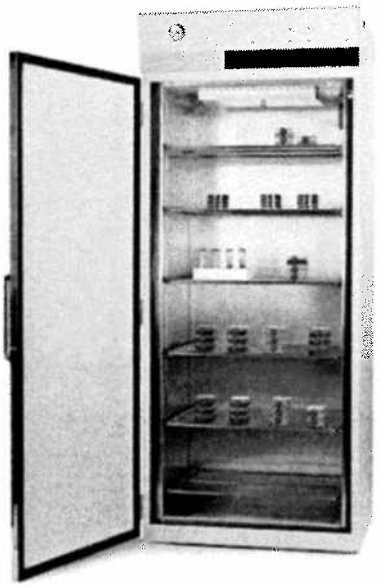
Thermo Scientific Precision Incubators

A wide range of incubators to fit your laboratory needs

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

Thermo Scientific Precision incubators fit all your needs



With more than twenty models to choose from, you're sure to find a Precision incubator to match your needs. Even our smallest and lowest priced incubators come with an inner glass door as standard equipment so as not to sacrifice the integrity of your important samples.

For applications that require temperatures at room temperature or lower, Precision offers three refrigerated incubators. These incubators provide excellent uniformity and sensitivity to protect your valuable samples.

Applications

	Economy	Thelco	High Performance	Model 30M	Models 815, 818, 30MR
Antibody Testing		■	■		
BOD Determinations					■
Bacterial Research	■	■	■	■	■
Chemical Storage		■	■	■	■
Coliform Determinations	■	■	■	■	■
Crystallization Studies	■	■	■		
Curing	■	■	■	■	■
Drying and Staining Procedures	■	■	■	■	■
Entomological Studies					■
Enzyme Digestion Studies	■	■	■	■	■
Hematological Testing	■	■	■	■	■
Histochemical Procedures	■	■	■	■	■
Microbiological Determinations	■	■	■	■	■
Paraffin Embedding	■	■			
Pharmaceutical Stability Testing		■	■		
Plant Growth Studies					■
Sample Storage		■	■	■	■
Seed Germination Studies					■
Serum and Enzyme Tests		■	■	■	■
Tissue Culturing	■	■	■	■	■

Thermo Scientific Precision Economy Incubators

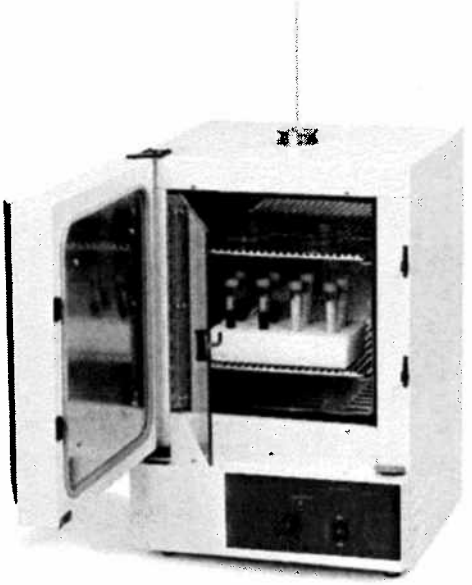
Features:
- Broad temperature range
- Excellent temperature control
- Small footprint, large capacity
- Simple to maintain
- All models UL listed

Performance you can depend on... at a price you can afford
These value-packed incubators are easy on your wallet... yet provide the full featured performance you need for most incubation applications.

Precision Economy Incubators are available in five different models. Choose mechanical or gravity convection; capacities of 1.4 cu. ft. (40 liters), 2.5 cu. ft. (71.5 liters), or 4.5 cu. ft. (129 liters). All feature corrosion-resistant stainless steel interiors; easyclean, non-tip shelving; and tough powder coated exteriors.

Equally important, Precision Economy Incubators combine a wide temperature range with excellent temperature sensitivity, stability, and uniformity.

Precision Economy Incubators are also designed to help you conserve precious bench space. Plus they are ready to go upon delivery, just unpack and plug it in! No calibration required.



Precision 2EG Economy Incubator

Specifications

Model	**2EG**	**3EG**	**5EG**	**3EM**	**5EM**
Chamber Volume	1.4 cu. ft. (40 liters)	2.5 cu. ft. (71.5 liters)	4.5 cu. ft. (129 liters)	2.5 cu. ft. (71.5 liters)	4.5 cu. ft. (129 liters)
Convection Technique	Gravity	Gravity	Gravity	Mechanical	Mechanical
Temperature Control	Hydraulic	Electronic	Electronic	Electronic	Electronic
Temperature Display	0 to 100 °C	0 to 100 °C	0 to 100 °C	0 to 100 °C	0 to 100 °C
	Thermometer	Thermometer	Thermometer	Thermometer	Thermometer
Temperature					
Range	Ambient +5 °C to 65 °C	Ambient +5 °C to 65 °C	Ambient +5 °C to 65 °C	Ambient +5 °C to 65 °C	Ambient +5 °C to 65 °C
Uniformity @37 °C	± 1.5 °C	± 1.0 °C	± 1.0 °C	± 0.75 °C	± 0.75 °C
Stability	± 0.5 °C	± 0.5 °C	± 0.5 °C	± 0.5 °C	± 0.5 °C
Sensitivity	± 0.3 °C	± 0.3 °C	± 0.5 °C	± 0.5 °C	± 0.5 °C
Dimensions (L x W x H)					
Chamber	14 x 12.5 x 13.75 in.	15.5 x 18.5 x 15 in.	15.5 x 18.5 x 27 in.	15.5 x 18.5 x 15 in.	15.5 x 18.5 x 27 in.
	(35.6 x 31.7 x 34.9 cm)	(39.4 x 47.0 x 38.1 cm)	(39.4 x 47.0 x 68.6 cm)	(39.4 x 47.0 x 38.1 cm)	(39.4 x 47.0 x 68.6 cm)
Shelf (each)	13.5 x 12.5 in.	15.5 x 18 in.	15.5 x 18 in.	15.5 x 18 in.	15.5 x 18 in.
	(34.3 x 31.75 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)
Exterior [1]	19.5 x 18 x 28 in.	21.5 x 24 x 28 in.	21.5 x 24 x 40 in.	21.5 x 24 x 28 in.	21.5 x 24 x 40 in.
	(49.3 x 45.7 x 71.1 cm)	(54.6 x 61.0 x 71.1 cm)	(54.6 x 61.0 x 101.6 cm)	(54.6 x 61.0 x 71.1 cm)	(54.6 x 61.0 x 101.6 cm)
Electrical Specs (50/60 Hz):					
120 V	100 Watt, 0.8 Amps	125 Watt, 1.1 Amps	150 Watt, 1.3 Amps	200 Watt, 1.7 Amps	225 Watt, 2.0 Amps
230 V	100 Watt, 0.4 Amps	125 Watt, 0.6 Amps	150 Watt, 0.7 Amps	200 Watt, 0.9 Amps	225 Watt, 1.0 Amps
BTU Output	341	427	512	683	768
Net Weight	72 lbs. (32.6 kg)	102 lbs. (46.2 kg)	132 lbs. (59.9 kg)	112 lbs. (50.8 kg)	142 lbs. (64.4 kg)
Shelves [2]	2 supplied/5 max	2 supplied/6 max	2 supplied/10 max	2 supplied/6 max	2 supplied/10 max
Shipping Information					
Dimensions (L x W x H)	24 x 23 x 30 in.	25 x 26 x 31.5 in.	25 x 26 x 43.5 in.	25 x 26 x 31.5 in.	25 x 26 x 43.5 in.
	(61.0 x 58.4 x 76.2 cm)	(63.6 x 66.0 x 80.0 cm)	(63.6 x 66.0 x 80.0 cm)	(63.6 x 66.0 x 80.0 cm)	(63.6 x 66.0 x 110.5 cm)
Weight	82 lbs. (37.2 kg)	126 lbs. (57.1 kg)	157 lbs. (71.2 kg)	136 lbs. (61.7 kg)	167 lbs. (75.8 kg)
Volume	9.8 cu. ft. (0.28 cu. meter)	11.7 cu. ft. (0.33 cu. meter)	16.3 cu. ft. (0.46 cu. meter)	11.7 cu. ft. (0.33 cu. meter)	16.3 cu. ft. (0.46 cu. meter)
Catalog Number					
120 V (UL listed)	3520	3522	3524	3526	3528
230 V [3]	3521	3523	3525	3527	3529

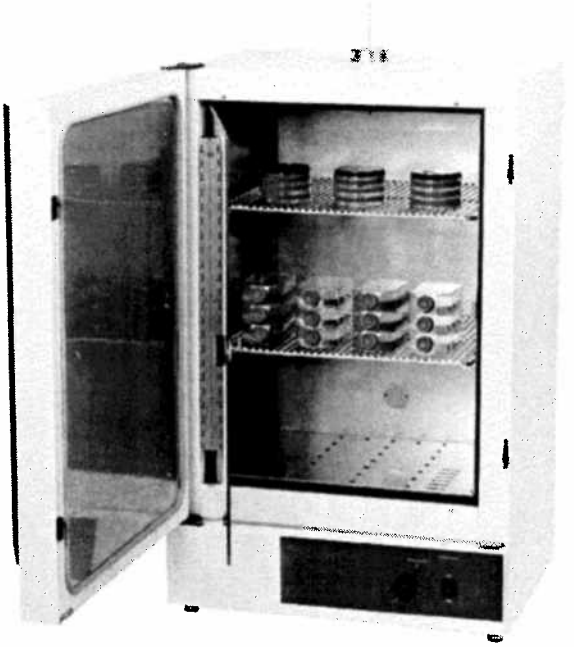
[1] Exterior height includes vent cap and adjustable feet. [2] Spacing between shelves is 2 in. (50mm). [3] 50/60 Hz

Thermo Scientific Precision Thelco Incubators

Features:

- Convenient rear access port for auxiliary equipment
- Built-in calibration capability
- Convenient jack for external chart recorder equipment
- Double-latched outer door
- Fully gasketed inner glass door
- Top vent for more efficient air venting in tight spaces
- RS-232 capabilities
- UL Listed (120 V)

Precision Thelco Incubators are designed to provide the precise temperature control and uniformity required for the most demanding incubation applications. These versatile microprocessor controlled incubators feature push-button temperature setpoint selection, an easy-to-read digital display, and built-in over-temperature protection. Equally important, the specially balanced heat convection patterns combine to provide chamber uniformity as precise as ±0.25 °C.



Precision Thelco 6DM Incubator with optional thermometer

Specifications

Models	2DG	3DG	5DG	6DG	3DM	5DM	6DM
Chamber Volume	1.4 cu. ft.	2.5 cu. ft.	4.5 cu. ft.	5.5 cu. ft.	2.5 cu. ft.	4.5 cu. ft.	5.5 cu. ft.
	(40 liters)	(71.5 liters)	(129 liters)	(157.5 liters)	(71.5 liters)	(129 liters)	(157.5 liters)
Convection Technique	Gravity	Gravity	Gravity	Gravity	Mechanical	Mechanical	Mechanical
Temperature Control	Microprocessor	Microprocessor	Microprocessor	Microprocessor	Microprocessor	Microprocessor	Microprocessor
Temperature Display	3-digit LED	3-digit LED	3-digit LED	3-digit LED	3-digit LED	3-digit LED	3-digit LED
Temperature							
Range	Ambient +5 °C to 70 °C	Ambient +5 °C to 70 °C	Ambient +5 °C to 70 °C	Ambient +5 °C to 70 °C	Ambient +5 °C to 70 °C	Ambient +5 °C to 70 °C	Ambient +5 °C to 70 °C
Uniformity @ 37 °C	± 0.5 °C	± 0.5 °C	± 0.5 °C	± 0.5 °C	± 0.25 °C	± 0.25 °C	± 0.25 °C
Sensitivity	± 0.1 °C	± 0.1 °C	± 0.1 °C	± 0.1 °C	± 0.1 °C	± 0.1 °C	± 0.1 °C
Stability	± 0.1 °C	± 0.3 °C	± 0.3 °C	± 0.3 °C	± 0.2 °C	± 0.2 °C	± 0.2 °C
Dimensions (L x W x H)							
Chamber	14 x 12.5 x13.75 in.	15.5 x 18.5 x 15 in.	15.5 x 18.5 x 27 in.	15.5 x 18.5 x 33 in.	15.5 x18.5 x 15 in.	15.5 x18.5 x27 in.	15.5 x 18.5 x 33 in.
	(35.6 x 31.7 x 34.9 cm)	(39.4 x 47.0 x 38.1 cm)	(39.4 x 47.0 x 68.6 cm)	(39.4 x 47.0 x 83.8 cm)	(39.4 x 47.0 x 38.1 cm)	(39.4 x 47.0 x 68.6 cm)	(39.4 x 47.0 x 83.8 cm)
Shelf (each)	13.5 x 12.5 in.	15.5 x 18 in.	15.5 x 18 in.	15.5 x 18 in.	15.5 x 18 in.	15.5 x 18 in.	15.5 x 18 in.
	(34.3 x 31.75 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)	(39.4 x 45.7 cm)
Exterior [1]	19.5 x 18 x 28 in.	21.5 x 24 x 28 in.	21.5 x 24 x 40 in.	21.5 x 24 x 46 in.	21.5 x24 x 28 in.	21.5 x24 x 40 in.	21.5 x 24 x 46 in.
	(49.5 x 45.7 x 71.1 cm)	(54.6 x 61.0 x 71.1 cm)	(54.6 x 61.0 x 101.6 cm)	(54.6 x 61.0 x116.8 cm)	(54.6 x 61.0 x 71.1 cm)	(54.6 x 61.0 x 101.6 cm)	(54.6 x 61.0 x 116.8 cm)
Electrical Specs (50/60 Hz)							
120 V	120 Watt, 1.0 Amps	125 Watt, 1.1 Amps	150 Watt, 1.3 Amps	175 Watt, 1.5 Amps	200 Watt, 1.7 Amps	225 Watt, 2.0 Amps	250 Watt, 2.2 Amps
230 V	120 Watt, 0.5 Amps	125 Watt, 0.6 Amps	150 Watt, 0.7 Amps	175 Watt, 0.8 Amps	200 Watt, 0.9 Amps	225 Watt, 1.0 Amps	250 Watt, 1.1 Amps
BTU Output	410	427	768	597	683	768	853
Net Weight	80 lbs (36.3 kg)	105 lbs (47.6 kg)	135 lbs (61.2 kg)	150 lbs (68.1 kg)	115 lbs (52.16 kg)	145 lbs (65.8 kg)	160 lbs (72.5 kg)
Shelves [2]	2 supplied, 6 max	2 supplied, 6 max	2 supplied, 12 max	2 supplied, 15 max	2 supplied, 6 max	2 supplied, 12 max	2 supplied, 15 max
Shipping Data							
Dimensions (L x W x H)	24 x 23 x 30 in.	25 x 26 x 31.5 in.	25 x 26 x 43.5 in.	25 x 26 x 49.5 in.	25 x 26 x 31.5 in.	25 x 26 x 43.5 in.	25 x 26 x 49.5 in.
	(61.0 x 58.4 x 76.2 cm)	(63.5 x 66.0 x 80.0 cm)	(63.5 x 66.0 x 110.5 cm)	(63.5 x 66.0 x 125.7 cm)	(63.5 x 66.0 x 80.0 cm)	(63.5 x 66.0 x 110.5 cm)	(63.5 x 66.0 x 125.7 cm)
Weight	95 lbs (43.1 kg)	130 lbs (59.0 kg)	160 lbs (72.6 kg)	175 lbs (79.4 kg)	140 lbs (63.5 kg)	170 lbs (77.1 kg)	185 lbs (83.9)
Volume	9.8 cu. ft.	11.7 cu. ft.	16.3 cu. ft.	18.5 cu. ft.	11.7 cu. ft.	16.3 cu. ft.	18.5 cu. ft.
	(0.28 cu. meter)	(0.33 cu. meter)	(0.46 cu. meter)	(0.52 cu. meter)	(0.33 cu. meter)	(0.46 cu. meter)	(0.52 cu. meter)
Catalog Number							
120 V (UL listed)	3500	3502	3504	3506	3508	3510	3512
230 V [3]	3501	3503	3505	3507	3509	3511	3513

[1] Includes vent cap and adjustable feet [2] Spacing between selves is 1-7/8" (48 mm). All models equipped with standard line cord and plug.
[3] 50/60 Hz (Includes European style 50 Hz power cord; standard 220V 60 Hz power cord available separately. Part number 34400001)

Thermo Scientific Precision High Performance Incubators

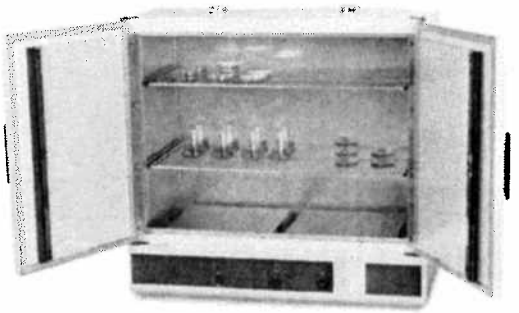
Features:
- Double door design has no center post to enable full utilization of chamber
- Interior glass doors for easy viewing
- Built-in high temperature safety
- Precise temperature control
- UL listed

Our Precision High Performance Incubators are ideal for laboratory applications requiring dry heat incubations in the ambient +5 °C to 65 °C temperature range. Available in three different models, these incubators feature temperature uniformities as precise as ±0.3 °C at 37 °C, built-in high temperature safety, and inner glass doors so you can inspect chamber contents without disturbing the inner chamber environment.

Model 6 – This double door, gravity convection incubator boasts 283.2 liters of usable chamber capacity. It also features a hydraulic thermostat with independent high temperature safety.

Model 6M –This double door, mechanical convection incubator features a direct drive turbo blower and wattage selection switch for fast heat up with excellent temperature uniformity. A hydraulic thermostat controls temperature with independent high temperature safety.

Model 6LM –This double door incubator combines microprocessor temperature control with mechanical convection to improve temperature uniformity and sensitivity of ±0.3 °C and ±0.1 °C respectively. Chamber temperature is set via a keypad on the face of the instrument while a bright LED readout displays actual chamber temperature to 0.1 °C. An independent high temperature safety thermostat guards against thermal runaway.



Precision Model 6

Specifications

Model	6	6M	6LM
Chamber Volume	10 cu. ft. (283.2 liters)	10 cu. ft. (283.2 liters)	10 cu. ft. (283.2 liters)
Convection Technique	Gravity	Mechanical	Mechanical
Temperature Control	Hydraulic	Hydraulic	Microprocessor
Temperature Display	20 °C to 100 °C Thermometer	20 °C to 100 °C Thermometer	LED
Temperature			
Range	Ambient +5 °C to 6 5 °C	Ambient +5 °C to 65 °C	Ambient +5 °C to 65 °C
Uniformity @ 37 °C	± 0.5 °C	± 0.3 °C	± 0.3 °C
Sensitivity	± 0.2 °C	± 0.2 °C	± 0.1 °C
Chamber Dimensions (W x D x H)	36 x 18 x 27 in.	36 x 18 x 27 in.	36 x 18 x 27 in.
	(91.4 x 45.7 x 68.6 cm)	(91.4 x 45.7 x 68.6 cm)	(91.4 x 45.7 x 68.6 cm)
Electrical Specs (50/60 Hz)			
120 V	300 Watts, 2.5 Amps	600 Watts, 5.0 Amps	600 Watts, 5.0 Amps
230 V	275 Watts, 1.2 Amps	–	590 Watts, 2.6 Amps
BTU Output	1024	2049	2049
Shelves [1]	2 supplied, 12 max	4 supplied, 12 max	4 supplied, 12 max
Exterior Dimensions (W x D x H)	42 x 21 x 39 in.	42 x 21 x 39 in.	42 x 21 x 39 in.
	(106.7 x 53.3 x 99.1 cm)	(106.7 x 53.3 x 99.1 cm)	(106.7 x 53.3 x 99.1 cm)
Shipping Data			
Dimensions (L x W x H)	26 x 45 x 42 in.	26 x 45 x 42 in.	26 x 45 x 42 in.
	(66.0 x 114.3 x 106.7 cm)	(66.0 x 114.3 x 106.7 cm)	(66.0 x 114.3 x 106.7 cm)
Weight	230 lbs (104.3 kg)	268 lbs (121.5 kg)	265 lbs (120.2 kg)
Volume	28.5 cu. ft. (0.8 cu. meter)	28.5 cu. ft. (0.8 cu. meter)	28.5 cu. ft. (0.8 cu. meter)
Catalog Number			
120 V	3621	3623	3624
240 V [2]	3622	—	3625

[1] 2 inch (51mm) spacing between shelves [2] 50/60 Hz

Thermo Scientific Precision 30M High Capacity Incubator

Features:

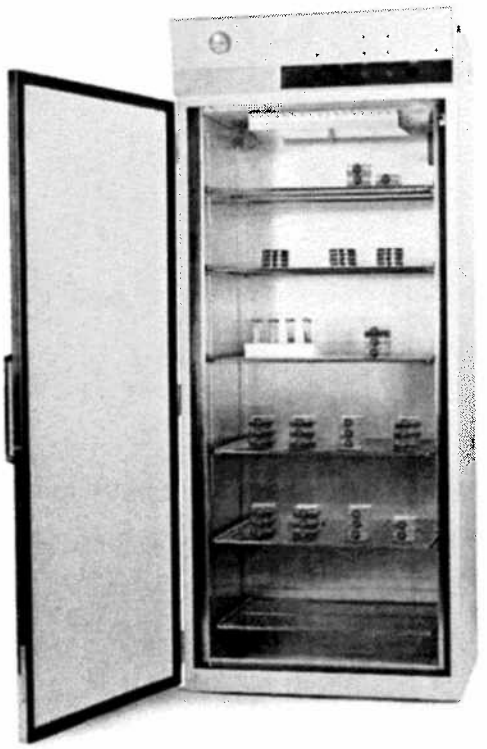
- Internal duplex convenience outlet for powering auxiliary equipment
- Available with a solid or glass door
- Built-in high-temperature safety
- Easy to clean
- Corrosion and chemical resistant
- Aluminum chamber
- Top mounted fan with diffuser panel for gentle circulation of air inside chamber
- Adjustable shelves

Mechanical Convection Incubators offer walk-in capacity with reach-in convenience.

Precision Model 30M Incubators are ideal for laboratory applications requiring a broad temperature range, fast temperature recovery, and large loading capacities. The integral direct drive blower gently circulates air throughout the chamber to provide a temperature uniformity of ±0.5 °C at 37 °C while ensuring fast temperature recovery after the door is opened. The 30M incubator requires hardwire installation by a qualified electrician.

Specifications	
Models	30M
Chamber Volume	30 cu. ft.
	(849.6. liters)
Convection Technique	Mechanical
Temperature Control	Hydraulic Thermostat
Temperature	
Range	Ambient +5 °C to 70 °C
Uniformity	±0.5 °C at 37 °C
Sensitivity	±0.2 °C
Recovery Time @ 37 °C	14 minutes
Dimensions (L x W x H)	
Chamber	24.25 x 30 x 72 in.
	(61.6 x 72.2 x 182.9 cm)
Shelf (each)	23.5 x 28.5 in.
	(60.0 x 72.4 cm)
Exterior [1]	31.5 x 36 x 88.5 in.
	(74.3 x 91.4 x 224.8 cm)
Electrical Specs	(50/60 Hz)
120 V	1450 Watts
	12.1 Amps
BTU Output	4952
Shelves	6 supplied
Shipping Data	
Dimensions [2]	42 x 95 x 40 in.
	(106.7 x 241.3 x 101.6 cm)
Weight	685 lbs.
	(310.7 kg)
Volume	92.6 cu. ft.
	(2.62 cu. meters)
Catalog Number	
LH Hinge, Solid Door	3971
LH Hinge, Glass Door	3973

[1] Add 2.25 inches to depth of unit for door handle.
[2] Unit is shipped on its back in a wooden crate.



Precision 30M Incubator

Thermo Scientific Precision Refrigerated Incubators

Features:

- High and low temperature protection
- Six shelves standard
- RS-232 and recorder jacks
- Gasketed door with key lock
- Front panel calibration
- Microprocessor controlled
- Access port
- Easy-to-clean, corrosion-resistant construction
- Dry contacts for alarm hookup
- UL listed (120 V)

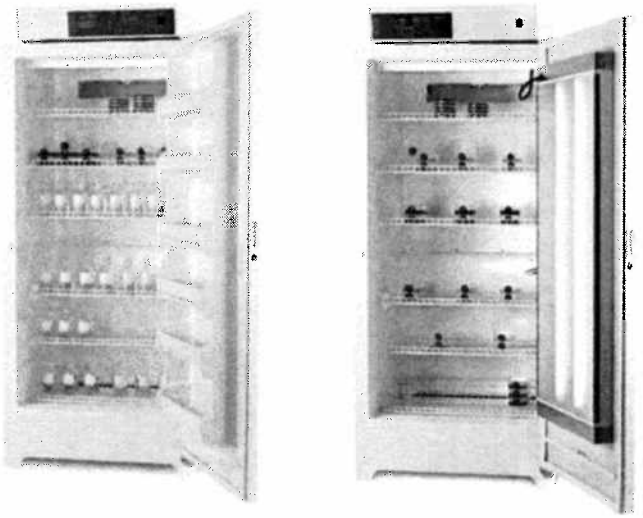
Additional Features – Model 815

- Holds up to 297 - 300 ml BOD bottles on the chamber shelves. Holds an additional 36 - 300 ml BOD bottles on the door shelves

Additional Features – Model 818

- Plant growth chamber
- Microprocessor software lock
- 7-day program with 2 light cycles per day
- Dual lamp fluorescent lighting providing 300 foot candles for uniform illumination

Precision Refrigerated Incubator Model 815 (left) and Model 818 (right)



Precision Model 815 Refrigerated Incubator

Designed specifically for Biological Oxygen Demand (BOD) determinations, the Precision Model 815 can also be used for any application that requires a temperature setting at or below the ambient temperature of the laboratory. The unit is microprocessor controlled and features push button temperature set-point selection, high and low temperature protection, and an easy to read digital display. Calibrations can be performed on the front panel using a simple procedure. The unit includes jacks for connecting an external chart recorder and an RS-232 interface option for data logging. With a roomy interior chamber of 20 cubic feet, the Model 815 comes equipped with 6 interior shelves and 6 shelves in the door of the unit.

Precision Model 818 Refrigerated Incubator

Designed for applications requiring illumination and precise temperature control and uniformity over a broad temperature range. Totally microprocessor controlled, this versatile incubator features push-button temperature set-point selection, programmable heating and lighting cycles, high and low temperature protection, easy to read displays, and a simple front-panel calibration procedure. The unit includes jacks for connecting an external chart recorder and an RS- 232 interface option for data logging. The large 17.8 cubic foot interior comes equipped with 6 shelves. The door contains two fluorescent lamps that provide the chamber interior with an evenly distributed 300 foot candles of light.

Specifications

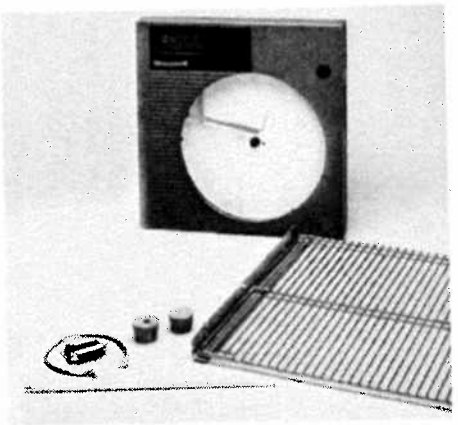
Models	815	818
Chamber Volume	20 cu. ft. (566 liters)	17.8 cu. ft. (504 liters)
Convection Technique	Mechanical	Mechanical
Temperature Range	-10 °C to +50 °C	-10 °C to 50 °C [1] / 10 °C to 50 °C [2]
Temperature Uniformity	±0.9 °C at -10 °C ±0.5 °C at 37 °C	±2.0 °C at -10 °C [1] ±1.8 °C at 10 °C [2]
	±0.5 °C at 20 °C ±0.6 °C at 50 °C	±0.6 °C at 20 °C [1] ±1.5 °C at 20 °C [2]
		±0.7 °C at 50 °C [2]
Temperature Sensitivity	±0.1 °C	±0.2 °C
Recovery Time	10 minutes at 20 °C	10 minutes at 20 °C
	(after 30 second door opening)	(after 30 second door opening)
Chamber Dimensions	20 x 26.5 x 57 in.	20 x 26.5 x 57 in.
(L x W x H)	(50.8 x 67.3 x 144.8 cm)	(50.8 x 67.3 x 144.8 cm)
Electrical Specs		
120 V	60 Hz, 800 Watts, 7.0 Amps	60 Hz, 860 Watts, 7.5 Amps
230 V	50 Hz, 800 Watts, 3.5 Amps	50 Hz, 860 Watts, 3.75 Amps
BTU Output	2730	2935
Shelves		
Number Supplied [3]	6	6
Total Interior Shelf Area	15.8 sq. ft. (1.47 sq. meters)	15.8 sq. ft. (1.47 sq. meters)
Exterior Dimensions	29 x 32 x 75 in.	29 x 32 x 75 in.
(L x W x H)	(74 x 82 x 191 cm)	(74 x 82 x 191 cm)
Shipping Information		
Dimensions (L x W x H)	32 x 34 x 82 in.	32 x 34 x 82 in.
	(81.3 x 86.4 x 208.3 cm)	(81.3 x 86.4 x 208.3 cm)
Weight	315 lbs. (142.9 kg)	347 lbs. (157.4 kg)
Volume	48.5 cu. ft. (1.37 cu. meters)	48.5 cu. ft. (1.37 cu. meters)
Catalog Number		
120 V	3721	3751
230 V [4]	3722	3752

[1] Without illumination [2] With illumination [3] Shelves not adjustable [4] 50/60 Hz

Thermo Scientific Precision Incubator Accessories

Ordering Information

These top quality accessories are designed to enhance the performance of your Precision and Thelco Incubators.



Shelf Kits for Incubators

(1 shelf and 2 supports)
Precision High Performance Models
Catalog No. 51200818
Precision Economy 2EG and Thelco 2DG
Catalog No. 51200833
All Other Precision Economy and Thelco models
Catalog No. 51200835
Precision Models 30 and 30MR
Catalog No. 51200811

Glass Thermometers

Non-hazardous glass thermometers 0 °C to 100 °C in 1 °C increments. Precision Economy, High Performance, and Thelco Incubators, 12 in. (305 mm) long. For monitoring purposes only.
Catalog No. 34001768

RS232 Interface Kit

For bi-directional communication for data-logging or remote control. Maximum distance, 50 feet (15.25 meters). Includes D-connector, PCB, and required cables. For Precision 815, 818, and all Thelco Incubators.
Catalog No. 51200906

Oakite Sanitizer

Safe, effective, quartenary ammonium-type germicide and disinfectant.
1 quart (0.946 liter)
Catalog No. 51200912

Digital Chart Recorder for Thelco and Models 815 and 818

Connects directly to incubator's output jacks. Documents chamber conditions. Built-in digital readout. Operates on 120/240 VAC, 50/60 Hz.
Catalog No. 51200828
Paper, 100 Sheets
Catalog No. 34003496

Access Port Stopper

Helps prevent heat, humidity, and gas loss through access port for use with Model 815, 818, and all Thelco incubators, this kit contains three different stoppers.
Catalog No. 51245330

North America: USA/Canada +1 866 984 3766
Europe: Austria +43 1 801 40 0, Belgium +32 2 482 30 30, Finland +358 9 329 100, France +33 2 2803 2000, Germany national toll free 08001-536 376, Germany international +49 6184 90 6940, Italy +39 02 95059 1, Netherlands +31 76 571 4440, Russia/CIS +7 095 225 11 15, Spain/Portugal +34 93 223 09 18, Switzerland +41 44 454 12 12, UK/Ireland +44 870 609 9203
Asia: China +86 21 6865 4588 or +86 10 5850 3588, India +91 22 5542 9494, Japan +81 45 453 9220, Other Asian countries +852 2885 4613
Countries not listed: +49 6184 90 6940 or +33 2 2803 2000

BRO-LECT-PREINC-0108

Thermo SCIENTIFIC

CUSTOMER: _____

REFERENCE: _____

GETINGE

400LS & 500LS SERIES GRAVITY & VACUUM/GRAVITY STEAM STERILIZERS FOR LIFE SCIENCE APPLICATIONS

PRODUCT SPECIFICATION

PRODUCT

Both the 400LS Series and 500LS Series Sterilizers consist of two models. The 422LS and 522LS Gravity Steam Sterilizers employ gravity/downward displacement with positive pulse conditioning and the 433LS and 533LS Vacuum/Gravity Steam Sterilizers employ both gravity/downward displacement with positive pulse conditioning and pressure/vacuum pulsing for dynamic air removal. Up to 19 cycles can be easily accessed in two easy steps. Custom cycle names can be designated for each cycle during installation. All cycle phases are sequenced and monitored by the control system, providing both audible and visual notification of deviation from certain operating parameters.

APPLICATION

For general-purpose gravity or vacuum steam sterilization and decontamination of laboratory, research and animal care supplies. The sterilizer controls are specifically designed with the flexibility needed for scientific purposes and are not to be used to sterilize medical devices for patient use in healthcare applications. The selectable temperature range is from 230°F to 275°F (110°C to 135°C) and from 219°F to 275°F (104°C to 135°C) for liquid cycles. Typical applications include wrapped and unwrapped hard goods, animal cages with bedding, textiles and linens and liquids in self-venting or unsealed containers. The liquid exhaust is microcomputer controlled for linear and consistent liquid cool down, programmable within a specified range.

KEY FEATURES: MODEL SELECTION

400LS Series 17.5" (445 mm) x 17.5" (445 mm) x 26" (660 mm), 4.6 Cu Ft (130 L)

- ☐ 422LS Gravity Steam or
- ☐ 433LS Gravity and Vacuum Steam

500LS Series 21" (532 mm) x 21" (532 mm) x 38" (965 mm), 9.7 Cu Ft (275 L)

- ☐ 522LS Gravity Steam or
- ☐ 533LS Gravity and Vacuum Steam

DOOR SELECTION

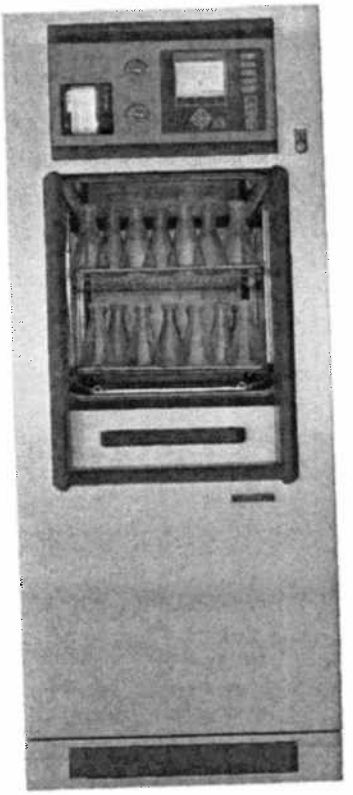
- ☐ Manual
- ☐ Power (not available for BSF or CCB)

SINGLE DOOR MOUNTING

- ☐ Recessed
- ☐ Cabinet

DOUBLE DOOR MOUNTING

- ☐ Cabinet, recessed one end
- ☐ Recessed both ends (500LS Series Only)

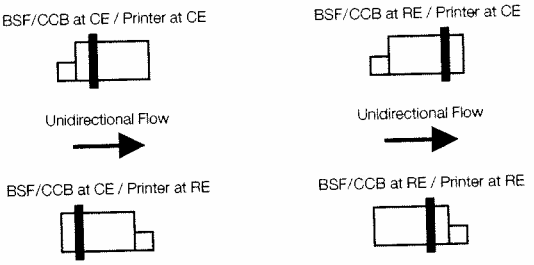


PRINTER LOCATION (Designation only for BSF or CCB)

- ☐ At Control End/Load End (CE)
- ☐ At Remote End/Unload End (RE)

NOTE: Printer located at control end as standard

BIOLOGIC SEALING FLANGE (BSF) (500LS Series Manual Door Only)



- ☐ At Control End/Load End (CE)
- ☐ At Remote End/Unload End (RE)

CROSS CONTAMINATION BARRIER (CCB) (500LS Series Manual Door Only)

- ☐ At Control End/Load End (CE)
- ☐ At Remote End/Unload End (RE)

CONTROL PANEL LOCATION

- ☐ On Unit
- ☐ Wall Mounted Vertically, Remote from unit

STEAM SOURCE

- ☐ House steam
- ☐ 30 kW integral steam boiler with an automatic feed water pump as standard (not available with double door 400LS Series Models)
  - ☐ 208V 3Ph
  - ☐ 240V 3Ph
  - ☐ 480V 3Ph
  - ☐ 600V 3Ph
  - ☐ 380/415V 50Hz 3Ph

LANGUAGE (Select one)

- ☐ English
- ☐ French
- ☐ Spanish

OPTIONS

- ☐ Boiler Control and Safety Device (CSD-1). Satisfies state ASME requirements for secondary low water cut-off as required by local jurisdiction.
- ☐ Uninterrupted Power Supply (UPS). Provides 115V power for up to 30 minutes to complete a cycle in process.
- ☐ 304 Stainless Steel piping for clean steam Tissue Culture applications. (Requires house steam to jacket).
- ☐ Thermocouple Gland
- ☐ Load RTD for temperature control of a liquid load
- ☐ Vacuum Pump (533LS w/House steam only)
- ☐ Automatic Steam Boiler Blowdown
- ☐ Water Saver Package
  - ☐ 120V
  - ☐ 220V

*OPTIONAL SYSTEMS

- ☐ Free standing electric stainless steel boilers for clean steam
- ☐ Free standing, stainless steel steam to steam generator for clean steam
- ☐ ASME Blowdown Separator

*Refer to Optional Systems literature for further details and descriptions.

INTERIOR EQUIPMENT

- ☐ Rack with two shelves
  - ☐ Extra third shelf – 400LS Series
  - ☐ Extra third shelf – 500LS Series
- ☐ 500LS Series Loading Car, with interior track _____Qty.
- ☐ 500LS Series Transfer Carriage _____Qty.

QUALITY STATEMENT

Confidence in the Getinge Group is the most important quality criterion. This must be the hallmark of all our external and internal commitments, activities and products. Products and services supplied by Getinge must conform to the agreed terms and expectations to ensure recommendations for further business. The achievement of these quality goals is the basis for a continued competitive and successful enterprise.

STANDARDS AND CODES

The sterilizer shall comply with or meet the requirements of:

- ASME (Section VIII, Division 1) Code for Pressure Vessels
- Canadian Registration Number (CRN) Pressure Vessel Design
- Uniform Plumbing Code
- ETL Listed to UL 3101-1 by Intertek Testing Services
- ETL Listed to IEC 61010-1 and IEC 61010-2-041 by Intertek Testing Services
- cETL Listed to CSA C22.2 Nos. 1010.1 and 61010.2.041 by Intertek Testing Services
- Seismic Anchoring Requirements per California Building Code

MICROCOMPUTER CONTROLS

Getinge Sterilizers employ a Hitachi 20 MHz microprocessor as a dedicated controller (CPU) with 8 MB of RAM. The control panel consists of an operator interface panel (called OP30), a thermal printer, mechanical chamber and jacket pressure gauges, status indicators, active touch sensitive switches, and controls On/Off switch.

Controls are located above the door for convenience. An internal deflection barrier routes steam vapor and moisture away from the door and behind the electronic controls to maintain temperatures at or below temperature limits. If specified, the control panel can be located remotely from the sterilizer with up to 32.8 feet (10 m) of cable. An RS 232 port is provided for serial communications for central data collection or remote service analysis and is ready for T-DOC® connection. The OP30 operator interface panel is a durable 1/4 VGA 5.7 inch diagonal color screen with 320 x 240 pixels. Below the screen are five soft keys to access other screens or displays and to make changes to cycle parameters.

A screen saver extends the life of the backlit LCD. Touching any key illuminates and reactivates the display. Push-button switches, with international symbols and descriptive words, provide door seal and unseal or, if a power door is furnished, vertical movement of the door. Audible and visible operator feedback is provided when a selection is made or a fault description is displayed. Temperature can be set, controlled and displayed in degrees Celsius or Fahrenheit and pressure in psia, bar or kPa. Double door models have one printer (located at control end as standard) and a complete OP30 Operator

Interface at both ends of the sterilizer for full control capabilities at either door.

The temperature of the discharge water is controlled by a temperature device to be less than 140°F (60°C). This switch also conserves water usage. The chamber drain is continuously monitored for the presence of water during a cycle. If water is detected and cannot be automatically corrected, a high water alarm alerts the operator. An RS 232 port is provided for serial communications for central data collection or remote service analysis.

CYCLE DOCUMENTATION

The printer documents cycle performance using special thermal paper for a permanent record. Thermal printing allows for quiet operation. At cycle completion, a cycle performance record is printed. Paper is replaced by a "drop in and quick feed" method and the printed strips can be either accumulated on an automatic take-up reel, or torn off for individual cycle storage. A last cycle duplicate print and paper feed switch is provided. The printer is located on the control panel as a standard and documents the following on a 200-dpi dot matrix printer (1.88" [47.6 mm] wide print width):

- Process start time and date, sterilizer name and number, daily cycle number and total cycle count
- Cycle selected with time and temperature, with other adjustable parameters identified
- Cycle phase transition points, temperature, pressure and total cycle time
- Process fault information messages with time of occurrence
- Summary verification of time at selected temperature (min/max exposure values)
- Cycle verification signature line

OP30 Operator Interface Features

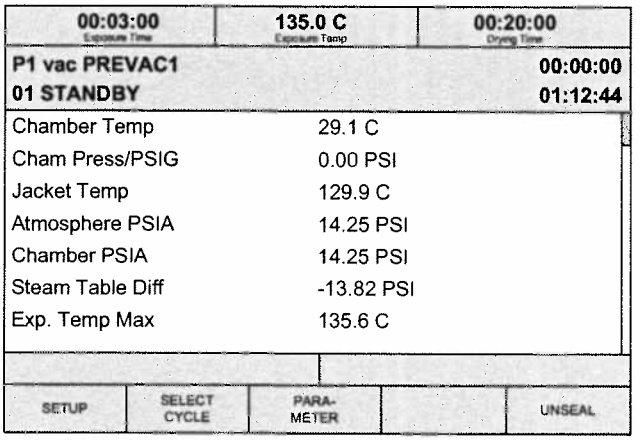
The OP30 color screen is divided into specific sections to display selection and performance information in a consistent manner. The top section identifies the time and temperature selected for the cycle. Below that is the type of cycle selected. The middle portion provides a choice of three screens to view actual, real time cycle information. "Pop-up" dialog boxes to change values appear within parameter selection screens to implement changes. Parameters are password protected.

The three screens are:

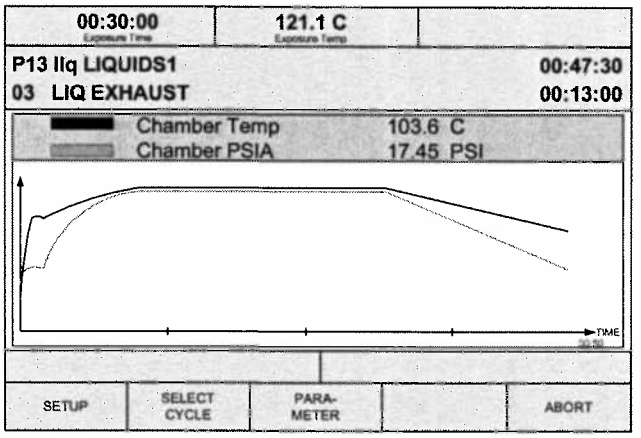
The lower portion of the screen provides text alarm messages and non-critical system messages, both using color displays, and soft key identifications. Navigating the various screens is accomplished by use of soft keys, directional arrows to move the cursor and change values, and the Enter key. Up to 19 factory recommended cycles are available. Time and temperature can be changed using a quick edit feature. Each change prompts operator acceptance by the use of a Yes/No acknowledgement and a "Save" soft key.

For Supervisor access, an alpha-numeric display provides levels of access for individual operators and service. Using the soft key labeled "Setup" provides the ability to:

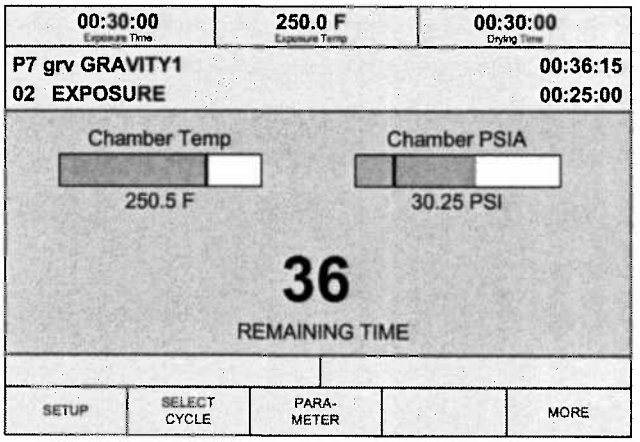
▶ **Detail.** Displays real time process information in text form.



▶ **Plot Graph.** Displays cycle temperature and pressure in colored graph during a cycle.



▶ **Bar Graph.** Displays temperature and pressure in a bar graph, with a large, easy to read, time remaining to the end of the cycle (averages the last three cycles for each cycle type).



- select operating screens
- print the last cycle
- adjust system menu for setting the calendar
- establish users
- passwords for each operator
- access the "about" selection to identify the model and system software number
- choose language, date format, and temperature and pressure measurement
- adjust parameters through password access

The supervisor can also select a Utilities Control feature, which provides a seven-day timer for programmed startup and shut-down of the sterilizer. The Utilities Control System shuts off water and steam to the unit to conserve energy. Cycles running beyond the programmed shutoff time will be completed. Finally, an optional Automatic Steam Boiler Blowdown System can be programmed to blow down the steam boiler automatically once a day, while cooling hot condensate through internal piping. This is typically scheduled during off-peak time.

The factory recommended cycles available for use are:

MODELS 422LS and 522LS (12 total cycles)

- 6 Gravity cycles of 30 minutes exposure at 121°C (250°F) with 30 minutes dry time
- 6 Liquid* cycles at 121°C (250°F), with 30 minutes exposure

MODELS 433LS and 533LS (19 total cycles)

- 6 Gravity cycles of 30 minutes exposure at 121°C (250°F) with 30 minutes dry time
- 6 Pre-Vacuum cycles of 30 minutes exposure at 121°C (250°F)
- 6 Liquid* cycles at 121°C (250°F) with 30 minutes exposure
- 1 Vacuum Leak Test cycle run at 131°C (268°F)

Note: Selection of time and temperatures other than factory recommendations require operator verification of the cycle efficacy.

*The liquid cycle, if used, is not intended for the sterilization of liquids used directly for patient contact.

PERFORMANCE

When installed and connected to specified utility services, the system provides accurate and repeatable performance. During the timed exposure phase, the temperature will be controlled by the chamber sensor at 0.5°C (0.9°F) above the set point (±0.2°C). Temperature selectivity is in 0.1°C (0.1°F) increments. Timing functions are selectable in one-second increments, and accuracy is within 0.04%. Temperature is controlled by a time proportioning continuous algorithm, called Proportional Integral (PI). A battery with a 10 year life holds programmed cycle values in memory. In the event of a power interruption, current cycle status is stored for up to 1 minute.

CYCLE PROGRESSION

- **Gravity/Wrapped Goods (pressure pulse pre-conditioning)**
  a. **Conditioning** — steam flows into the chamber for a timed period, followed by a series of positive pressure pulses to remove chamber air.
  b. **Heat-Up** — to selected temperature.
  c. **Exposure** — selected chamber temperature is attained and timed.
  d. **Exhaust** — chamber vented to atmospheric pressure.
  e. **Dry** — filtered air is drawn through chamber for the duration of time selected. (Either Gravity or Vacuum Dry is selectable; Vacuum Dry is recommended.)
  f. **Cycle Complete** — signaled by a tone, display message and light.
- **Prevac/Wrapped Goods (vacuum/pressure pulsing pre-conditioning)**
  a. **Conditioning** — steam flows into the chamber for a timed period, followed by a series of pressure/vacuum pulses to remove chamber air.
  b. **Heat-Up** — to selected temperature.
  c. **Exposure** — selected chamber temperature is attained and timed.
  d. **Exhaust** — chamber vented to atmospheric pressure.
  e. **Dry** — a vacuum is created for the duration of the time selected. Filtered air is admitted at the end of the drying time, chamber to atmospheric pressure.
  f. **Cycle Complete** — signaled by a tone, light and display message.
- **Liquids** —
  a. **Conditioning** — steam flows into chamber for a timed period to remove air.
  b. **Heat-Up** — to selected temperature.
  c. **Dwell** — allows liquid loads to reach drain temperature (when liquid RTD is not used).
  d. **Exposure** — selected chamber temperature is attained and timed.
  e. **Exhaust** — an adjustable linear exhaust.
  f. **Cycle Complete** — signaled by a tone, light and display message.

PARAMETER ADJUSTMENTS

Utilizing a service software utility tool, an authorized service representative can adjust and modify the following cycle parameters:

- Set the number of pre-conditioning pulses.
- Set the height of positive pre-conditioning pressure pulses.
- Set the depth of negative pre-conditioning pressure pulses.
- Set over-drive.
- Adjust liquid cycle dwell time.
- Adjust liquid cycle exhaust rate.

CONSTRUCTION

The chamber is constructed of an inner shell reinforced by a series of "U" channels that form the outer jacket of the chamber.

The gasket ring and backhead (on single door models) are formed and welded to the chamber body. Chamber material is 5 mm (0.197") thick and door material is 6 mm (0.236") thick, and both are constructed of Stainless Steel, 316L. The jacket material is also 316L. The interior chamber finish is polished to a high luster finish. All pressure vessel construction meets ASME code requirements for working pressures up to 45 psig (310 kPa). The gasket ring holds a continuous, one-piece silicone gasket, 0.63" (16 mm) in diameter. The body assembly is thermally insulated with 1.5" fiberglass insulation and is double thick between the jacket "U" channels.

A steam baffle is provided to prevent con densation from wetting the load. An extra threaded opening permits passage of thermocouple leads to monitor interior and load temperatures. Steam connection to the jacket and chamber is 316L material. A manual gasket retract valve is provided for emergency chamber access. When rack and shelves are supplied, shelf adjustments will be approximately every 2.5" (63.5 mm). Individual rack supports and shelves shall be easy to remove for cleaning.

VERTI-GLIDE DOOR

The vertical sliding door is counterbalanced for ease of operation. When open, it is totally out of the way, allowing safe and complete access to the chamber. Opening or closing the manual door requires only gentle upward or downward hand pressure. The optional Power Door is operated by a foot switch, and the door will stop automatically if an obstruction is encountered. If the foot switch is actuated while the door is opening or closing, the direction will be reversed. The Power Door can be opened or closed manually. At the beginning of the cycle, steam pressure behind the gasket automatically seals the door and retracts automatically at the end of the cycle. Sealing is positive and consistent. The gasket is recessed for added protection and long life. Once the cycle begins and the chamber is pressurized, the door cannot be opened. A safety switch prevents steam from entering the chamber when the door is not in the closed position. The door is insulated with fiberglass insulation and covered with a stainless steel panel.

BIOLOGIC SEALING FLANGE (BSF)

When specified, a 1/4" thick, carbon steel, inner flange plate is seal welded around the chamber periphery. The flange plate is mated to the 3/8" thick wall frame installed in the building wall. The wall frame is shipped early as directed. Studs welded on approximately three-inch centers are located around the flange plate and the wall frame. The mating surfaces are gasketed with a 1/4" thick Buna-N rubber gasket using stainless steel clamping bars, nuts and lock washers. The completed assembly of the sealing flange and wall frame provides an airtight seal, which then prevents passage of airborne microorganisms from a "contaminated" room to a "clean" room. Any necessary penetrations in the flange for wiring or plumbing shall be through potted fittings. Infiltration tests show no cross contamination leakage through the sealing flange with pressure differential of 0.22 psig (6" W.C.). Unidirectional door operation is standard, meaning that one door is sealed at all times, and once the designated "Control End" (CE) door is opened, the sterilizer must complete a successful cycle before the door designated Remote End (RE) can be opened. Full operator interface is provided at both doors with the printer designated at one door (CE or RE). An emergency backup system is provided to maintain the door gasket in the event of utility loss. Compressed air is used as the medium for gasket seal.

CROSS CONTAIMINATION BARRIER (CCB)

The Cross Contamination Barrier has the same inner flange plate as the BSF, and is used when a barrier to maintain an air differential is needed. Sheet metal paneling is supplied to span the distance from the flange plate to the wall opening and is sealed with caulking compound, creating the barrier separation. Electrical or plumbing penetrations through the flange plate shall be compression fittings. Compressed air is used as the medium for sealing the sterilizer door gaskets. Unidirectional door operation, as described for BSF, is standard.

PANELING

The front paneling is constructed of nominal 0.050" (1.27 mm) 300 series #3 brush finish stainless steel and is hinged for easy access to components, the manual gasket retract valve and, if specified, the electric steam boiler. The trim panels are built-in to fit within a recessed wall or optional cabinet. When specified, the cabinet model will be made of the same material.

INTEGRAL STEAM BOILER

The steam boiler will have a 30 kW capacity at standard voltages, and be integral with an automatic fill valve to ensure the correct water level at all times. The sterilizer control on/off switch controls the boiler control power (115V). The steam boiler is automatically controlled to generate and maintain a supply of steam to the sterilizer at minimum of 40 psig (3.72 bar). An automatic feedwater pump is provided as standard.

STEAM BOILER

CONTROLS & FEATURES

The integral steam boiler heating system includes:

1. On-off selector switch with power light. Control power will be removed from the steam boiler when "control off" is selected.
2. An adjustable pressure control and a high-limit control.
3. Adjustable over-pressure cutoff.
4. Automatic fill valve to maintain the correct water levels at all times.

5. An ASME, UV rated 100-psi pressure relief valve.
6. Magnetic contactors for heater circuit, visible water level gauge, safety relief valve and manual drain blowdown valve.
7. A high-water cutoff safety feature prevents water from entering the sterilizer.
8. Full-size, stainless steel drip pan with leak detection and automatic system shutdown.
9. During the blowdown function for either manual or automatic operation, hot condensate flows through the lower piping and is condensed by cold water.

OPTIONS

10. Low water kit to meet ASME CSD-1 requirements per local jurisdictions.
11. An automatic blowdown that incorporates a motorized ball (shutoff) valve that automatically uses steam pressure to minimize mineral accumulation in the steam boiler. The seven-day timer allows the user to select a time each day to schedule the blowdown function.

OPTIONAL WATER SAVER PACKAGE

Features and Benefits:

- No change in cycle performance
- Operator instructions for equipment are unchanged
- Flexible mounting schemes allow installation anywhere within 15 feet of the sterilizer
- Significant water usage reduced

When the is installed and adjusted properly, the system can provide water savings of 75% or greater. The table below shows average savings for various models of Getinge Vacuum-Steam sterilizers when the equipment is programmed for a wrapped goods cycle with 3 minutes exposure time and a dry-time of 30 minutes. Even when installed on gravity displacement sterilizers that require a lengthy dry phase for processing porous loads, the Water Saver can produce significant savings.

NOTE: Requires independent electrical service

Water Consumption Per Cycle

Equipment: 400/500LS
Standard Unit Consumption: 139 gal.
With Water Saver package: 25 gal.
% Savings: over 75%

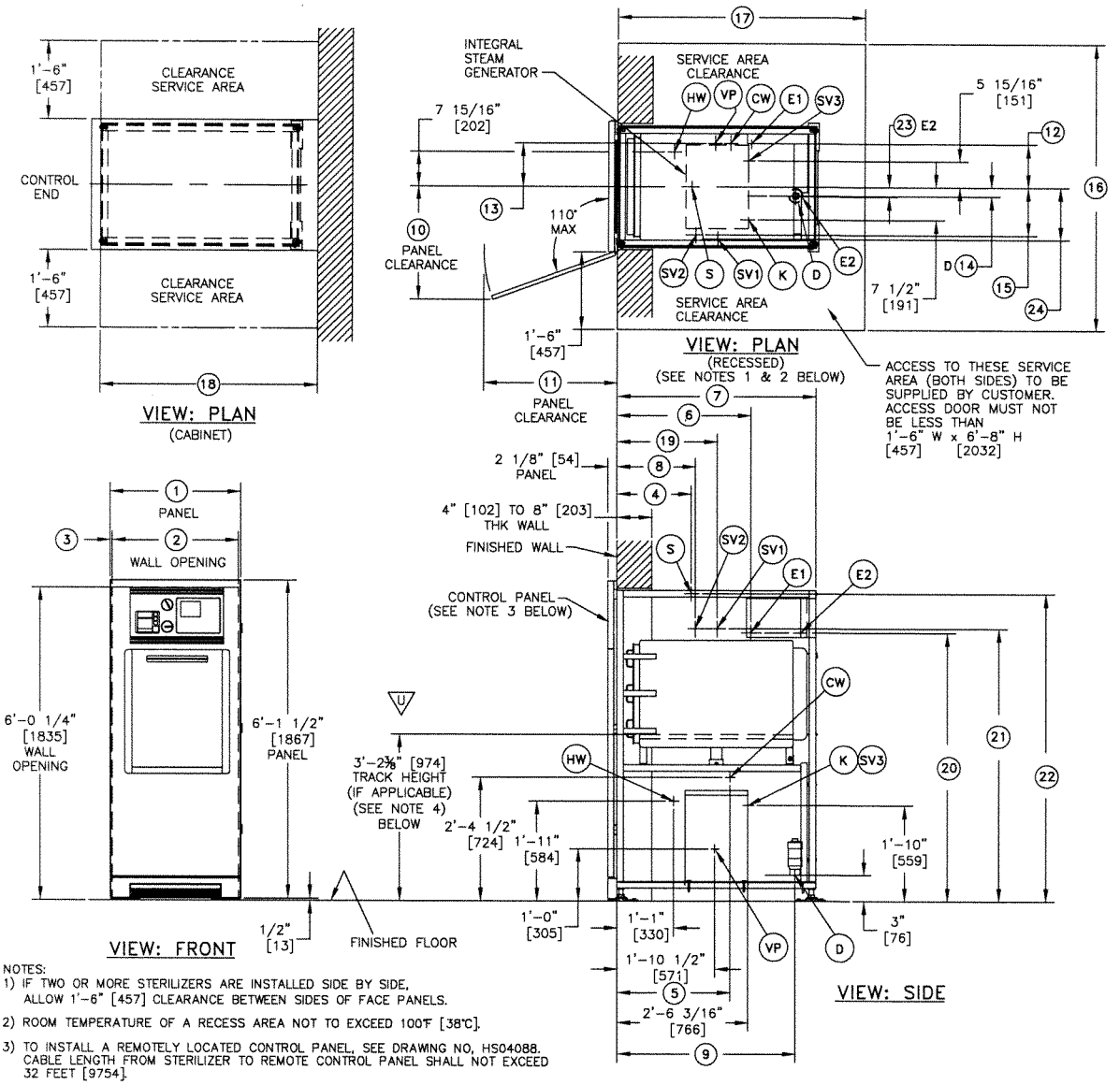
ENVIRONMENTAL IMPACT

Getinge steam sterilizers are designed and constructed with our environment in mind. To aid in the conservation of natural resources, and in recognition of prevailing Environmental Policies, in particular ISO 14001, Getinge steam sterilizers are more than 90% (by weight) recyclable.

Under normal operation, Getinge steam sterilizers produce no harmful byproducts. The Getinge steam sterilization process, in and of itself, produces nothing more dangerous than hot drain.

WARRANTY

Getinge USA, Inc. warrants that each sterilizer is carefully tested, inspected and leaves the factory in proper working condition, free from visible defects. Sterilizers are warranted for one year from the start of the warranty, including parts and labor (excluding expendable parts). The ASME pressure vessel is further warranted to the original owner against structural failure for a period of 15 years from the date of initial operation. See warranty pamphlet for complete details.



NOTES:
1) IF TWO OR MORE STERILIZERS ARE INSTALLED SIDE BY SIDE, ALLOW 1'-6" [457] CLEARANCE BETWEEN SIDES OF FACE PANELS.
2) ROOM TEMPERATURE OF A RECESS AREA NOT TO EXCEED 100°F [38°C].
3) TO INSTALL A REMOTELY LOCATED CONTROL PANEL, SEE DRAWING NO, HS04088. CABLE LENGTH FROM STERILIZER TO REMOTE CONTROL PANEL SHALL NOT EXCEED 32 FEET [9754].
4) CHAMBER FLOOR HEIGHT SHOULD BE APPROX. 3'-1 1/4" OFF FINISHED FLOOR.

UNIT	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓	㉔
400	2'-2 1/4" [711]	2'-1" [635]	5/8" [16]	1'-9 1/2" [546]	1'-10" [559]	1'-7" [483]	2'-10" [863]	1'-5" [432]	2'-8" [813]	2'-0" [610]	2'-4" [711]	8" [203]	8" [203]	7" [178]	6" [152]	5'-0" [1524]	3'-9" [1143]	3'-2" [965]	1'-10" [559]	5'-3" [1600]	5'-2" [1575]	5'-7" [1702]	3" [76]	8" [203]
500	2'-6" [762]	2'-5" [737]	1/2" [13]	1'-5" [432]	2'-0" [610]	2'-7" [787]	3'-10" [1168]	1'-6" [457]	3'-5" [1041]	2'-2" [660]	2'-6" [762]	10" [254]	10" [254]	9" [229]	7" [178]	5'-6" [1676]	4'-9" [1448]	4'-2" [1270]	1'-11" [584]	5'-2" [1575]	5'-3" [1600]	5'-11" [1803]	5" [127]	9" [229]

UNIT SIZE	CONTROL AREA	HEAT LOSSES BTU/HR [KCal/HR]			
		RECESS AREA		CABINET MODEL	
		W/O STM GEN	WITH STM GEN	W/O STM GEN	WITH STM GEN
400	1111 [280]	2583 [651]	4631 [1167]	3694 [(931]	5742 [1447]
500	1534 [387]	4296 [1083]	6343 [1598]	5830 [1469]	7877 [1985]

REV LEVEL	REVISION/EC NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY
V				
U	122779	11-11-08	TL	AP
T	122670	03-06-08	TL	AP
S	122270	10/12/06	AP	RER

REVISION HISTORY

THE FILENAME IS: HS4083U1-7
THIS PLOT MADE: 11/11/08

DRAWN BY: TL
APPROVED BY–DATE: 12/19/01
IF NO OTHER TOLERANCE GIVEN
DATE: 4/9/01
SCALE: 1=1
PROJECTION
CLIENT
REFERENCE DOCUMENTS
TITLE: 400/500 SERIES ARRANGEMENT DRAWING, STEAM STERILIZER, SINGLE DOOR
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Rochester, NY 14623-3133

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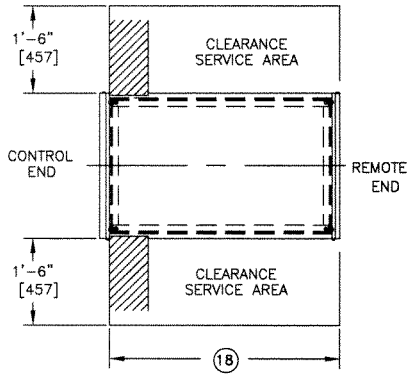
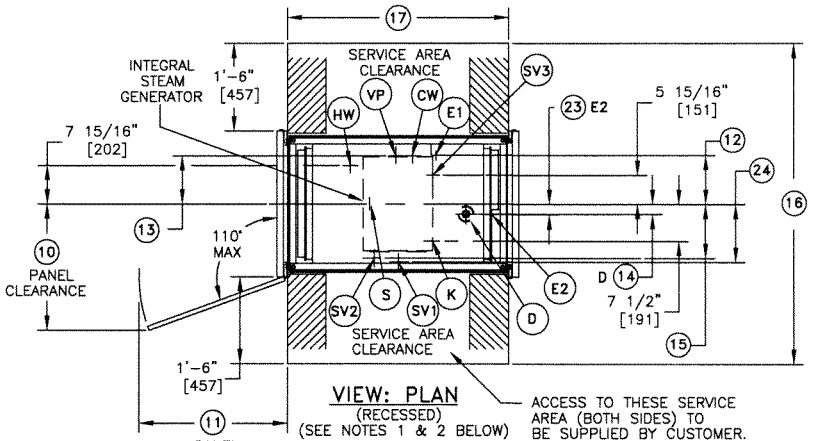
REV: U
PAGE: 1 of 7

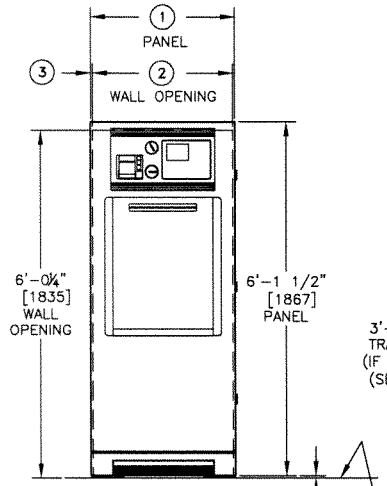


VIEW: PLAN
(RECESSED MOUNTED CONTROL END OR REMOTE END, CABINET OPPOSITE END)

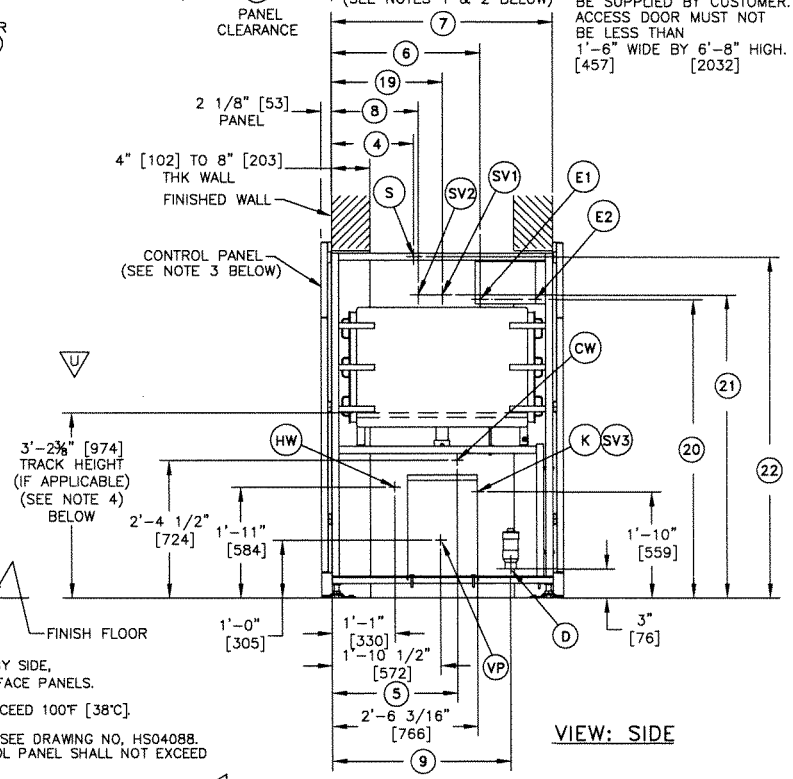


VIEW: PLAN
(RECESSED)
(SEE NOTES 1 & 2 BELOW)

ACCESS TO THESE SERVICE AREA (BOTH SIDES) TO BE SUPPLIED BY CUSTOMER. ACCESS DOOR MUST NOT BE LESS THAN 1'-6" WIDE BY 6'-8" HIGH. [457] [2032]



VIEW: FRONT



VIEW: SIDE

NOTES:
1) IF TWO OR MORE STERILIZERS ARE INSTALLED SIDE BY SIDE, ALLOW 1'-6" [457] CLEARANCE BETWEEN SIDES OF FACE PANELS.
2) ROOM TEMPERATURE OF A RECESS AREA NOT TO EXCEED 100°F [38°C].
3) TO INSTALL A REMOTELY LOCATED CONTROL PANEL, SEE DRAWING NO, HS04088. CABLE LENGTH FROM STERILIZER TO REMOTE CONTROL PANEL SHALL NOT EXCEED 32 FEET [9754].
4) CHAMBER FLOOR HEIGHT SHOULD BE APPROX. 3'-1 1/4" OFF FINISHED FLOOR. U

UNIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
400	2'-2 1/4" [711]	2'-1" [635]	5/8" [16]	1'-9 1/2" [546]	1'-10" [559]	1'-7" [483]	2'-10" [863]	1'-5" [432]	2'-7" [787]	2'-0" [610]	2'-4" [711]	8" [203]	8" [203]	7" [178]	6" [152]	5'-0" [1524]	2'-10" [863]	3'-0" [914]	1'-10" [559]	5'-3" [1600]	5'-2" [1575]	5'-7" [1702]	3" [76]	8" [203]
500	2'-6" [762]	2'-5" [737]	1/2" [13]	1'-5" [432]	2'-0" [610]	2'-7" [787]	3'-10" [1168]	1'-6" [457]	3'-1" [940]	2'-2" [660]	2'-6" [762]	10" [254]	10" [254]	9" [229]	7" [178]	5'-6" [1676]	3'-10" [1168]	4'-0" [1219]	1'-11" [584]	5'-2" [1575]	5'-3" [1600]	5'-11" [1803]	5" [127]	9" [229]

UNIT SIZE	CONTROL AREA	HEAT LOSSES BTU/HR [KCal/HR]			
		RECESS AREA		CABINET MODEL	
		W/O STM GEN	WITH STM GEN	W/O STM GEN	WITH STM GEN
400	1111 [280]	2583 [651]	4631 [1167]	3694 [931]	5742 [1447]
500	1534 [387]	4296 [108]	6343 [1598]	5830 [1469]	7877 [1985]

SEE SHEET 1

REV LEVEL	REVISION/EC NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY

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THE FILENAME IS: HS4083U1-7
THIS PLOT MADE: 11/11/08

DRAWN BY TL	APPROVED BY–DATE 12/19/01	IF NO OTHER TOLERANCE GIVEN	DATE 4/19/01	SCALE 1=1
PROJECTION	CLIENT	GETINGE		
REFERENCE DOCUMENTS	TITLE 400/500 SERIES ARRANGEMENT DRAWING, STEAM STERILIZER, DOUBLE DOOR	GETINGE USA, Inc. 1777 East Henrietta Road Rochester, NY 14623-3133		ORIGINAL SIZE C
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NOTICE: Work by others

Safe and efficient operation of this product is dependent upon the owner/user providing the services specified herein as well as any other normally accepted electrical, mechanical or plumbing interface between user's supply and this product. Getinge USA will not assume responsibility for problems that result from non-compliance with the above conditions. The following conditions and services are required by Getinge USA equipment and are to be provided by others.

TABLE A: PLUMBING CONNECTIONS & UTILITIES

(Refer to notes 1-6 on sheet 4)

ON UNIT CONNECTION	PIPE SIZE TO UNIT	PRESSURE RANGE DYNAMIC AT UNIT	FLOW RATE MAX
S= Steam 3/4" NPT female see note 4 and 11	3/4" NPT	40-50 psig [2.8-3.5 kg/cm²]	96 lbs/Hr [44 kg/Hr]
CW= Cold water 3/4" NPT female see note 1	3/4" NPT	40-70 psig [2.8-4.9 kg/cm²]	11 gpm [2.5 m³/Hr]
D= Drain 1 1/2" [38] ODT	See note 3	Not applicable	See note 3
HW= Hot water 3/8" NPT female see note 2	1/2" NPT	20-50 psig (min.) [1.4-3.5 kg/cm²]	0.4 gpm [.09 m³/Hr]
SV1 (Chamber) SV2(Jacket) = Sterilizer vessel pressure relief valve vent 3/4" NPT female	See note 5	Not applicable	See note 5
SV3=Steam Boiler pressure relief valve vent 1" NPT female (Sussman) 3/4" NPT female (Chromalox)	See note 5	Not applicable	See note 5
AS= Compressed Air dry , filtered, oil-less (BSF/CCB only) (see sheets 5&6)	1/4" NPT	70-100 psig dynamic [4.9-7.0 kg/cm²]	1 SCFM [1.7 cu. m/Hr]

TABLE B: ELECTRICAL CONNECTIONS & UTILITIES

(Refer to note 7 on sheet 4)

SERVICE	CONDUIT SIZE	UTILITY NOMINAL VOLTAGE	UTILITY VOLTAGE RANGE	MAX. CURRENT NOMINAL VOLTAGE	Breaker/Fusing Recommended	Consumption
E1= Power Box	1/2" [13]	115V, 50/60 Hz, 1~	104 - 126V	12 A	15 A	250 W/Hr
OPTIONAL - connections required for optional equipment listed below						
E2= Integral Transformer Box	1/2" [13]	230V, 50/60Hz, 1~	207 - 253V	5 A	15 A	N/A
K= Electric 4 WIRE WITH GROUND (for units with Integral Steam Boiler, not available on 400 Double Door)	1 1/4" [32]	208V, 50/60Hz, 3~	188 - 216V	84 A	100 A	N/A
	1" [25]	240V, 50/60Hz, 3~	217 - 250V	73 A	100 A	
	1" [25]	380V, 50Hz, 3~	374 - 432V	46 A	60 A	
	1" [25]	415V, 50Hz, 3~	374 - 432V	42 A	60 A	
	3/4" [19]	480V, 60Hz, 3~	432 - 500V	36 A	50 A	
	3/4" [19]	600V, 60Hz, 3~	540 - 625V	29 A	40 A	
VP= vacuum pump motor (2HP) junction box. 4 WIRE WITH GROUND (Model 533LS only, w/o steam boiler	1/2" [13]	208V, 60Hz, 3~	188 - 216V	5.7 A	10 A	N/A
		230V, 60Hz, 3~	217 - 250V	5.4 A		
		380V, 50Hz, 3~	374 - 432V	2.8 A		
		460V, 60Hz, 3~	432 - 500V	2.7 A		

SEE SHEET 1

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THE FILENAME IS: HS4083U1-7
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PROJECTION	CLIENT	GETINGE	
REFERENCE DOCUMENTS	TITLE 400/500 SERIES ARRANGEMENT DRAWING STEAM STERILIZER	GETINGE USA, Inc. 1777 East Henrietta Road Rochester, NY 14623-3133	ORIGINAL SIZE C
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NOTES TO ARCHITECTS & CONTRACTORS

1) Cold water:
   a) Cold water quality: Use potable water with a hardness of 0.5–10 grains/gal [8–170 ppm].
   b) Maximum temperature requirement is 80°F [27°C]. Optimal vacuum efficiency is at or below 70°F [21°C], 60°F [16°C] for optional LS vacuum pump.
   c) Back–syphonage protection is required by others. Check local plumbing code and install backflow preventer. (Examples: Vacuum breaker, dual–check or reduced pressure type).
   d) An optional water booster pump is available:
      * For installations where water pressure is at least 20 psig [1.4 kg/cm²] dynamic but less than 40 psig [2.8 kg/cm²].
      * To achieve satisfactory performance with dense loads where dynamic pressure is at or below 40 psig [2.8 kg/cm²].
      * if required backflow preventer lowers the water pressure below the minimum specified.
      * The optional booster pump requires mechanical electrical and plumbing hook–up by customer. A separate electrical service to the water booster pump junction box is necessary. Contact your local Getinge USA representative for Utility Data.
   e) For optional Water Saver see Getinge USA drawing HS03472.
2) Hot water to be supplied only when integral steam boiler is selected.
   a) Water quality information: For optimum results, the feed water supply should be tested prior to initial startup. If the mineral content exceeds the following recommended limits, various external treatment processes (water softener, RO, etc.) may be used to correct the problem. Routine manual blow–down or automatic blow–down option lowers concentrations of impurities and maintains the pH level above 7.0.
   b) Feedwater quality:

HARDNESS	0.5–5.0 GRAINS/GALLON [8–85 ppm]
RESISTIVITY	NOT TO EXCEED 50 KOHMS/CM
TEMPERATURE	100°F – 150°F [38°C – 65°C]
TOTAL DISSOLVED SOLIDS	150 PPM MAX.
pH	6.8–7.5

3) It shall be the customer's responsibility to provide a proper drainage system in accordance with applicable local codes. Temperature of drain water will not exceed 140°F [60°C] under normal operating conditions. If cold water supply is cut–off, temperature may exceed 200°F [93°C].
4) It shall be the customer's responsibility to provide condensate free steam between 97% and 100% saturated vapor.
5) Getinge USA recommends piping all vessel pressure relief valves to a vented manifold outside the equipment service area. Caution must be exercised not to reduce the discharge capacity of the relief valve. Recommended piping practices for relief valve piping can be found in ASME Boiler and Pressure Vessel Code Section VIII, Div. I, UG–135. Check local codes for specical requirements.
6) All customer connections to sterilizer must be labeled. For safety, all shutoff valves must be reachable when standing on the floor at the equipment (i.e. water, steam, compressed air).
7) Electrical Supply:
   a) It shall be the customer's responsibility to complete all electrical connections in accordance with the National Electrical Code and all applicable local codes.
   b) A dedicated, permanently connected electrical supply with conveniently accessible disconnect switch (supplied by customer) is required for each sterilizer service indicated in Table B. Where both single phase and 3 phase supply is required, two disconnect switches can be used, yet shall be properly labeled and located as close as possible to each other and the sterilizer. Refer to the Getinge USA installation Manual for specific instructions.
   c) For standard 115VAC units, 115VAC supply is required at "E1". For units with the optional 230V to 115V step–down transformer (integral with sterilizer), 230VAC supply is required at "E2" (and no connection at "E1").
   d) For voltages other than 115V or 230V, a separate universal transformer is available to provide 115VAC to "E1" with input voltage configurable to 100, 200/208, 380/400/415, or 440/460/480. It shall be the customer's responsibility to install the universal transformer. Transformer box dimensions: 10" [254] L x 7 1/4" [184] W x 5 3/8" [137] D.
8) For 500LS units equipped with biological sealing flange or cross contamination barrier (optional), see this drawing sheet 5 & 6.
9) Double Door units, recessed into two walls, require partial dis–assembly of unit to allow installation into fixed walls.
10) Optional Wall Mounted Control Panel, see drawing no. HS04088. Cable length to sterilizer not to exceed 32 ft [9754].
11) Refer to Drawing HS04131 for piping with clean steam.
12) For Seismic Force information and loaded weights see Getinge USA drawing P/N 700337 (400 unit)/700338 (500 unit). see sheet 7 of 7.

UNIT WEIGHTS AND CRATED MEASUREMENTS TABLE

UNIT SIZE	MAX. WEIGHT UNLOADED CRATED	MAX. WEIGHT UNLOADED UNCRATED	CRATED MEASUREMENTS LENGTH	WIDTH	HEIGHT
400 SINGLE DOOR	965 LBS [438 Kg]	855 LBS [387 Kg]	4'–5 1/2" [1359]	3'–4 3/4" [1035]	6'–7" [2007]
400 DOUBLE DOOR	1020 LBS [462 Kg]	910 LBS [412 Kg]			
500 SINGLE DOOR	1223 LBS [554 Kg]	1103 LBS [500 Kg]	5'–2 3/4" [1594]	3'–7 3/4" [1111]	6'–7" [2007]
500 DOUBLE DOOR	1298 LBS [588 Kg]	1178 LBS [(534 Kg]			

FOR INTEGRAL STEAM BOILER ADD 204LBS [93Kg] TO MAX WEIGHT.

SEE SHEET 1

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THE FILENAME IS: HS4083U1-7
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PROJECTION | CLIENT

REFERENCE DOCUMENTS | TITLE: 400/500 SERIES ARRANGEMENT DRAWING STEAM STERILIZER

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DRAWING NUMBER HS4083 | REV U | PAGE 4 of 7

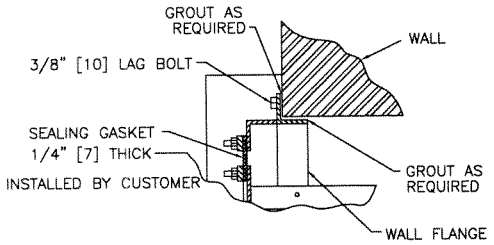
INFORMATION ON THIS PAGE IS FOR 500 SERIES STEAM STERILIZER WITH BIOLOGICAL FLANGE (BSF) ONLY

NOTES:

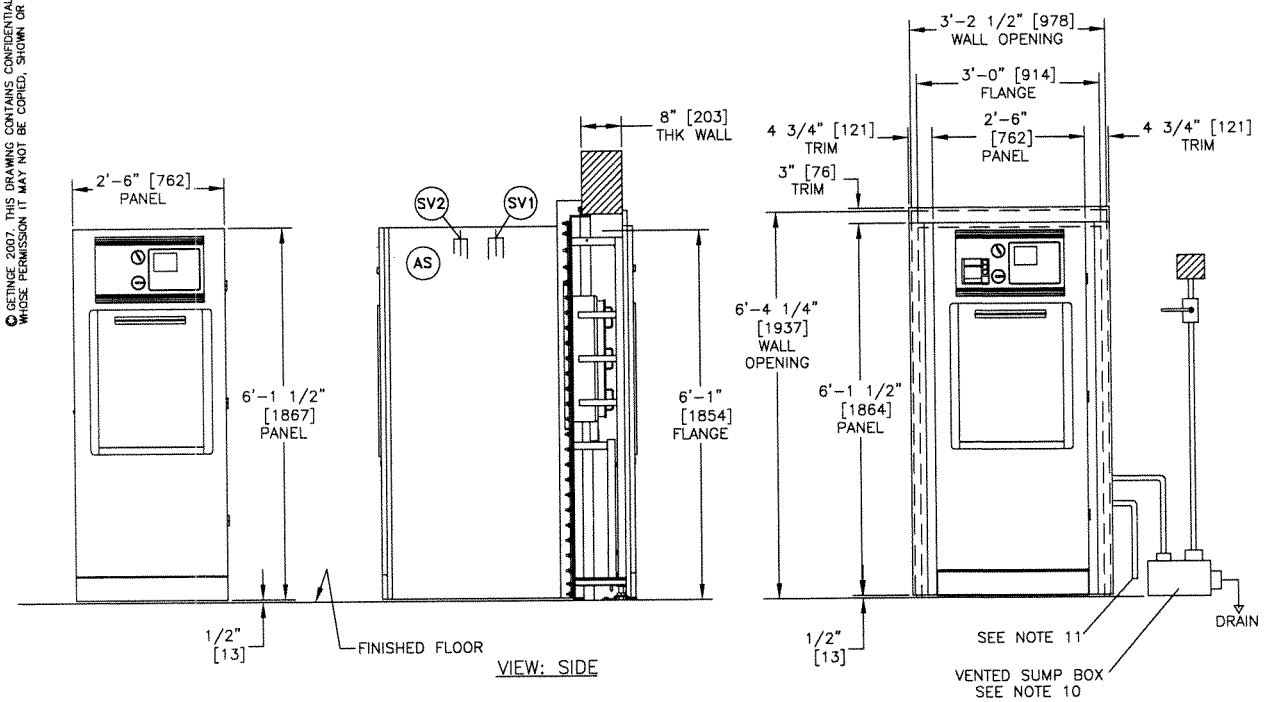
1) FOR SERVICE LOCATIONS, SPECIFICATIONS, AND ARCHITECT NOTES SEE SHEET 3 & 4. BIOLOGICAL FLANGE IS 500 SERIES ONLY.
2) FOR BIOLOGICAL FLANGE UNITS, CONTROLS ARE SWITCHED DEPENDING ON REQUESTED END FOR BIOLOGICAL FLANGE. IF (BFCE) IS REQUESTED, CONTROLS W/PRINTER ARE ON B/F END. IF (BFRE) IS REQUESTED, CONTROLS W/PRINTER ARE ON THE END OPPOSITE OF THE B/F. SERVICE LOCATIONS REMAIN THE SAME, AS INDICATED ON SHEET 2.
3) WALL FLANGE (SUPPLIED BY GETINGE) CAN BE SHIPPED AHEAD OF STERLIZER. WALL SHOULD BE BUILT BY CUSTOMER TO DIMENSIONS SPECIFIED FOR TIGHT FIT. SEE TYPICAL INSTALLATION.
4) SEE INSTALLATION INSTRUCTIONS P/N 61301608205 FOR MORE DETAIL.
5) DIMENSIONS ARE FEET-INCHES [MILLIMETERS].
6) FOR MOUNTING OF CABINET AND TRIM PACKAGE SEE GETINGE USA DRAWING P/N 61301608483 & 61301608562.
7) BIOLOGICAL FLANGE UNITS INCLUDE A UNIDIRECTIONAL DOOR SEAL AIR RETENTION TANK AS SHOWN.. SERVICE REQUIREMENTS FOR THE DOOR SEAL RETENTION SYSTEM ARE AS FOLLOWS::

(AS) A DRY, FILTERED, OIL-LESS COMPRESSED AIR SUPPLY (70-100 PSIG DYNAMIC, USAGE <1SCFM) IS REQUIRED FOR THIS SYSTEM. CONNECTION IS 1/4" NPT AT LOCATION INDICATED. A COMPRESSOR FOR THIS PURPOSE IS AVAILABLE FROM GETINGE USA (P/N 61301601462) AT EXTRA COST. AIR QUALITY WILL BE CLEAN, DRY INSTRUMENT QUALITY.

8) IF THE UNITS RECESSED AT THE END OPPOSITE THE BIOLOGICAL FLANGE, REFER TO SHEET 2 FOR DIMENSIONAL INFORMATION.
9) NOT USED
10) CHAMBER DRAIN PIPING WILL BE CONSIDERED TO BE CONTAMINATED AND A METHOD AND MEANS OF DECONTAMINATION FOR THIS PIPING HAS NOT BEEN PROVIDED FOR DISASSEMBLY/SERVICING.
11) 1/2" [13] OD TUBING (JACKET) CAN BE PIPING TO SANITARY SEWER.



TYPICAL INSTALLATION



VIEW: SIDE

SEE SHEET 1

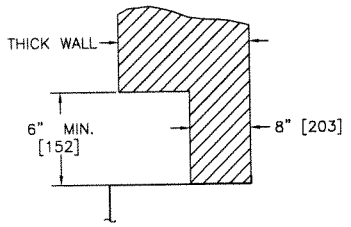
REV. LEVEL	REVISION/EC NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY

REVISION HISTORY

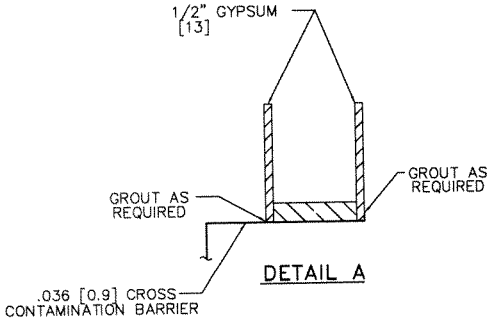
THE FILENAME IS: HS4083U1-7
THIS PLOT MADE: 11/11/08

DRAWN BY TDL	APPROVED BY-DATE 12/19/01	IF NO OTHER TOLERANCE GIVEN	DATE 12/19/01 / SCALE 1=1
PROJECTION	CLIENT	GETINGE	
REFERENCE DOCUMENTS	TITLE 500 SERIES ARRANGEMENT DRAWING, STEAM STERILIZER, BIOLOGICAL FLANGE	GETINGE USA, Inc. 1777 East Henrietta Road Rochester, NY 14623-3133	ORIGINAL SIZE C
SYMBOL LIBRARY		DRAWING NUMBER HS4083	REV U / PAGE 5 of 7

INFORMATION ON THIS PAGE IS FOR 500 SERIES
STEAM STERILIZER WITH CROSS-CONTAMINATION BARRIER (CCB) ONLY



WHEN WALLS ARE GREATER THAN 8" THICK – INSTALL CCB AS SHOWN.

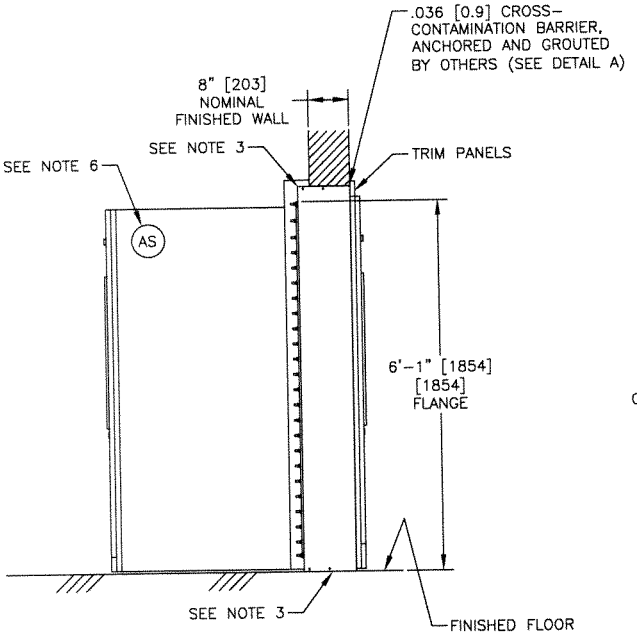


DETAIL A

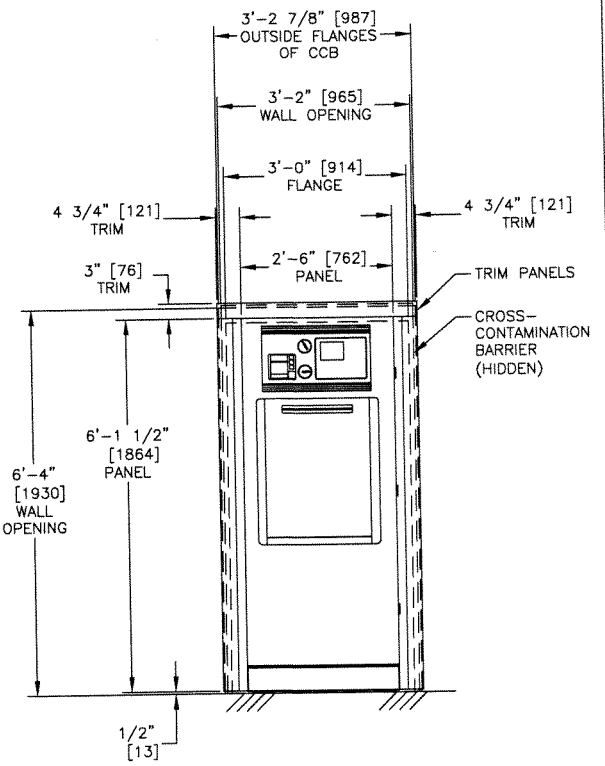
NOTES:

1) FOR SERVICE LOCATIONS, SPECIFICATIONS AND ARCHITECT NOTES, SEE SHEET 3 & 4
2) FOR CROSS-CONTAMINATION BARRIER (CCB) UNITS, CONTROLS ARE SWITCHED DEPENDING ON REQUESTED END FOR CCB. IF CCB-CE IS REQUIRED, CONTROLS WITH PRINTER ARE ON CCB END. IF CCB-RE IS REQUESTED, CONTROLS WITH PRINTER ARE ON THE END OPPOSITE THE CCB. SERVICE LOCATIONS REMAIN THE SAME, AS INDICATED ON SHEET 2 OF THIS DRAWING.
3) SEAL ALL CRACKS AND HOLES WITH GROUT OR RTV AS REQUIRED.
4) FOR MOUNTING OF TRIM PACKAGE, SEE GETINGE USA DRAWING P/N 61301608562.
5) IF THE UNIT IS RECESSED AT THE END OPPOSITE THE CCB, REFER TO SHEET 2 FOR DIMENSIONAL INFORMATION.
6) CROSS-CONTAMINATION BARRIER (CCB) UNITS INCLUDE A UNIDIRECTIONAL DOOR SEAL AIR RETENTION AS SHOWN. (EXCEPT NO AIR TANK IS PROVIDED)

(AS) A DRY, FILTERED, OIL-LESS COMPRESSED AIR SUPPLY (70-100) PSIG DYNAMIC, USAGE <1SCFM) IS REQUIRED FOR THIS SYSTEM, CONNECTION IS 1/4" NPT AT LOCATION INDICATED. A COMPRESSOR FOR THIS PURPOSE IS AVAILABLE FROM GETINGE USA (P/N 61301601462) AT EXTRA COST, AIR QUALITY WILL BE CLEAN, DRY INSTRUMENT QUALITY.



VIEW: SIDE
TYPICAL INSTALLATION



VIEW: RIGHT

SEE SHEET 1

REV. LEVEL	REVISION/ECO NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY

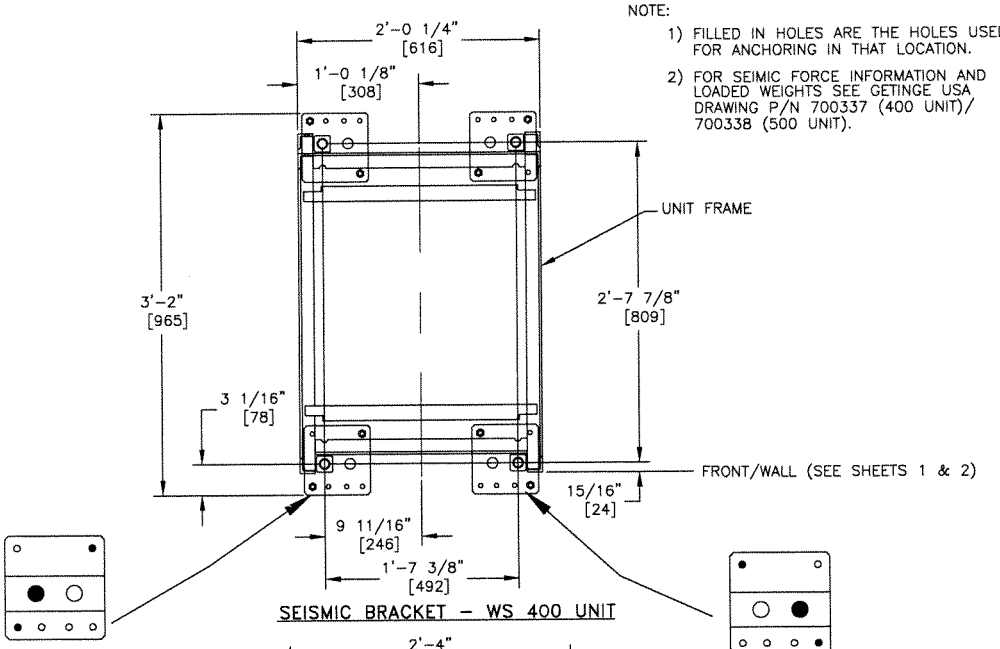
REVSION HISTORY

THE FILENAME IS: HS4083U1-7
THIS PLOT MADE: 11/11/08

DRAWN BY EEM	APPROVED BY-DATE 1/30/02	IF NO OTHER TOLERANCE GIVEN	DATE 1/29/02 SCALE 1=1
PROJECTION	CLIENT	GETINGE	
REFERENCE DOCUMENTS	TITLE 500 SERIES ARRANGEMENT DRAWING, STEAM STERILIZER, CROSS-CONTAMINATION BARRIER	GETINGE USA, Inc. 1777 East Henrietta Road Rochester, NY 14623-3133	ORIGINAL SIZE C
SYMBOL LIBRARY		DRAWING NUMBER HS4083	REV U PAGE 6 of 7

NOTE:

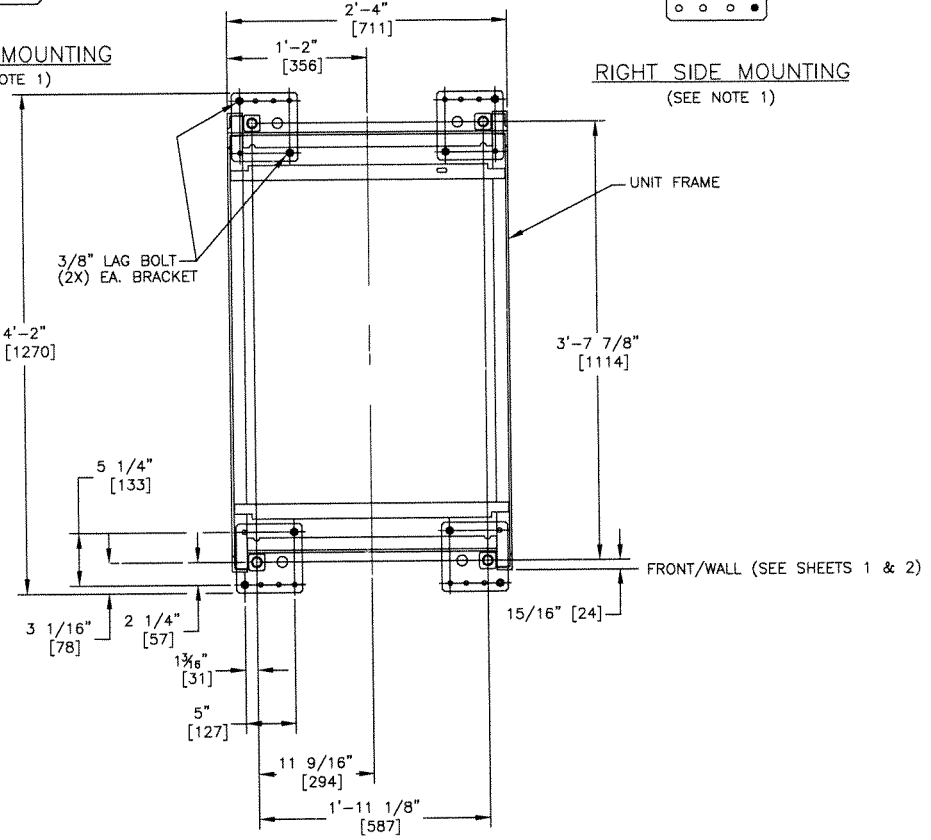
1) FILLED IN HOLES ARE THE HOLES USED FOR ANCHORING IN THAT LOCATION.
2) FOR SEIMIC FORCE INFORMATION AND LOADED WEIGHTS SEE GETINGE USA DRAWING P/N 700337 (400 UNIT)/ 700338 (500 UNIT).



SEISMIC BRACKET – WS 400 UNIT

LEFT SIDE MOUNTING
(SEE NOTE 1)

RIGHT SIDE MOUNTING
(SEE NOTE 1)



SEISMIC BRACKET – WS 500 UNIT

SEE SHEET 1

REV LEVEL	REVISION/ECO NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY
REVSION HISTORY				

THE FILENAME IS: HS4083U1-7
THIS PLOT MADE: 11/11/08

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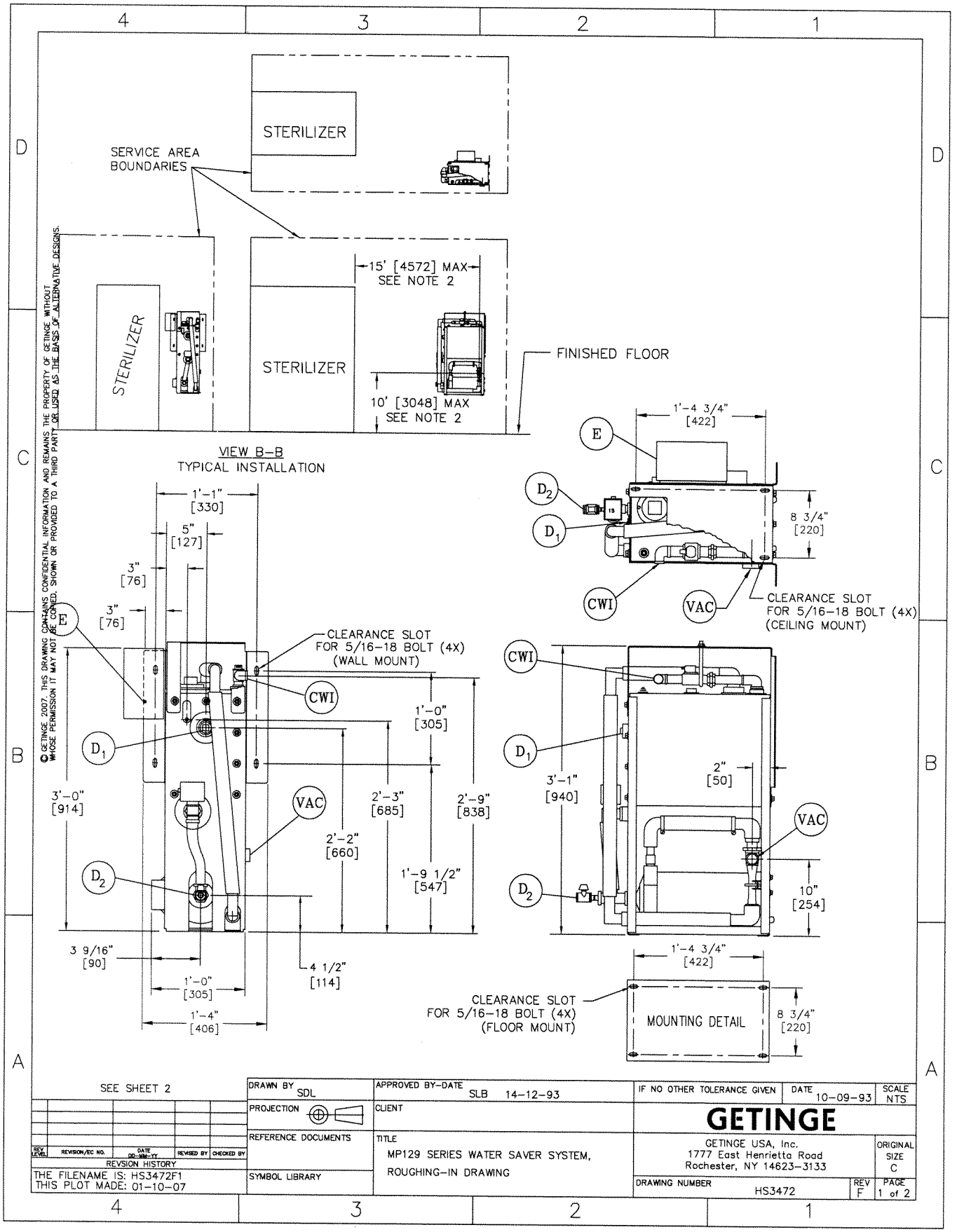
PROJECTION	CLIENT	GETINGE	
REFERENCE DOCUMENTS	TITLE 400/500 SERIES ARRANGEMENT DRAWING, SEISMIC ANCHOR INFORMATION	GETINGE USA, Inc. 1777 East Henrietta Road Rochester, NY 14623–3133	ORIGINAL SIZE C
SYMBOL LIBRARY		DRAWING NUMBER HS4083	REV U / PAGE 7 of 7



SEE SHEET 2

REV LEVEL	REVISION/EC NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY
REVSION HISTORY				

THE FILENAME IS: HS3472F1
THIS PLOT MADE: 01-10-07

DRAWN BY SDL	APPROVED BY–DATE SLB 14-12-93	IF NO OTHER TOLERANCE GIVEN	DATE 10-09-93 / SCALE NTS
PROJECTION	CLIENT	GETINGE	
REFERENCE DOCUMENTS	TITLE MP129 SERIES WATER SAVER SYSTEM, ROUGHING–IN DRAWING	GETINGE USA, Inc. 1777 East Henrietta Road Rochester, NY 14623–3133	ORIGINAL SIZE C
SYMBOL LIBRARY		DRAWING NUMBER HS3472	REV F / PAGE 1 of 2

NOTICE: WORK BY OTHERS

SAFE AND EFFICIENT OPERATION OF THIS PRODUCT IS DEPENDENT UPON THE OWNER/USER PROVIDING THE SERVICES SPECIFIED HEREIN AS WELL AS ANY OTHER NORMALLY ACCEPTED ELECTRICAL, MECHANICAL OR PLUMBING INTERFACE BETWEEN USER'S SUPPLY AND THIS PRODUCT. GETINGE USA WILL NOT ASSUME RESPONSIBILITY FOR PROBLEMS THAT RESULT FROM NON-COMPLIANCE WITH THE ABOVE CONDITIONS. THE FOLLOWING CONDITIONS AND SERVICES ARE REQUIRED BY GETINGE USA EQUIPMENT AND ARE TO BE PROVIDED BY OTHERS.

TABLE A: PLUMBING CONNECTIONS & UTILITIES

ON UNIT CONNECTION	PIPE SIZE TO UNIT	PRESSURE RANGE DYNAMIC
(CWI) = SUPPLY - COLD WATER TO RESERVOIR (TEMP CONTROL) 3/4" NPT [19]	3/4" NPT [19]	30-70 PSI SEE NOTE 6
(VAC) = VACUUM TO STERILIZER (EJECTOR)	1 1/4" [32] FLEX HOSE (200,3600,4200) 3/4"OD [19] COPPER TUBE (100,3500,400,500,700)	N/A
(D_1) = DRAIN, OVERFLOW OUTLET TO DRAIN OR COLLECTION SYSTEM. 1-1/4" NPT [32]	N/A	N/A
(D_2) = DRAIN, TANK 1/4" NPT [6]	N/A	N/A

TABLE B: ELECTRICAL CONNECTIONS & UTILITIES

SERVICE	UTILITY	MAX CURRENT (AMPS)	BREAKER/FUSING RECOMMENDED
(E) = MOTOR STARTER RELAY BOX (1/2" CONDUIT CONNECTION)	115V, 60HZ, 1~	26A	40A
	230V, 60HZ, 1~	13A	20A

NOTES ARCHITECTS AND CONTRACTORS

1) FOR SEISMIC ANCHORING REQUIREMENTS, WORST CASE CG LOCATION & WORST CASE WEIGHT REFER TO DRAWING 531199.

2) TYPICAL INSTALLATION SHOWN IN VIEW "B". WATER SAVER VACUUM PORT SHOULD BE WITHIN 15 FEET [4572] OF STERILIZER, AND NO MORE THAN 10 FEET [3048] ABOVE THE COMMON FLOOR. GETINGE USA, INC. SUPPLIED INTERCONNECTING HOSE IS 20 FEET [6096] IN LENGTH, AND CAN BE SHORTENED BY CUSTOMER IF DESIRED. CONSULT WITH GETINGE USA, INC PRODUCT SUPPORT IF THIS LOCATION REQUIREMENT CAN NOT BE MET.

3) IT SHALL BE THE CUSTOMER'S RESPONSIBILITY TO PROVIDE A PROPER DRAINAGE SYSTEM IN ACCORDANCE WITH APPLICABLE LOCAL CODES. TEMPERATURE OF DRAIN WATER WILL NOT EXCEED 140°F [60°C] UNDER NORMAL OPERATING CONDITIONS.

4) ROUTE SERVICES TO PREVENT DAMAGE TO SERVICES AND INJURY TO PERSONNEL.

5) ALLOW 18 INCHES [457] MINIMUM CLEARANCE ON ALL SIDES FOR SERVICE ACCESS. CHECK LOCAL CODES FOR GREATER APPLICABLE CLEARANCE REQUIREMENTS.

6) COLD WATER:
   A) COLD WATER QUALITY: USE PORTABLE WATER WITH A HARDNESS OF 0.5-10 GRAINS/GAL [8-170 PPM].
   B) MAXIMUM TEMPERATURE REQUIREMENT IS 80°F [27°C]. OPTIMAL VACUUM EFFICIENCY IS AT OR BELOW 70°F [21°C], 60°F [16°C] FOR OPTIONAL LS VACUUM PUMP.
   C) BACK-SYPHONAGE PROTECTION IS REQUIRED BY OTHERS. CHECK LOCAL PLUMBING CODE AND INSTALL REQUIRED BACKFLOW PREVENTER. (EXAMPLES: VACUUM BREAKER, DUAL-CHECK OR REDUCED PRESSURE TYPE).

7) ELECTRICAL SUPPLY:
   A) IT SHALL BE THE CUSTOMER'S RESPONSIBILITY TO COMPLETE ALL ELECTRICAL CONNECTIONS IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND ALL APPLICABLE LOCAL CODES.
   B) A DEDICATED, PERMANENTLY CONNECTED ELECTRICAL SUPPLY WITH CONVIENTLY ACCESSIBLE DISCONNECT SWITCH (SUPPLIED BY CUSTOMER) IS REQUIRED.
   C) FOR MODELS MP-129A THRU E, THE CONTACTOR INTERFACE BOX SHALL BE LOCATED WITHIN 15 FEET [4572] OF STERILIZER.

TABLE C: OPERATING ENVIRONMENTAL CONDITIONS

TEMPERATURE	PRESSURE	RELATIVE HUMIDITY
10°C (50°F) to 40°C (104°F)	Atmospheric from 0-6500 ft. (2000m) (Special software needed for elevations over 6500ft. (2000m)	10 to 90% non-condensing

VOLTAGE FLUCTUATIONS (Main supply)	OVERVOLTAGE CATAGORY	POLLUTION DEGREE
not to exceed ±10% of the nominal voltage	III	2

TABLE D: UNIT WEIGHTS

MAX WEIGHT		CRATED DIMENSIONS		
CRATED	UNCRATED	LENGTH	WIDTH	HEIGHT
295 LBS	190 LBS	41"	41"	30"
[134 KG]	[86 KG]	[1041]	[1041]	[762]

REV	REVISION/EC NO.	DATE DD-MM-YY	REVISED BY	CHECKED BY
F	122486	01-10-07	TL	
E	121370	06-11-03	CC	
D	121063	31-03-03	DRL	
C	118280	13-06-00	DN	
B	119090	16-06-99	CC	
A	118072D	19-03-97	MH	

REVISION HISTORY

THE FILENAME IS: HS3472F2
THIS PLOT MADE: 01-10-07

DRAWN BY SDL
PROJECTION
REFERENCE DOCUMENTS
SYMBOL LIBRARY

APPROVED BY-DATE SLB 14-12-93
CLIENT
TITLE MP129 SERIES WATER SAVER SYSTEM, ROUGHING-IN DRAWING

IF NO OTHER TOLERANCE GIVEN
DATE 10-09-93
SCALE NTS

GETINGE

GETINGE USA, Inc.
1777 East Henrietta Road
Rochester, NY 14623-3133

ORIGINAL SIZE C

DRAWING NUMBER HS3472
REV F
PAGE 2 of 2

Getinge provides complete solutions for effective and efficient cleaning, disinfection and sterilization in the healthcare and life science sectors. Our know-how comprises everything from architectural planning, production and handling equipment, to systems for full traceability of sterile goods. Our commitment covers expert advice, training and long-term technical support.

Addtitional Comments:

GETINGE

Getinge USA, Inc.
1777 East Henrietta Road
Rochester, New York 14623-3133 U.S.A.
Phone: (800) 475-9040
Fax: (585) 272-5116
info@getingeusa.com www.getingeusa.com

GETINGE

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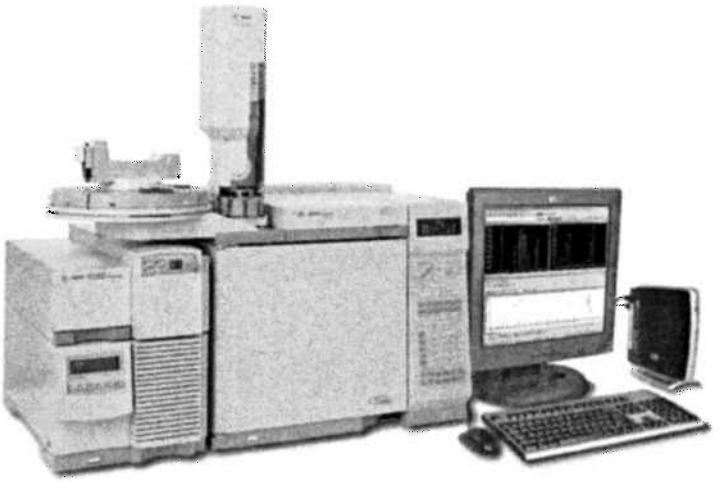
Agilent 5973 inert GC/MS System

Data Sheet



GC/MS

The Agilent 5973 inert Gas Chromatograph/Mass Spectrometer (GC/MS) is the latest in the 5973 series of mass selective detectors. This model provides improved inertness for reactive compounds resulting in better peak shape. This improvement is due to a new material for the ion source. Since this is not a coating, the inertness does not change with cleaning. This source is available as an upgrade for older 5973 series instruments.

The 5973 inert system is retention time locking (RTL) ready. RTL is a unique Agilent feature that allows creation of permanent and universal methods. Using RTL methods, the retention times do not change, even with column maintenance. The same retention times will be obtained on the GC/MS as they will on GCs with conventional detectors. It allows exact matching of peaks across multiple instruments, whether in the same lab or in another country. RTL databases for specific compound classes allow for rapid screening of a large number of compounds without injecting hundreds of standards.

The 5973 series instruments are known for their reliability, ruggedness, and long-life. The 5973 inert system offers even greater value with a 10-year use guarantee, whether it is purchased in the first or last year of production. This guarantee provides greater assurance for low-cost of ownership.

The Agilent 5973 inert GC/MS features:

- Proven ruggedness and reliability
- Improved, more inert EI source for better performance on active compounds
- Higher sensitivity
- Higher maximum source temperature
- Greater mass stability - better than 0.10 amu over 48 hours
- Enhanced software
- RTL-ready
- Short GC interface (<20 cm)
- Independently heated zones: transfer line, source, quad
- True hyperbolic gold-coated quadrupole
- Easy access to full ion optics
- High energy dynode and electron multiplier detector
- Two MS control per PC
- Four simultaneous signal acquisitions (up to 2 MS)
- Intelligent sequencing for samples
- Upgrade source for 5973 series GC/MSDs
- Compatibility with many third-party sampling devices
- Optional 21CFR11 compliance software
- Ten-year use guarantee

Agilent 5973 inert GC/MS System Data Sheet

Mass Spectrometer

Modes (standard)	Classical EI
Modes (optional)	PCI and NCI
Ion source type	Non-coated inert EI source
Ionization energy	5–241.5 eV
Ionization current	0–315 µA
Transfer line temperature	100 °C–350 °C
Ion source temperature	150 °C–300 °C
Quadupole temperature	150 °C–200 °C
Mass filter	Monolithic hyperbolic quadrupole
Mass filter protection	Entrance lens
Mass range	1.6–800 amu
Mass resolution	Unit mass adjustable by tune
Mass axis stability	Better than 0.10 amu/48 h
Detector	Electron multiplier with Replaceable horn
Dynamic range (electronic)	10e6
Scan rate (electronic)	6250 amu/s with 0.1 amu step size
Record rate	5200 amu/s
SIM	30 ions × 50 groups
Pumping system	Turbomolecular pump
Total flow	2 mL/min (standard turbo) 4 mL/min (performance turbo)
Instrument control	Data system and local user interface
Maintenance access	Source, filaments, lenses, mass filter, and detector on removable plate
Maintenance scheduling	Early maintenance feedback

Gas Chromatograph

Automatic injector (optional)	Automatic alignment, fast injection
Injector	Split-splitless (standard), others available
Oven temperature	Ambient +4 °C– 450 °C
Oven ramps/plateaus	6/7
Carrier gases	Helium, hydrogen, nitrogen, argon
Electronic pneumatic control	Auto pressure regulation for split/splitless, septum purge
Carrier gas control modes	Constant pressure and flow modes; pressure and flow programmable
Pressure range	0–100 psi (standard), 0–150 psi (optional) with 0.01 psi resolution, pressure and temperature corrected
Retention-time locking	RTL ready

Data system

Simultaneous MS and GC	Four signals (up to 2 MS) detector data acquisitions
Ionization mode autotunes	EI, PCI, NCI
Application autotunes	BFB, DFTPP
Quantitation setup	Automated
Application reports	Environmental, drugs of abuse, aromatics in gasoline
File import/export	Sequence file/quant and custom report
Customization	Macro language, report writer
Security	Password and audit trail
Spectral libraries (optional)	NIST, Wiley, Pfleger-Mauer Drug, Stan pesticide
Spectral and RTL databases (optional)	Pesticides and endocrine disrupters, volatiles, PCBs, toxicology, FAMEs, flavors, organotin compounds
21CFR11 Compliance	Optional software available
Support life	Ten-year use guarantee

Physical (EI system with standard turbo)

Dimensions	88 cm (w) × 56 cm (d) × 50 cm (h)
Weight	88 kg
Power	120 vac or 200–240 vac

Installation Checkout Specifications

All tests performed using an autosampler, split-splitless injector, and a 30 m × 0.25 mm × 0.25 µm HP-5MS column. All scan determinations use continuous linear scanning across the entire mass range. Noise selection, peak integration, and RMS s/n calculation performed by automated macro. Specifications are not comparable to those using different conditions. The system will exceed the following specifications at installation:

EI scan sensitivity	60:1 s/n for 1 pg OFN scanning from 50–300 amu at nominal *m/z* 272 ion
PCI scan sensitivity	75:1 s/n for 100 pg BZP scanning from 80–230 amu at nominal *m/z* 183 ion
NCI scan sensitivity	500:1 s/n for 1 pg OFN scanning from 50–300 amu at nominal *m/z* 272 ion

Other Sensitivity Specifications

EI SIM sensitivity	10:1 s/n for 20 fg OFN at nominal *m/z* 272 ion
PCI SIM sensitivity	10:1 s/n for 1 pg BZP at nominal *m/z* 183 ion
NCI SIM sensitivity	10:1 s/n for 1 fg OFN at nominal *m/z* 272 ion

Trace Repeatability

Results are for three replicate splitless injections of 1 pg OFN using MS detection and automated integration and processing. Specifications using a different compound, concentration, detectors, or conditions, are not comparable.

Trace RT repeatability	<0.0012 min
Trace area repeatability	<2.0% RSD

For More Information

For more information on our products and services, visit our Web site at www.agilent.com/chem

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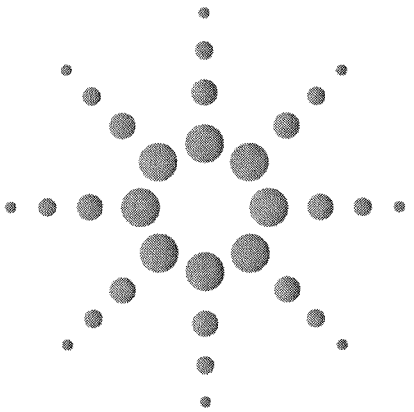
5988-9991EN

Agilent Technologies



5973N and 5973 inert Mass Selective Detectors

Site Preparation Guide

Agilent Technologies

Notices

Manual Part Number

G2589-90070

Edition

First edition, August 2003
Replaces part number G2589-90010

Printed in USA

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Wilmington, DE 19808-1610 USA

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Safety Notices

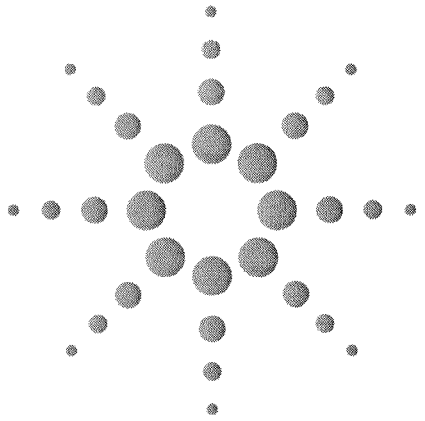
CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents



1
General Information

This section provides information on how to identify specifically what type of MSD you are working with as well as how to properly clean and dispose of the instrument. Also included in this section are the "Important Safety Warnings" which list critical safety precautions for all users.

Instrument Identification

Each 5973N and 5973 inert Mass Selective Detector (MSD) is identified by a unique 10-character serial number. This serial number is located on a label on the lower left side near the front of the instrument. On CI upgrades, a serial number is located on the flow module.

When corresponding with Agilent Technologies about your instrument, be sure to include the model number and both full 10-character serial numbers.

Write the serial number of your 5973 MSD here for reference:

5973N MSD version

The 5973N MSD is equipped with a diffusion pump. The serial number label displays a product number that tells what kind of MSD you have:

Product number	MSD type
G2577A	Diffusion Pump, EI

5973 inert MSD version

The 5973 inert MSD is equipped with either a standard turbomolecular pump or a performance turbomolecular pump. Chemical Ionization is available for the turbo MSDs only. The serial number label displays a product number that tells what kind of MSD you have:

Product number	MSD type
G2578A	Standard Turbo Pump, EI
G2579A	Performance Turbo Pump, EI
G2589A	Performance Turbo Pump, EI, NCI, PCI

This site preparation guide will refer to both 5973N and 5973 inert MSDs as 5973 Series MSDs unless noted otherwise.

Important Safety Warnings

Before moving on, there are several important safety notices that you should always keep in mind when using the 5973 Series Mass Selective Detector.

Many internal parts of the MSD carry dangerous voltages

If the MSD is connected to a power source, even if the power switch is off, potentially dangerous voltages exist on:

- The wiring between the MSD power cord and the AC power supply, the AC power supply itself, and the wiring from the AC power supply to the power switch.

With the power switch on, potentially dangerous voltages also exist on:

- All electronics boards in the instrument.
- The internal wires and cables connected to these boards.
- The wires for any heater.

WARNING **All these parts are shielded by covers. With the covers in place, it should be difficult to accidentally make contact with dangerous voltages. Unless specifically instructed to, never remove a cover unless the detector, inlet, or oven are turned off.**

WARNING **If the power cord insulation is frayed or worn, the cord must be replaced. Contact your Agilent service representative.**

Connecting the MSD to power sources that are not equipped with protective earth contacts creates a shock hazard for the operator and can damage the instrument.

Interrupting the protective conductor inside or outside the MSD or disconnecting the protective earth terminal creates a shock hazard for the operator and can damage the instrument.

Make sure the power cords supplied with the MSD are appropriate for your country and site before using them. Maintain easy access to the power cords so they can be disconnected during maintenance.

The use of incorrect or makeshift fuses or the short-circuiting of fuse holders creates a shock hazard for the operator and can damage the instrument. Replace fuses only with fuses of identical current rating and type.

Excessive fluctuations in the line voltage can create a shock hazard and can damage the instrument. Make sure the supply voltage does not fluctuate more than +5% or -10% from the rated voltage. This equipment must be installed in a Category II environment as defined in IEC 664.

Electrostatic discharge is a threat to MSD electronics

The printed circuit (PC) boards in the MSD can be damaged by electrostatic discharge. Do not touch any of the boards unless it is absolutely necessary. If you must handle them, wear a grounded wrist strap and take other antistatic precautions. Wear a grounded wrist strap any time you must remove the MSD covers.

Many parts are dangerously hot

Many parts of the MSD operate at temperatures high enough to cause serious burns.

You should always cool heated areas of the MSD to room temperature before working on them. They will cool faster if you first set the temperature of the heated zone to room temperature. Turn the zone off after it has reached the setpoint. If you must perform maintenance on hot parts, use a wrench and wear gloves. Whenever possible, cool the part of the instrument that you will be maintaining before you begin working on it.

WARNING **Be careful when working behind the gas chromatograph (GC). During cool-down cycles, the GC emits hot exhaust which can cause burns.**

WARNING **The insulation around the GC inlets, detectors, valve box, and the insulation cups is made of refractory ceramic fibers. To avoid inhaling fiber particles, we recommend the following safety procedures: ventilate your work area; wear long sleeves, gloves, safety glasses, and a disposable dust/mist respirator; dispose of insulation in a sealed plastic bag; wash your hands with mild soap and cold water after handling the insulation.**

Hydrogen

Hydrogen gas may be used as carrier gas, and/or as fuel for an FID. When mixed with air, hydrogen can form explosive mixtures.

WARNING **When using hydrogen (H_2) as the carrier gas or fuel gas, be aware that hydrogen gas can flow into the oven and create an explosion hazard. Therefore, be sure that the supply is off until all connections are made, and ensure that the GC inlet and detector column fittings are either connected to a column or capped at all times when hydrogen gas is supplied to the instrument.**

Hydrogen is flammable. Leaks, when confined in an enclosed space, may create a fire or explosion hazard. In any application using hydrogen, leak test all connections, lines, and valves before operating the instrument. Always turn off the hydrogen supply at its source before working on the instrument.

WARNING **The MSD cannot detect leaks in gas streams. For this reason, it is vital that column fittings should always be either connected to a column, or have a cap or plug installed.**

When using hydrogen gas, check the system for leaks as described by your local Environmental Health and Safety (EHS) requirements to prevent possible fire and explosion hazards. Always check for leaks after changing a tank or servicing the gas lines. Always make sure the vent line is vented into a fume hood.

Chemical safety

WARNING **The foreline pump exhaust and split vent exhaust will contain traces of the chemicals you are analyzing. These could potentially be toxic. Vent the foreline pump exhaust and split vent exhaust outside your laboratory or into a fume hood. Be sure to comply with all local environmental regulations.**

Safety and Regulatory Certifications

The 5973 Series Mass Selective Detector conforms to the following safety standards:

- Canadian Standards Association (CSA): C22.2 No. 1010.1
- CSA/Nationally Recognized Test Laboratory (NRTL): UL 61010A-1
- International Electrotechnical Commission (IEC): 61010-1
- EuroNorm (EN): 61010-1

The 5973 Series Mass Selective Detector conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interference (RFI):

- CISPR 11/EN 55011: Group 1, Class A
- IEC/EN 61326
- AUS/NZ

This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB–001 du Canada.

CE

The 5973 Series Mass Selective Detector is designed and manufactured under a quality system registered to ISO 9001.

Information

The Agilent Technologies 5973 Series Mass Selective Detector meets the following IEC (International Electro-technical Commission) classifications: Safety Class I, Transient Overvoltage Category II, Pollution Degree 2.

This unit has been designed and tested in accordance with recognized safety standards and is designed for use indoors. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. Whenever the safety protection of the MSD has been compromised, disconnect the unit from all power sources and secure the unit against unintended operation.

Refer servicing to qualified service personnel. Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.

Symbols

Warnings in the manual or on the instrument must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions violates safety standards of design and the intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

See accompanying instructions for more information.

Indicates a hot surface.

Indicates hazardous voltages.

Indicates earth (ground) terminal.

Indicates explosion hazard.

Indicates radioactivity hazard.

Indicates electrostatic discharge hazard.

Electromagnetic compatibility

This device complies with the requirements of CISPR 11. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

1. Relocate the radio or antenna.
2. Move the device away from the radio or television.
3. Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
4. Make sure that all peripheral devices are also certified.
5. Make sure that appropriate cables are used to connect the device to peripheral equipment.
6. Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.
7. Changes or modifications not expressly approved by Agilent Technologies could void the user's authority to operate the equipment.

Sound emission certification for Federal Republic of Germany

Sound pressure

Sound pressure Lp < 70 dB according to EN 27779:1991.

Schalldruckpegel

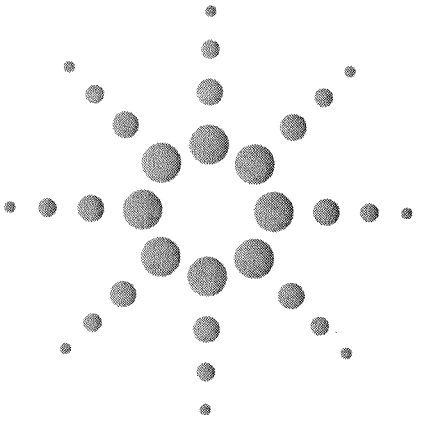
Schalldruckpegel LP < 70 dB am nach EN 27779:1991.

Cleaning

To clean the unit, disconnect the power and wipe down with a damp, lint-free cloth.

Recycling the Product

For recycling, contact your local Agilent sales office.



2
Site Preparation

This section describes how to properly prepare your site for a new MSD. Follow these instructions carefully as delays due to improper site preparation may result in loss of instrument use during the warranty period.

Overview

Before the 5973 Series Mass Selective Detector system can be installed, the site must be properly prepared. Site preparation includes, but is not limited to, ensuring that adequate facilities are available. Among the site requirements are:

- Adequate space is available for the MSD system.
- A suitable supporting bench is available.
- Adequate electrical power is available at the correct voltages and frequencies.
- Environmental control systems are adequate to maintain a correct, stable operating environment.
- Preparations for safe exhaust venting are adequate.
- Supplies necessary for instrument operation are available, including solvents, carrier and reagent gasses, and printer paper.

NOTE Installation and verification will **only** be performed using helium carrier gas.

Delays due to inadequate site preparation could cause loss of instrument use during the warranty period. In extreme cases, Agilent Technologies may ask to be reimbursed for the additional time required to complete the installation. Agilent Technologies provides service during the warranty period and under maintenance agreements only if the specified site requirements are met.

Customer responsibility

Unless previous arrangements have been made with Agilent Technologies, site preparation is the customer's responsibility. Customer responsibilities include, but are not limited to:

- Planning, scheduling, and preparing the site according to the specifications in this manual

- Verifying that the electrical environment is safe and adequate for the MSD system installation and operation
- Complying with all local laws (codes, ordinances, and regulations) for mechanical, building, and electrical distribution systems, hazardous waste disposal, and chemical storage.
  Compliance must exist prior to installation.
- Providing lifting equipment adequate to unload the system from the delivery vehicle and transport it to the site where it will be installed
- Providing someone to help lift the MSD onto the laboratory bench
- Providing adequate secure storage space for the system until it can be installed by an Agilent Technologies representative

Agilent responsibility

An Agilent Technologies service representative will install the MSD and verify its performance. The service representative's responsibilities are limited to:

- Unpacking the MSD system and verifying that all components are present and undamaged
- Connecting the carrier gas line to the instrument from the tank, regulators, and lines previously installed by the customer
- Installing, connecting, and turning on MSD system components
- Verifying that the system meets Agilent Technologies performance standards
- Providing **basic** user familiarization for system hardware and software
- Signing the customer up through the Response Centers for instrument and software support

Agilent Technologies is not responsible for:

- Any task not listed in the *5973 Series MSD Hardware Installation Manual* (G2589-90073) or the installation guides for the GC, data system, and other accessories
- Installing helium carrier gas or reagent gas tanks and regulators
- Connecting or verifying the performance of hardware and software not provided by Agilent Technologies

NOTE Items that do not include installation by Agilent Technologies must be installed by the customer.

- Connecting the MSD/ChemStation system to the building network
- Testing the MSD against customer standards or samples
- Providing detailed instruction in the operation of the computer operating system and MSD software

NOTE Contact Agilent Technologies for information concerning training classes.

- Setting up laboratory procedures

NOTE Contact Agilent Technologies for information concerning Application Assist or Chemical Analysis Consulting services.

- Operating the MSD system following installation

Other documentation

Additional information is contained in the following documentation:

- *5973N* or *5973 inert Mass Selective Detector Hardware Manual*, which is located on the *5973N and 5973 inert Mass Selective Detector User Information* CD-ROM
- *5973 Network Mass Selective Detector Site Preparation manual* or *5973 inert Mass Selective Detector Site Preparation Guide*
- 6890 Series GC manuals
- GC accessories (autosampler, etc.) manuals
- G1701DA MSD Productivity ChemStations software manuals and online help
- The appropriate sensitivity specifications for your instrument:

  5973N: Agilent publication 5968-7358E
  5973 inert: Agilent publication 5988-9991EN
- *Hydrogen Carrier Gas Safety Guide* (5955-5398)

For updated information, see the Agilent Technologies website at http://www.agilent.com/chem.

Space and Weight Requirements

Table 1 lists dimension and weight information for the MSD and related components. Your site must have enough bench space for the MSD, GC, data system, and accessories. In addition, there must be sufficient space around the system for ventilation and maintenance access. At least 30 cm (12 inches) to the left of the MSD and at least 20 cm (8 1/4 inches) behind the MSD must be kept clear.

Benches must be sturdy enough to support the weight of the entire system.

The foreline pump can be located on the laboratory bench or on the floor. It must be close to the MSD because it is connected by a 200-cm (79-inch) hose. The hose is stiff and cannot be bent sharply.

CAUTION Do not put the foreline pump on your laboratory bench if vibration-sensitive equipment is located on the bench.

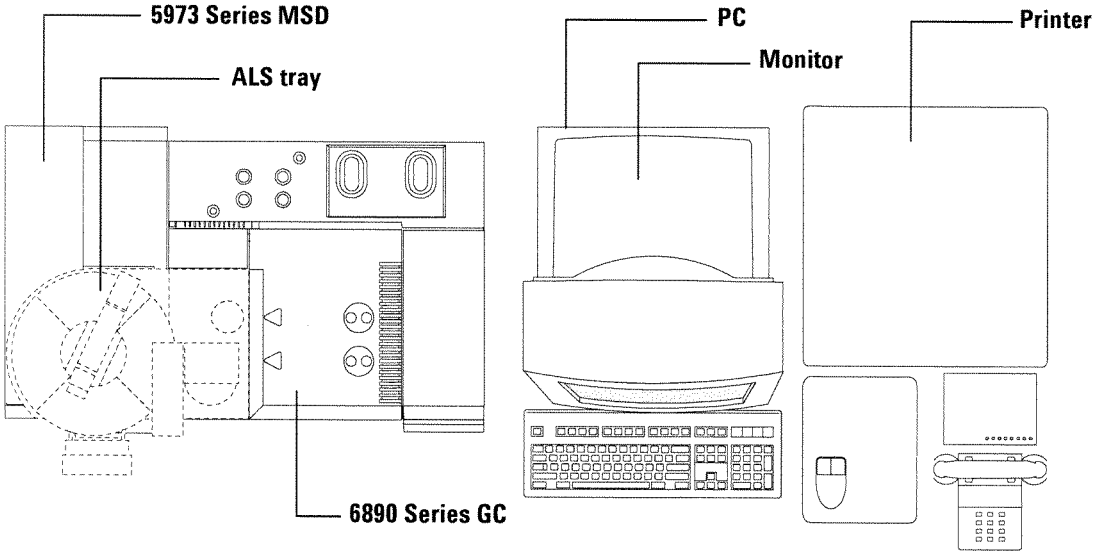


Table 1 Product dimensions*

Product	Dimensions, cm (in)			
	Height	**Width**	**Depth**	**Weight, kg (lb)**
5973 Series MSD†				
G2577A Diffusion pump EI MSD	40.6 (16)	29.8 (11.75)	54 (21.25)	36 (80)
G2578A Standard turbo EI MSD	40.6 (16)	29.8 (11.75)	54 (21.25)	39 (85)
G2579A Performance turbo EI MSD	40.6 (16)	29.8 (11.75)	54 (21.25)	44 (95)
G2589A EI/PCI/NCI MSD	40.6 (16)	30.3 (12.01)	54 (21.25)	46 (100)
6890 Series GC	50.0 (21)	58.5 (23)	50.0 (21)	50.0 (110)
Data System	Data system size and weight depend on the components included in the data system. Reserve at least 100 cm (39 in) of bench space for the data system. A typical data system weight is 34 kg (75 lb).			

* All dimesions are approximate

† Be sure to plan for the space for your carrier and reagent gas source(s).

NOTE The specifications in Table 1 are for a single MSD ChemStation configuration. Two-MSD configurations require additional table space. The second GC/MSD system can be located on a different table, connected to the ChemStation with a network cable.

Communications Requirements

Telephone

A telephone with a cord long enough to be used at the computer will allow the MSD operator to communicate with Agilent Technologies support personnel. In addition, a second analog phone line is strongly recommended to allow remote control and diagnosis of the MSD through a modem. This is **required** for some service contracts.

Building network

If you intend to connect your MSD system to your building's network, you must have an additional shielded twisted pair (STP) network cable.

NOTE

Agilent Technologies is not responsible for connecting to or establishing communication with your building network. The representative will test the 5973 Series MSD's ability to communicate on a mini-hub only.

NOTE

The IP addresses assigned to the instrument(s) and the ChemStation PC must be **fixed** (permanently assigned) addresses. If you intend to connect your MSD system to your building's network, each piece of equipment (the MSD, the GC, and the PC) must have a unique IP address assigned to it.

Electrical Requirements

You are responsible for providing appropriate electrical power and power outlets for all of the components in your 5973 Series MSD system. Power considerations include:

- Voltage ranges of major components
- Power configurations
- Power requirements
- Power plugs and cords

Voltage ranges of major components

The 5973 Series MSD includes a full-range power supply that can operate without reconfiguration on either of two wide ranges of single-phase alternating current (AC) electrical power:

- 120 VAC +5/-10%, 50/60 Hz ± 5% (typical for North America)
- 200-240 VAC +5/-10%, 50/60 Hz ± 5% (typical for Europe and Japan)

The foreline pump also draws its power from the MSD. However, a different foreline pump is supplied depending on the voltage range on which the MSD will be operating. The pump is supplied according to the standard voltage in the country from which the order originates. For example, if an order originates from an Agilent Technologies sales office in Germany, the foreline pump supplied will be configured to operated on the standard voltage and frequency of electrical power in Germany.

NOTE The MSD does not support 100 VAC input power. In countries that have only 100 VAC power, a step-up transformer must be used to provide the appropriate voltage to the MSD.

CAUTION If an instrument is being ordered from one location, but is to be installed in another location with different electrical power characteristics, this must be noted on the order. A special note must also be made if the electrical power at the site is different from the standard electrical power in that country.

Power configurations

Electrical power for the MSD may be delivered in either single-phase or 208-Wye configuration. Correct grounding for the 208-Wye configuration must be verified by an electrician. The neutral wire **cannot** be used for safety grounding. The ground wire should carry zero current except for ground-fault current or static electric discharge. The entire system should share an isolated, noise-free electrical ground. This system ground should be electrically separate from the ground for the rest of the building, back to the main ground for the facility. Power configurations are provided in Table 2.

WARNING **Connecting an MSD to a power source which is not equipped with a protective earth contact (ground) creates a shock hazard for the operator and can damage the instrument.**

WARNING **Interrupting the protective conductor inside or outside the MSD or disconnecting the protective earth terminal (ground) creates a shock hazard for the operator and can damage the instrument.**

Table 2 Power configurations

Configuration	Measurement	Nominal voltage
Single phase, 120 VAC	Line to neutral	120 VAC*
	Line to ground	120 VAC*
	Ground to neutral	< 0.5 V rms
Single phase, 200-240 VAC	Line to neutral	200, 220, or 240 VAC*
	Line to ground	200, 220, or 240 VAC*
	Ground to neutral	< 0.5 V rms
208-Wye	Line to line (phase A to phase B)	208 VAC
	Line to ground (phase A to ground)	120 VAC
	Line to ground (phase B to ground)	120 VAC

* Varies with country and/or region

Power requirements

Table 3 lists the power requirements for the 5973 Series MSD and related equipment. Extra power capacity for future additions is a very good idea.

Each product listed requires a dedicated circuit. The MSD, GC, and data system must each have a separate circuit breaker. All of the equipment **must** share a common ground.

Power must meet the stability specifications listed in Table 3. Use a line monitor to check power stability. If your line power is unstable, you may need to install a line conditioner.

Table 3 Power requirements

Product	Line voltage	Maximum continuous power consumption	Supply circuit rating	Outlets required
5973 Series MSD*	120 VAC +5/-10%, 50/60 Hz ± 5%	900 VA (400 VA for foreline pump only)	15 A	1
	200-240 VAC +5/-10%, 50/60 Hz ± 5%	900 VA	15 A	1
6890 Series GC and ALS	120 VAC +5/-10%, 50/60 Hz ± 5%	1000 VA[2]	20 A	1 or 2
	200-240 VAC +5/-10%, 50/60 Hz ± 5%	1000 VA†	15 A	1 or 2
Gauge controller	100-240 VAC			1
ChemStation PC	100-120 or 220-240 VAC +5/-10%, 50/60 Hz ± 5%	1000 VA[2]	15 A	3 to 5

* The MSD operates on either voltage range. The foreline pump and the diffusion pump are supplied for one voltage range or the other based on the standard voltage in the country where the order originates.

† Depends on product configuration.

WARNING **Excessive fluctuations in the voltage of the power supply can create a shock hazard and can damage the instrument. Make sure the supply voltage does not fluctuate more than +5% or –10% from the rated voltage. This equipment must be installed in a Category II environment as defined in IEC 664.**

Power plugs and cords

The MSD is supplied with a power cord and plug appropriate for the country from which the order originates. For example, if an order originates from a Agilent Technologies sales office in Germany, the power cord and plug supplied will be compatible with the standard voltage and outlet configuration in Germany. See "Power Cords" on page 43 for illustrations of the power cords available.

Data system components also include power cords with plugs appropriate for the country where the order was placed.

Power cord lengths for the MSD and the data system components and accessories are approximately 2.3 m (7.5 ft).

CAUTION If an instrument is being ordered from one location, but is to be installed in another location with different electrical power characteristics, this must be noted on the order. A special note must also be made if the electrical power at the site is different from the standard electrical power in that country.

WARNING **Make sure the power cords supplied with the MSD are appropriate for your country and site before installing the instrument. See "Power Cords" on page 43.**

WARNING **Do not use extension cords with the MSD or GC. Extension cords normally do not provide enough power and can be a safety hazard.**

NOTE Maintain easy access to the power cords so they can be disconnected for maintenance.

Other electrical considerations

Additional electrical considerations include:

- Electromagnetic interference (EMI), such as is generated by NMRs, radio transmitters, and microwave links, may interfere with system performance.
- Protect the system from static electricity by observing humidity and temperature requirements. Minimize the presence of non-conductive products such as carpets and vinyl floor tiles.
- Install emergency-off pushbuttons that can disconnect power to the ventilation system and all electric equipment in the room except overhead lighting.

- Provide separate convenience outlets for building maintenance and other appliances. Convenience outlets must be on circuits separate from the MSD system. Convenience outlets must share the normal building distribution ground, **not** the MSD system ground.
- In some geographical areas it may be advisable to install lightning protection for personnel and equipment.

Air Conditioning Requirements

Air conditioning considerations include temperature, humidity, airborne dust, and exhaust venting. Each of these is considered in more detail in the following material.

Temperature and humidity

The 5973 Series MSD is specified for operation under the following conditions:

- Operation requires constant temperature (variations < 2 °C/hr)
- Operation and storage require a non-condensing, non-corrosive atmosphere
- The temperature and humidity limits in Table 4

Table 4 Temperature and humidity limits

	Temperature	Humidity (relative)
Operation	15 °C to 35 °C (59 °F to 95 °F)	40% to 80%
Storage	-20 °C to 70 °C (-4 °F to 158 °F	0% to 95%

Environmental control systems must maintain these temperature and humidity ranges.

The MSD is rated for 900 Watts (3000 BTU/hr). The GC and the data system also contribute significantly to the cooling load although the exact amounts depend on their configurations. Additional allowances should be made for other heat sources such as heat from other equipment, heat from adjacent rooms, and heat from laboratory personnel.

Airborne dust

Agilent Technologies recommends a maximum airborne particle density of 55 $\mu g/m^3$. If you suspect your site exceeds this limit, contact your local Agilent Technologies Customer Service Organization. Customer Engineers with special training and equipment can test for airborne particle density. They can offer suggestions for reducing airborne dust.

Exhaust venting

There are two sources of exhaust on the GC/MSD system: the foreline pump and the GC split vent. The foreline pump outputs gas removed from the vacuum manifold by the high vacuum pumps. The foreline pump exhaust will also contain traces of solvent and sample.

WARNING **User safety requires that the exhaust gases from the MSD be vented externally to the building and not recirculated by the environmental control system. Health hazards include chemical toxicity of solvents, samples, derivitizing agents, pump fluid vapor, and aerosolized biological samples.**

WARNING **The pump exhaust contains carrier gas and traces of solvents, analytes, and foreline pump oil. The supplied oil trap stops only pump oil. It does *not* trap or filter out toxic chemicals. If you are using toxic solvents or toxic or flammable carrier gas, or analyzing toxic chemicals, do not install the oil trap. Install a hose to take the pump exhaust to a fume hood. Do not use the oil trap on any CI MSD.**

The foreline pump exhaust **cannot** be vented into the laboratory if any hazardous materials will be introduced into the GC/MS system, including samples, solvents, carrier gases, and reagent gases. It must be vented external to the building or vacuum exhausted to a fume hood.

If a negative pressure vent is not available, the length of tubing from the foreline pump to an ambient pressure vent should not exceed 460 cm (15 ft). The exhaust can **not** be connected to a positive pressure vent.

Exhaust gas venting must comply with all local environmental and safety codes.

Fume (exhaust) hood

An auxiliary work space and fume hood are needed for some maintenance procedures.

WARNING **Hydrogen is potentially explosive. Take extreme care when using hydrogen as the GC carrier gas in a GC/MS system. Read the *Hydrogen Carrier Gas Safety Guide* (5955-5398) before operating the MSD with hydrogen carrier gas.**

Carrier and Reagent Gas Requirements

Table 5 lists the specifications for the carrier and reagent gases.

Table 5 Carrier and reagent gas requirements

	Purity	Typical pressure range (psi)	Typical flow (mL/min)
Helium (required)	99.999% or better and hydrocarbon free	50 to 80	20 to 50 (column and split flow)
Methane reagent gas (required for CI operation)	Research or SFC grade, 99.999%	15 to 25	1 to 2
Isobutane reagent gas (optional)	Instrument grade, 99.999%	15 to 25	1 to 2
Ammonia reagent gas (optional)	Research or SFC grade, 99.9995%	5 to 8	1 to 2
Carbon dioxide reagent gas (optional)	SFC Grade, 99.995%	15 to 25	1 to 2

WARNING **Methane is flammable and ammonia is corrosive and toxic. Read and follow the safety information that comes with the gases.**

Regulators, tubing, and fittings

You must supply an appropriate regulator for your carrier and reagent gas. The regulator must be able to supply gas in the specified pressure range. It must have one outlet with 1/4-inch Swagelok fittings. See the Agilent Technologies Chemical Analysis Columns and Supplies Catalog or visit the Agilent Technologies Chemical Analysis website at http://www.agilent.com/chem for dual-stage regulators available from Agilent Technologies.

You must supply fittings, ferrules, and connectors of a Swagelok design for the 1/8-inch tubing.

Laboratory Supply Requirements

Laboratory supply requirements vary with applications.

Cleaning solvents

Cleaning tasks for the MSD require the following HPLC-grade (or better) solvents:

- Methylene chloride
- Isopropyl alcohol
- Methanol
- Acetone
- Water

Proper storage, handling, and disposal of these chemicals is required for personal and environmental safety.

CAUTION Carbon disulfide used as a sample solvent is corrosive and will damage the MSD analyzer. Using carbon disulfide will void the warranty on the analyzer.

WARNING **Chemical solvents should be considered hazardous and must be handled with care. Contact your chemical supplier for solvent handling and safety information, preferably a material safety data sheet (MSDS).**

Data system supplies

You will need paper for printing the results of the testing done during installation and later for printing reports of your analyses. You will also need appropriate hardware and media (flexible disks, tape cartridges, CD writers, etc.) for making backup copies of your data files.

NOTE

Agilent Technologies does not include CD writers with MSD systems. These are available from many suppliers.

Spare parts and consumables

The supplies and parts listed in Table 6 are used in the operation and maintenance of a 5973 Series MSD system. Keeping these parts on hand can reduce system downtime related to instrument maintenance and repair.

Table 6 Maintenance supplies and consumables

Description	Part number
Miscellaneous consumables	
One-year maintenance kit	5183-0296
He/H_2 gas filter for GC	5182-3468
Abrasive sheets (5/pk)	5061-5896
Cloths, lint-free (15/pk)	05980-60051
Cotton swabs (100/pk)	5080-5400
Diffusion pump fluid, 18.5 mL, approximately 30 mL needed (diffusion pump MSDs only)	6040-0809
Foreline pump oil, Inland 45, 1 liter	6040-0834
EI filament (2/pk)	05972-60053
EI high temp filament	G2590-60053
Octafluoronapthalene (OFN)	8500-5441
Gloves, clean	
large	8650-0030
small	8650-0029
Nitrile rubber gloves, medium	9300-1751
Filaments	
CI (2/pk)	G1099-80053

Table 6 Maintenance supplies and consumables (continued)

EI filament (2/pk)	05972-60053
EI high temp filament	G2590-60053
Chemical Consumables	
PFTBA (EI calibration fluid)	05971-60571
PFDTD (CI calibration fluid)	8500-8130
EVAL A (evaluation sample)	05990-60045
OFN (Octafluoronapthalene)	8500-5441
Benzophenone	8500-5440
Diffusion pump fluid (2 required)	6040-0809
Foreline pump oil, Inland 45, 1 liter	6040-0834
Gas Filters	
He/H_2 gas purifier for GC	RMSH-2
Methane/Isobutane gas purifier for CI MSD	G1999-80410
Commonly used tools	
Safety glasses	9300-1159
Wrenches	
1/2-inch x 9/16-inch, open end	8710-0877
Ferrules	
Blank, graphite-vespel	5181-3308
GC/MSD interface	
0.3-mm id, 85% Vespel 15% graphite, for 0.10-mm id columns	5062-3507

Table 6 Maintenance supplies and consumables (continued)

0.4-mm id, 85% Vespel 15% graphite, for 0.20-mm id and 0.25-mm id columns	5062-3508
0.5-mm id, 85% Vespel 15% graphite, for 0.32-mm id columns	5062-3506
0.8-mm id, 85% Vespel 15% graphite, for 0.53-mm id columns	5062-3538
Injection port	
0.27-mm id, 90% Vespel 10% graphite, for 0.10-mm id columns	5062-3518
0.37-mm id, 90% Vespel 10% graphite, for 0.20-mm id columns	5062-3516
0.40-mm id, 90% Vespel 10% graphite, for 0.25-mm id columns	5181-3323
0.47-mm id, 90% Vespel 10% graphite, for 0.32-mm id columns	5062-3514
0.74-mm id, 90% Vespel 10% graphite, for 0.53-mm id columns	5062-3512

Receiving the System

When your MSD system is delivered, it is your responsibility to provide for removal of the shipping containers from the truck and their storage until installation. Contact your Agilent Technologies service representative as soon as your shipment arrives to arrange an installation date.

Delivery and unloading

The shipping containers are large and heavy. The largest container in the shipment is
121.9 cm (48 inches) x 121.9 cm x 121.9 cm. It contains several smaller cartons that can be removed from the large container after delivery to facilitate moving them to the location where the instrument is to be installed. After removing the smaller cartons and discarding the outer container, the largest remaining carton, which contains the GC, is approximately:

- 88.9 cm (35 inches) high
- 81.3 cm (32 inches) wide
- 73.7 cm (29 inches) deep
- 60 kg (132 lbs)

All doorways, hallways, floors, and elevators must be able to accommodate the largest, heaviest container.

Inspecting for damage

Once the shipping containers are unloaded, examine them for any obvious **external** damage. If any of the containers appear damaged, note on the carrier's bill of lading that there is: *Apparent damage - subject to inspection and test.* Arrange for both the carrier's claims representative and your Agilent Technologies service representative to be present when the containers are unpacked.

Do not open any of the shipping containers unless a representative of Agilent Technologies is present. **Opening any of the containers without an Agilent Technologies representative being present will void the receiving warranty on the instrument**.

Storage

It is your responsibility to store the containers until installation. If your site does not have adequate storage space, the containers may be stored at your expense in a bonded warehouse. Allow space for data system and accessory containers too.

The environment in the storage area should be between 5 °C and 50 °C (41 °F and 122 °F), 20% to 80% relative humidity, non-condensing and non-corrosive.

Unpacking

Do not open any shipping containers until an Agilent Technologies representative is present. Warranty claims for missing items will not be honored unless an Agilent Technologies representative is present to verify the contents of each container as it is unpacked.

The actual shipping containers become your property and should not be returned to Agilent Technologies.

Installation and Verification

Installation

Once the installation has begun, it should progress in a timely manner to completion. Delays due to inadequate site preparation could cause loss of instrument use during the warranty period. In extreme cases, Agilent Technologies may ask to be reimbursed for the additional time required to complete the installation.

The primary user and, if possible, all other users of the MSD should be present during installation to receive familiarization instruction from the Agilent Technologies service representative.

Verification

The final step in the installation process is system verification. Your Agilent Technologies service representative will test the system against Agilent Technologies specifications as documented for the product(s) or system(s) you have purchased. (Not all tests are performed for every system.)

The Agilent Technologies service representative will not test your system against your standards or samples. Further, the Agilent Technologies service representative will not set up your laboratory procedures. Assistance with laboratory procedures can be obtained from your local Agilent Technologies Applications Engineer (AE) on a consulting basis at additional cost.

Sensitivity specifications

See the appropriate sensitivity specifications for your instrument type:

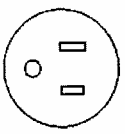
5973N: Request Agilent publication 5968-7358E
5973 inert: Request Agilent publication 5988-9991EN

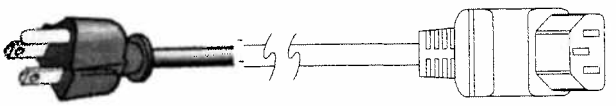
NOTE SIM performance verification is not performed at installation and must be purchased if desired.

A
Power Cords

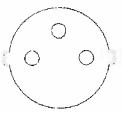
This appendix shows the power cords available for the 5973 Series MSD. See page 26 for information about ensuring that the correct power cord is supplied with your system.

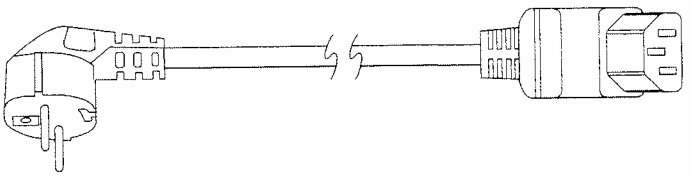
US and Canada, NEMA 6-15P (Part number 8120-6825)



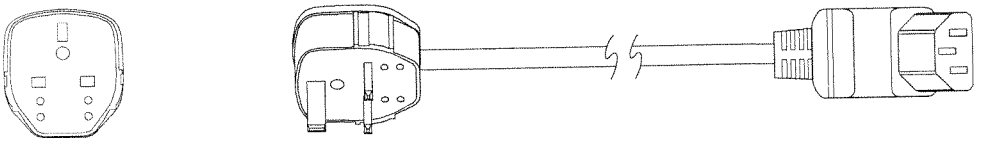


European Power, CEE 7/7 (Part number 8120-1689)

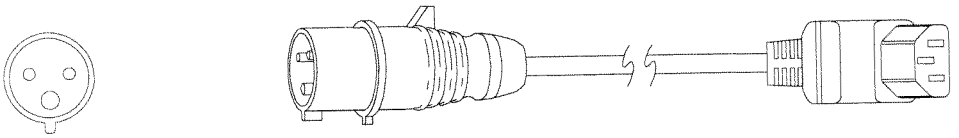




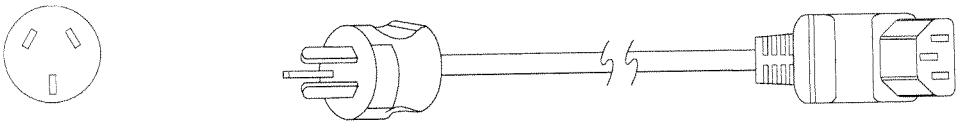
UK / Hong Kong, BS 1363 (Part number 8120-1351)



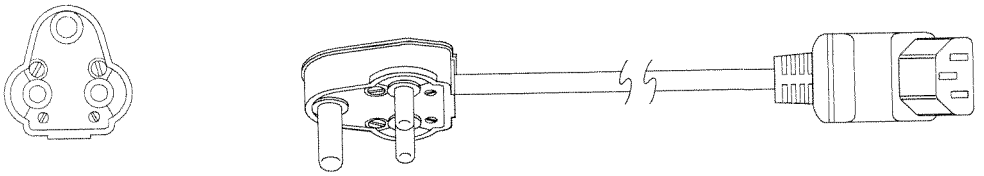
Denmark/Greenland, IEC 309 (Part number 8120-3997)



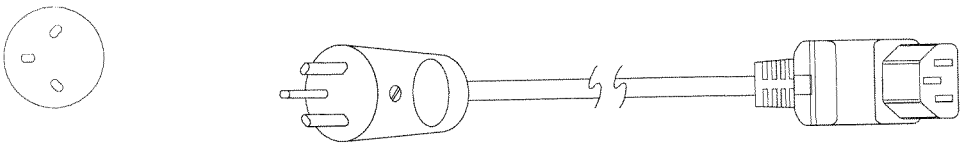
Australia / New Zealand, AS 3112-1981 (Part number 8120-1369)



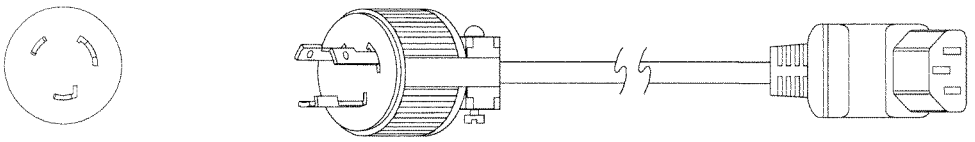
India / South Africa, BS 546 (Part number 8120-4211)



Israel, SI 32 (Part number 8120-5182)



Japan, NEMA L6-20P (Part number G2025-60189)



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