APC Silcon 60-80kW 208/480V UPS Installation Guide



www.apcc.com

Copyright ©2000 APC Denmark ApS

Information in this document is subject to change without notice and does not represent a commitment on the part of the vendor

Thank You!
Thank you for investing in the APC Silcon 60-80kW 208/480V UPS. Please read this Installation Guide thoroughly prior to installing the system. It provides important information on safe and efficient installation.

The installation and use of this product must comply with national, federal, state, municipal and local codes.

Safety Symbols used in this manual:



WARNING! Indicates a hazard which, if not avoided, could result in injury or death.



CAUTION! Indicates a hazard which, if not avoided, could result in damage to the product or other property.

NOTICE! Read and pay attention to this important information.



WARNING!
This UPS unit contains hazardous AC and DC voltages. Only qualified electricians should install the UPS, AC line and external batteries, and must be familiar with batteries and battery installation.
Before installing, maintaining or servicing the UPS, shut off the UPS and disconnect all sources of AC and DC power.
As the UPS has no built-in disconnection devices to switch off external AC and DC input power, ensure that disconnection devices are provided as separate parts in connection with the installation!
The installer must provide each external disconnecting device for this UPS system with labels with the following text:
"Isolate the Uninterruptible Power Supply (UPS) as instructed in this guide before working on circuit".
AC and/or DC voltage will always involve a potential AC voltage at UPS output generated from either batteries or utility. To avoid equipment damage or personal injury, always assume that there may be voltage at UPS output.
This system is equipped with an auto-start function. If activated the system may start without warning. Refer to the "Programming" section for information on de-activation.

TEST BEFORE YOU TOUCH!
To reduce the risk of fire or electric shocks, install the UPS and external batteries in a temperature and humidity controlled indoor area, free of conductive contaminants.

UPS batteries are high-current sources. Shorting battery terminals, DC terminals or DC busbars can cause severe arcing, equipment damage and injury. A short circuit can cause a battery to explode. Always wear protective clothing and eye protection and use insulated tools when working on batteries.



CAUTION!
This unit contains components sensitive to electrostatic discharge (ESD). If you do not follow the ESD procedures, you may cause severe dammage to electronic components.



PLEASE RECYCLE
The shipping materials for the APC Silcon UPS are recyclable. Please save them for later use or dispose of them appropriately.

990-4048

Contents:

1.0	Introduction	6
1.1	Tools and Equipment	6
2.0	Unpacking/Identification of Equipment	7
3.0	Installation	13
3.1	Requirements on Site	13
3.2	Dimensions and Weight	13
3.2.1	UPS Dimensions and Weight of UPS	13
3.3	Footprint	14
3.3.1	39.37 in/1000 mm Cabinet 60kW, 80kW 480V	14
3.3.2	39.37/1000 inch/mm 208V	15
4.0	External Connection	16
4.1	Connecting the UPS (208V/480V)	16
4.1.1	Installing Conduit Boxes	16
4.1.2	Connecting Cable Terminals	18
4.1.3	Cable Terminal Connections (208V)	20
4.1.4	Connection Terminals	21
4.1.5	Torque Specifications	21
4.1.6	Grounding	21
4.2	System Integration Interface	22
4.2.1	Connecting the System Integration Interface Board (SII-board)	23
4.3	Parallel Board	27
4.4	Communication Interface Board	29
4.4.1	Connections	29
4.5	Smart Slot	30
4.6	APC Silcon Triple Chassis	31
4.6.1	Safety Warnings	31
4.6.2	Product Description	31
4.6.3	Installing Management Peripherals	32
4.6.4	Powering the APC Silcon Triple Chassis	34
4.6.5	Troubleshooting	35
4.6.6	Product Specifications	36
4.7	APC Silcon Battery Cabinets	39
4.8	External DC Connection	41
4.8.1	60-80kW 208/480V	41
4.9	Battery Breaker Box	42
4.9.1	Interconnection	43
4.9.2	Mounting and Connection	43
4.9.3	UPS with External Battery via Battery Breaker Box	44
4.10	UPS Installations in Computer Rooms	44
4.10.1	EPO Principle	45
4.10.2	Emergency Power Off (EPO) for UPS	47
5.0	Programming	48
5.1	Parameters	48

990-4048

	5.1.1	Programming Keys	49
	5.1.2	Programming Example - Switch to Bypass Operation	49
	5.2	System Configuration	50
	5.2.1	Programming Example - Change Boost Charge Voltage to 446V	52
	5.2.2	Programming Example - Change to Output Isolation Transformer Available	53
	5.3	Programming Parameters for Advanced Parallel Operation	54
	5.3.1	Description of Settings	54
	5.3.2	Programming Example	54
	5.4	Battery Monitor	55
	5.4.1	Installation of new batteries:	55
6.0	Options/Accessories		56
	6.1	Service Bypass Panel for Single Operation	56
	6.1.1	UPS with 1-module SBP and External Battery via Battery Breaker Box - Single Utility - 3-wire Grounded WYE Service	58
	6.1.2	UPS with 1-module SBP and External Battery via Battery Breaker Box - Single Utility - 4-wire Grounded WYE service	59
	6.1.3	Mounting and Connecting	59
	6.2	Service Bypass Panel for Parallel Redundant Operation	61
	6.2.1	Parallel/Redundant UPS with 2-module SBP and External Battery via Battery Breaker Box - Single Utility - 4-wire Grounded WYE Service	64
	6.2.2	Parallel/Redundant UPS with 2-module SBP and External Battery via Battery Breaker Box - Single Utility - 3-wire Grounded WYE Service	65
	6.2.3	Mounting and Connection	66
	6.3	Relay Board	67
	6.3.1	Relay Board Functions	67
	6.3.2	Cable Sizes	69
	6.4	Seismic Anchoring	69
	6.4.1	Mounting Seismic Anchoring without Conduit Box	69
	6.5	NEMA 12 Cover	71
	6.5.1	Mounting NEMA 12 Cover	71
	6.6	Remote Display	73
	6.6.1	Extension of Remote Display Communication Distance	73
	6.6.2	Remote Display Installation	75
	6.6.3	Remote Display Use	76
	6.7	Isolation Transformer Module	77
	6.7.1	Requirements on Site	77
	6.7.2	Footprint	78
	6.7.3	Connecting Isolation Transformer	79
	6.7.4	Isolation Transformer - Diagram Delta WYE Configuration (Dyn11)	81
	6.7.5	Grounding of Isolation Transformer	81
	6.7.6	Wiring up UPS system with Optional Dyn11 Isolation Transformer	82
	6.7.7	Top Cable Entry Modules	85
	6.8	Intersystem Synchronization Unit	88

7.0 System Specifications 89
7.1 Technical Data 89
8.0 Warranty 90
8.1 APC Silcon Series® Limited Factory Warranty 90
9.0 Appendix 91
9.1 Table 1 - Installation Planning Data 91
9.2 Table 2 – Table 310-16 92
10.0 How to Contact APC 94

Introduction

1.0 Introduction

Power regulation varies from country to country, and the information given in this installation guide can therefore only be of a general nature. Electricians should always refer to national and local electrical codes prior to installing the UPS system.

1.1 Tools and Equipment



CAUTION!
Heavy equipment. To prevent personal injury or equipment damage, take extreme care when handling and transporting UPS cabinet and equipment.



CAUTION!
Ensure that front doors are in place and that internal front cover is fastened by screws before attempting to lift or transport the system.

This section lists all tools and equipment required to install all UPS configurations. See also section 4 for further details on connection.

Tools:

- 0.4” or 10mm socket
- 0.5” or 13mm socket-deep
- 0.7” or 17mm socket
- 3/4” or 19mm socket-deep
- 3/4” or 19mm combo wrench
- Small flat/regular screwdriver
- #3 philips screwdriver
- Compression lug crimp tool
- Knock-out set (for conduit)

Equipment:

- Compression lugs for cable terminations
- Cable to service bypass panel from system feeder
- Cable to UPS input from service bypass panel
- Cable to service bypass panel from UPS output
- Cable from service bypass panel to customer distribution
- Cable to UPS input from external batteries/external Battery Breaker Box (systems with external battery)
- Solid core, control cable to UPS from service bypass panel
- Solid core, control cable to UPS from external batteries/external Battery Breaker Box
- Conduit necessary for above listed cabling

2.0 Unpacking/Identification of Equipment

NOTICE
Unless otherwise specified by the shipping company use a fork lift to unload equipment from pallet.

1. Unpack system.
2. Verify compliance between type label on reverse side of front door and system ordered. Check input and output voltage.
3. Copy the type label data to label copy below for easy identification of the system.
4. Use a fork lift to transport the system to installation site.
5. Open UPS doors and unscrew metal straps mounted on front cover of UPS.



Unpacking/Identification of Equipment

Copy of type label 208V

www.apcc.com

Hotline Support US/Canada/LAM 800 800 4APC
Hotline Support EMEA +353 91 70 2000
World Wide Support numbers www.apcc.com/support/service/geomap_world.cfm

Place label according to SKU no.	SKU no.	Model	Voltage	Current in/out	Weight	Battery				
			3Ø+N+PE 60Hz			Nom. V DC	AH	Current	Backup time	Type
	SL10KF	APC SILCON 10KW 208V UPS W/TERMINALS F. EXT. BATTERIES 10kVA 10kW	208	32.6A / 27.8A	420 LBS	±192	N/A	28A	N/A	N/A
	SL10KFB1	APC SILCON 10KW 208V UPS W/ 1 BPI 10kVA 10kW	208	32.6A / 27.8A	805 LBS	±192	14	28A	22 MIN.	12V/7Ah
	SL15KF	APC SILCON 15KW 208V UPS W/TERMINALS F. EXT. BATTERIES 15kVA 15kW	208	48.9A / 41.6A	520 LBS	±192	N/A	42A	N/A	N/A
	SL15KFB1	APC SILCON 15KW 208V UPS W/ 1 BPI 15kVA 15kW	208	48.9A / 41.6A	905 LBS	±192	14	42A	13 MIN.	12V / 7Ah
	SL15KFB2	APC SILCON 15KW 208V UPS W/ 2 BPI 15kVA 15kW	208	48.9A / 41.6A	1290 LBS	±192	28	42A	31 MIN.	12V/7Ah
	SL20KF	APC SILCON 20KW 208V UPS W/TERMINALS F. EXT. BATTERIES 20kVA 20kW	208	64.6A / 55.5A	529 LBS	±192	N/A	56A	N/A	N/A
	SL20KFB1	APC SILCON 20KW 208V UPS W/ 1 BPI 20kVA 20kW	208	64.6A / 55.5A	905 LBS	±192	14	56A	8 MIN.	12V/7Ah
	SL20KFB2	APC SILCON 20KW 208V UPS W/2 BPI 20kVA 20kW	208	64.6A / 55.5A	1290 LBS	±192	28	56A	22 MIN.	12V/7Ah
	SL30KF	APC SILCON 30KW 208V UPS W/TERMINALS F. EXT. BATTERIES 30kVA 30kW	208	96.7A / 83.3A	660 LBS	±192	N/A	83A	N/A	N/A
	SL30KFB2	APC SILCON 30KW 208V UPS W/ 2 BPI 30kVA 30kW	208	96.7A / 83.3A	1430 LBS	±192	28	83A	13 MIN.	12V/7Ah
	SL40KF	APC SILCON 40KW 208V UPS W/TERMINALS F. EXT. BATTERIES 40kVA 40kW	208	128.6A / 111A	660 LBS	±192	N/A	110A	N/A	N/A
	SL40KFB2	APC SILCON 40KW 208V UPS W/ 2 BPI 40kVA 40kW	208	128.6A / 111A	1430 LBS	±192	28	110A	8 MIN.	12V/7Ah
	SL60KF	APC SILCON 60KW 208V UPS W/TERMINALS F. EXT. BATTERIES 60kVA 60kW	208	193A / 167A	1170 LBS	±192	N/A	166A	N/A	N/A
	SL80KF	APC SILCON 80KW 208V UPS W/TERMINALS F. EXT. BATTERIES 80kVA 80kW	208	257A / 222A	1215 LBS	±192	N/A	220A	N/A	N/A

BATTERY INSTALLATION DATE
SEE BARCODE LABEL ABOVE

FIRST REPLACEMENT: MONTH _____ YEAR_____ SECOND REPLACEMENT: MONTH _____ YEAR _____
TEST PERSONNEL DATE AND SIGNATURE _____

885-4503

990-4048

Copy of type label 480V

www.apcc.com

Hotline Support US/Canada/LAM 800 800 4APC
Hotline Support EMEA +353 91 702000
World Wide Support numbers www.apcc.com/support/service/geomap_world.cfm

Place label according to SKU no.	SKU no.	Model	Voltage	Current in/out	Weight	Battery				
			3Ø+N+PE 60Hz			Nom. V DC	AH	Current	Backup time	Type
	SL10KG	APC SILCON 10KW 480V UPS W/TERMINALS F. EXT. BATTERIES 10kVA 10kW	480	14A / 12A	484 LBS	±384	N/A	15A	N/A	N/A
	SL10KGB1	APC SILCON 10KW 480V UPS W/ 1 BPI 10kVA 10kW	480	14A / 12A	870 LBS	±384	7	15A	22 MIN.	12V/7Ah
	SL15KG	APC SILCON 15KW 480V UPS W/TERMINALS F. EXT. BATTERIES 15kVA 15kW	480	21A / 18A	605 LBS	±384	N/A	22A	N/A	N/A
	SL15KGB1	APC SILCON 15KW 480V UPS W/ 1 BPI 15kVA 15kW	480	21A / 18A	990 LBS	±384	7	22A	13 MIN.	12V / 7Ah
	SL20KG	APC SILCON 15KW 480V UPS W/TERMINALS F. EXT. BATTERIES 20kVA 20kW	480	28A / 24A	605 LBS	±384	N/A	29A	N/A	N/A
	SL20KGB1	APC SILCON 20KW 480V UPS W/ 1 BPI 20kVA 20kW	480	28A / 24A	990 LBS	±384	7	29A	8 MIN.	12V / 7Ah
	SL30KG	APC SILCON 30KW 480V UPS W/TERMINALS F. EXT. BATTERIES 30kVA 30kW	480	42A / 36A	840 LBS	±384	N/A	43A	N/A	N/A
	SL30KGB2	APC SILCON 30KW 480V UPS W/ 2 BPI 30kVA 30kW	480	42A / 36A	1610 LBS	±384	14	43A	13 MIN.	12V/7Ah
	SL40KG	APC SILCON 40KW 480V UPS W/TERMINALS F. EXT. BATTERIES 40kVA 40kW	480	56A / 48A	840 LBS	±384	N/A	57A	N/A	N/A
	SL40KGB2	APC SILCON 40KW 480V UPS W/ 2 BPI 40kVA 40kW	480	56A / 48A	1610 LBS	±384	14	57A	8 MIN.	12V/7Ah
	SL60KG	APC SILCON 60KW 480V UPS W/TERMINALS F. EXT. BATTERIES 60kVA 60kW	480	84A / 72A	1125 LBS	±384	N/A	82A	N/A	N/A
	SL80KG	APC SILCON 80KW 480V UPS W/TERMINALS F. EXT. BATTERIES 80kVA 80kW	480	112A / 96A	1170 LBS	±384	N/A	114A	N/A	N/A

BATTERY INSTALLATION DATE FIRST REPLACEMENT: MONTH_____ YEAR_____ SECOND REPLACEMENT: MONTH_____ YEAR _____
SEE BARCODE LABEL ABOVE TEST PERSONNEL DATE AND SIGNATURE _____

715-7-588

NOTICE!
Contact your local APC representative or APC Support if you have any questions.

990-4048

Unpacking/Identification of Equipment

Main UPS system
The UPS is a battery back-up system. Unconditioned power is fed to UPS input and the UPS supplies conditioned power.



Conduit Box
The conduit box should be placed under the UPS. Position the conduit box on the floor before the UPS is put in place on top of it – always with the solid plate facing to the rear and the perforated plate facing the front.

Conduits can be attached to the rear side of the conduit box, which contains cable channels in order to separate AC, DC and communication cables.



Service Bypass Panel
AC utility power for critical load is led through the service bypass panel while UPS is shut down for maintenance.





990-4048

External Battery Breaker Box
The APC Battery Breaker Box is required if the UPS is installed with an external battery. The Battery Breaker Box provides overcurrent and short-circuit protection.



Battery Cabinet
For storage and protection of battery bank.



Battery Cabinet UPS

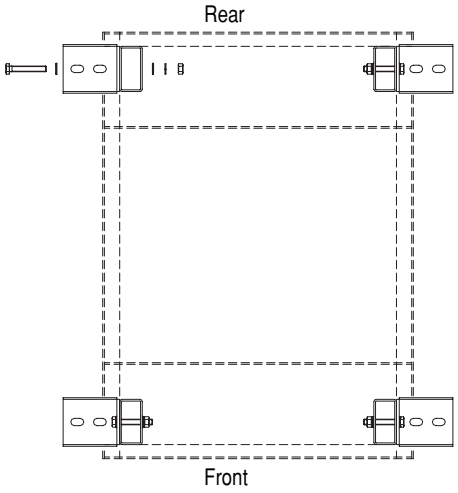
Isolation Transformer
Isolation Transformers are used for galvanic isolation of utility power and conditioned power.



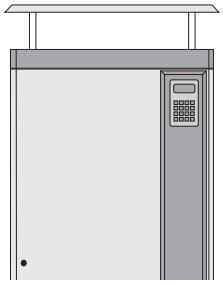
990-4048

Unpacking/Identification of Equipment

Seismic Anchoring
Seismic anchoring stabilizes the UPS in seismic areas.



NEMA 12 Cover
NEMA 12 covers are used in locations with potential risks of liquid discharge or leakage above UPS system.



Remote Display
Use remote display to monitor UPS



Please Recycle
The shipping materials for the APC Silcon UPS are recyclable. Please save them for later use or dispose of them appropriately.

990-4048

3.0 Installation

3.1 Requirements on Site

All system parts are accessible from front or top of UPS. Cable entries are accessible from bottom. Allow 3 foot/1 m free space on all sides during installation. Once the system is installed it may be put close to walls as long as free space is allowed for system doors to open. (Per applicable national and/or local codes.)

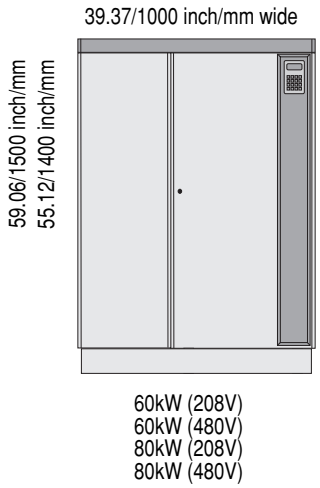
For ventilation and service purposes allow for free space of a minimum of 3 foot/1 m per national and/or local codes above and in front (and left of 208V) UPS. Never install systems in direct sunlight.

NOTICE!
For reliability reasons do not stand on the UPS. Keep the UPS cabinet surface free of any objects.

3.2 Dimensions and Weight

3.2.1 UPS Dimensions and Weight of UPS

SKU No.	UPS	Height [in/mm]	Width [in/mm]	Depth [in/mm]	Weight [lbs/kg]
SL60KF	60kW/208V	59.06/1500	39.37/1000	31.50/800	1170/531
SL60KG	60kW/480V	55.12/1400	39.37/1000	31.50/800	1125/510
SL80KF	80kW/208V	59.06/1500	39.37/1000	31.50/800	1215/551
SL80KG	80kW/480V	55.12/1400	39.37/1000	31.50/800	1170/531

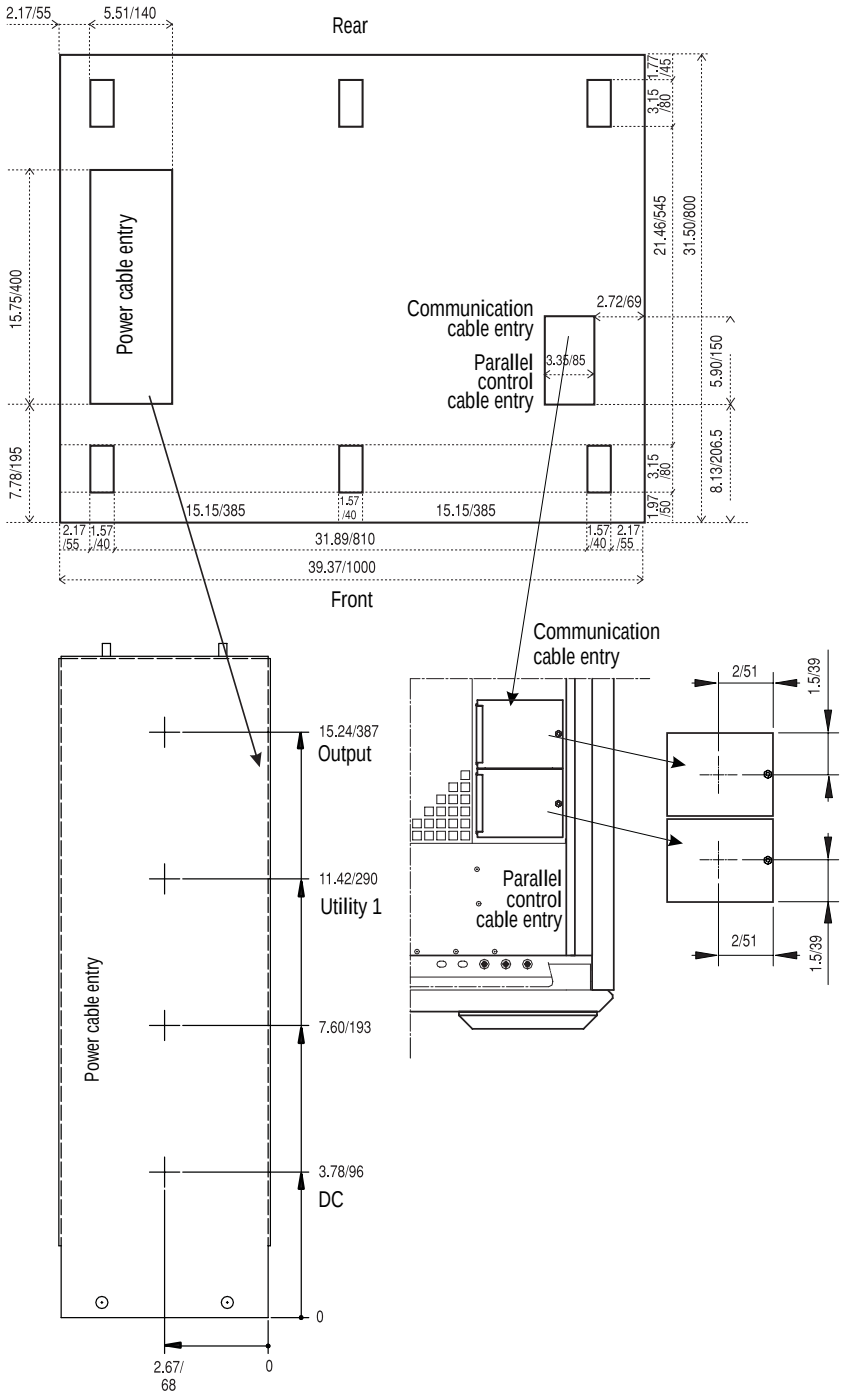


990-4048

3.3 Footprint

3.3.1 39.37 in/1000 mm Cabinet 60kW, 80kW 480V

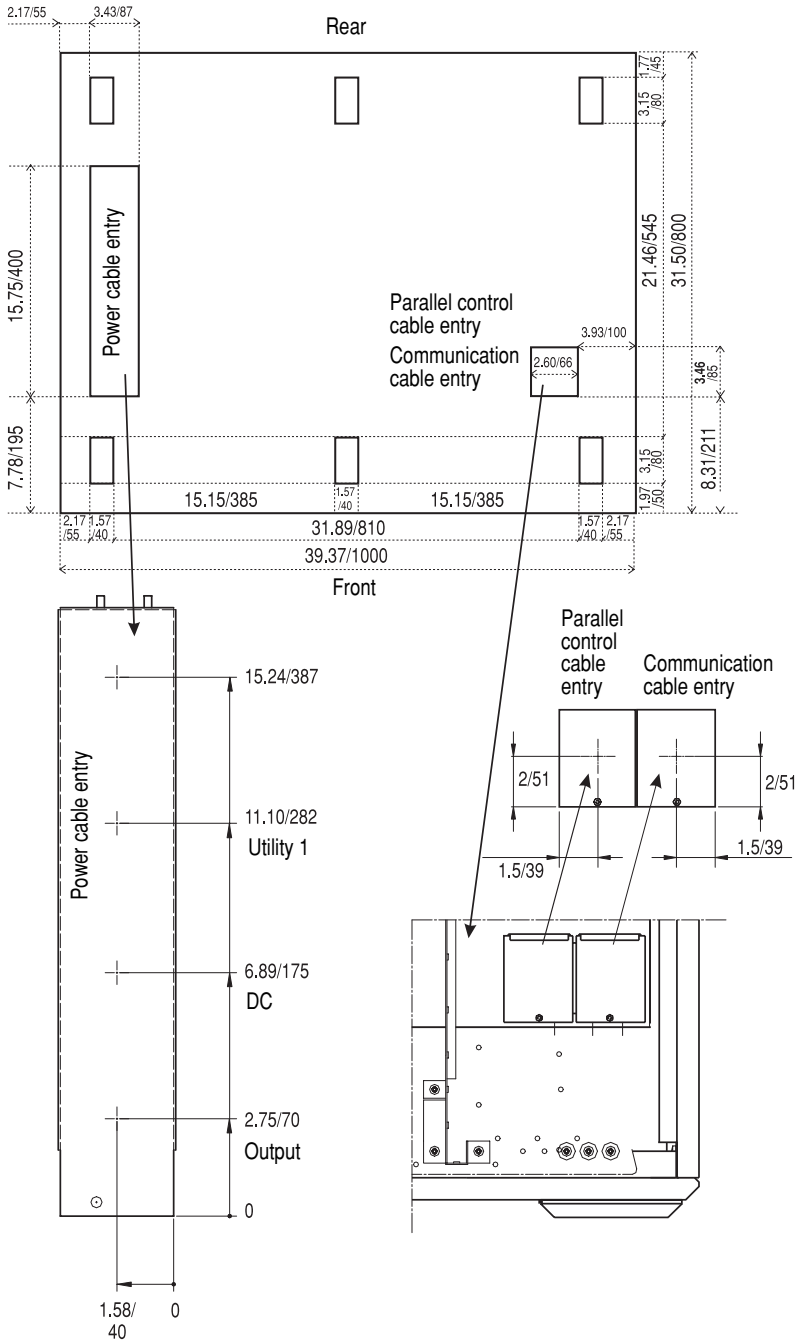
Cable Entry Locations



990-4048

3.3.2 39.37/1000 inch/mm 208V

Cable Entry Locations



990-4048

4.0 External Connection

CAUTION!
Read warnings on page 2 of this manual before continuing.

4.1 Connecting the UPS (208V/480V)

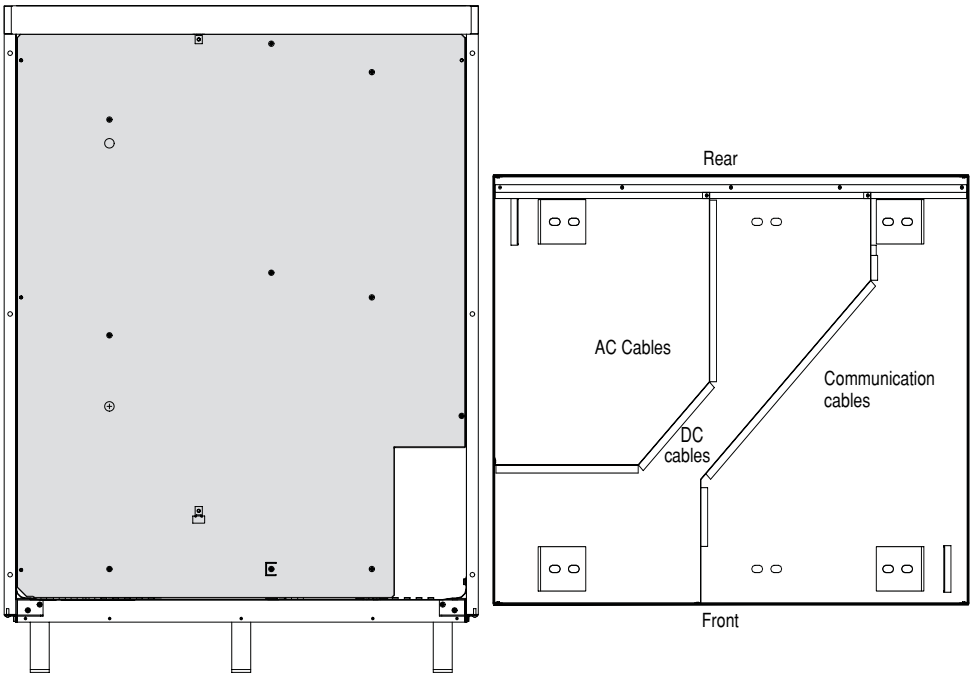
To access cable terminals, for 480V systems, open front door, remove screws and lift off front cover (remember earth wire on rear side).
For 208V systems: Remove screws and lift off left side panel.

NOTICE!
Always keep AC, DC and communication cables separate.

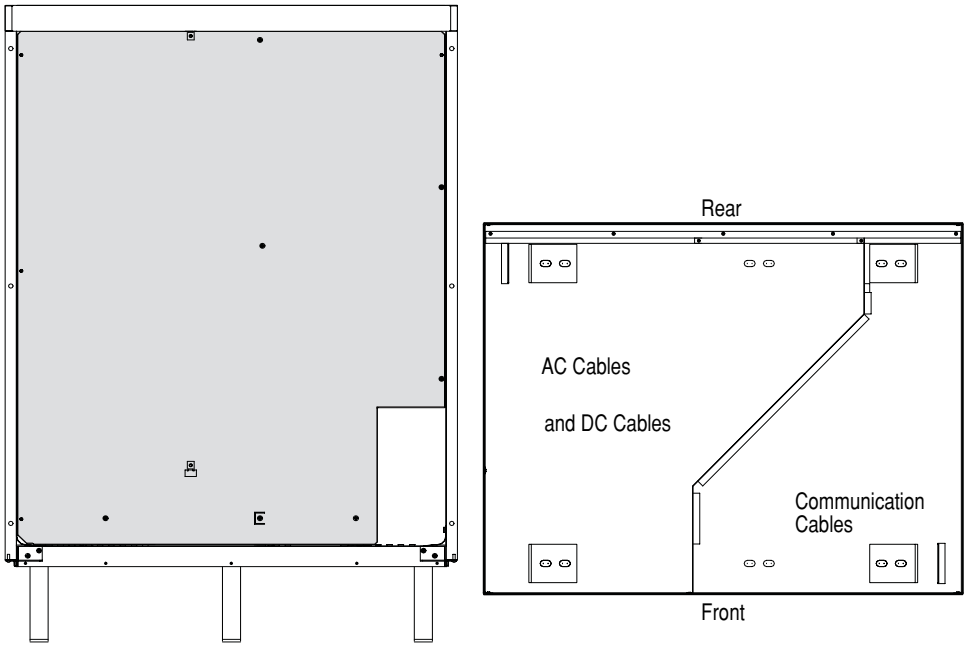
NOTICE!
Supply the UPS from grounded 3-wire/4-wire WYE service. With a 3-wire supply, the UPS may only support a phase-to-phase 3-wire load.

4.1.1 Installing Conduit Boxes

39.37in/1000mm cabinet front view door open, and Conduit Box 480V



Remember to remount front cover and earth wire before system start-up.
39.37in/1000mm cabinet front view door open, and Conduit Box 208V



The conduit box is placed under the UPS, the solid plate always facing to the rear, and perforated plate facing to the front.

Conduits can be attached to rear side of conduit box, containing cable channels to separate AC, DC and communication cables.

Remember to remount left side cover and earth wire before system start-up.

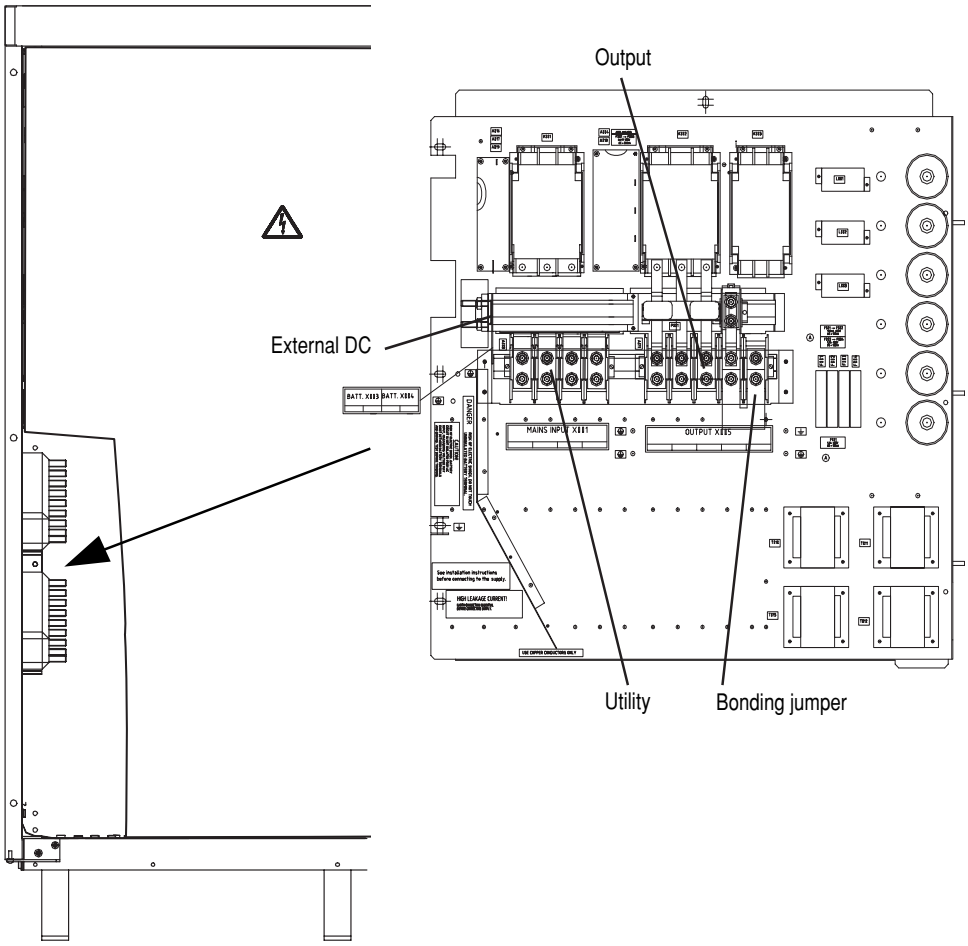
4.1.2 Connecting Cable Terminals

To access cable terminals, open front door, remove screws and lift off front cover (remember earth wire on rear side).

Remember to remount front cover (and earth wire) before system start-up.

CAUTION!
Ensure correct phase rotation of utility input voltage!! Max. power cable size 250 kcmil

Inside view of left side 480V



NOTICE!
With a 3-wire input, the UPS can only be 3-wire loaded (phase-to-phase).

NOTICE!
If an MCCB is used instead of external input fuses, the MCCB must be able to handle 8xIn (nominal current) for min. 10 ms, without tripping.

NOTICE!
Gland plate in bottom of system must be mounted.

Wiring
Select wire size based on the data in Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

Use commercially available UL approved solderless lugs for the wire size required for your application. Connect wire to the lug using tool and procedure specified by the lug manufacturer.

Input, output and DC cables are routed in separate conduits.
All AC cables rated 600V.
DC cables for 208VAC systems rated 600V.
DC cables for 480VAC systems rated 1000V unless otherwise stated.



CAUTION!
At a switch mode load of 100% the neutral must be rated for 173% output phase current

NOTICE!

ϕ "phase"

 "risk of electric shock"

 Terminal for Equipment Grounding Conductor

"E" Terminal for Grounding Electrode Conductor

NOTICE!

Terminals marked  and  are electrically connected to the terminal marked "E"

NOTICE!
For grounding, refer to local legal regulations.

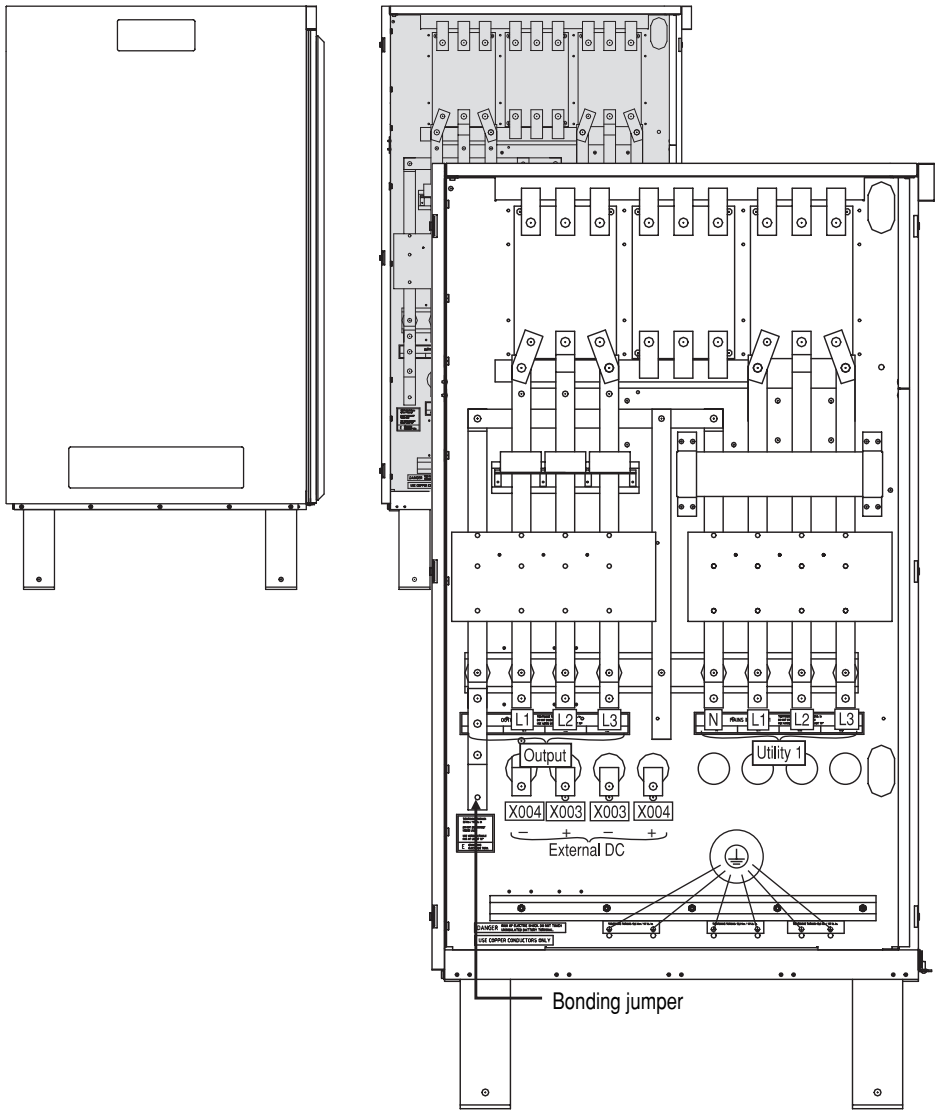


CAUTION!
Read warnings on page 7 of this manual before continuing.

990-4048

4.1.3 Cable Terminal Connections (208V)

39.37/1000 in/mm cabinet left side view with and without side cover



NOTICE!
The bus bar location from left to right: X004 – (Batt.2), X003 + (Batt.1), X003 – (Batt.1), X004 + (Batt.2).

CAUTION!
Ensure correct phase rotation of utility input voltage!! Max. power cable size: 500 kcmil.

- Verify all power connections are tight
- Verify all control wire terminations are tight

990-4048

- Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to-ground
- Verify that all control wires are run in individual, separate, steel conduit.

4.1.4 Connection Terminals

Terminals – 208V Version

Terminal Type	Input [mm]	Battery [mm]	Output [mm]	PE [mm]	System Earth [mm]
60kW	12	12	12	12	12
80kW	12	12	12	12	12

Terminals – 480V Version

Terminal Type	Input [mm]	Battery [mm]	Output [mm]	PE [mm]	System Earth [mm]
60kW	8	8	8	8	8
80kW	8	8	8	8	8

The terminals for the control & alarm cables are screw clamps for cable size AWG18 to AWG14. All other terminals are stud terminals.

4.1.5 Torque Specifications

Stud size	6mm	8 mm	10 mm	12 mm
Torque	66/7.5 lb-in/Nm	133/15 lb-in/Nm	266/30 lb-in/Nm	443/50 lb-in/Nm

4.1.6 Grounding

4.1.6.1 System Grounding

If no UPS neutral inputs are connected to a grounded service neutral conductor according to local NEC code rquirements, provisions must be made as follows:

a) Bonding jumper must be mounted between output terminals X005:N and X005:E

b) Output terminal X500:E, marked “Grounding electrode terminal”, must be connected by grounding electrode conductor to a local grounding electrode according to NEC 250-26.

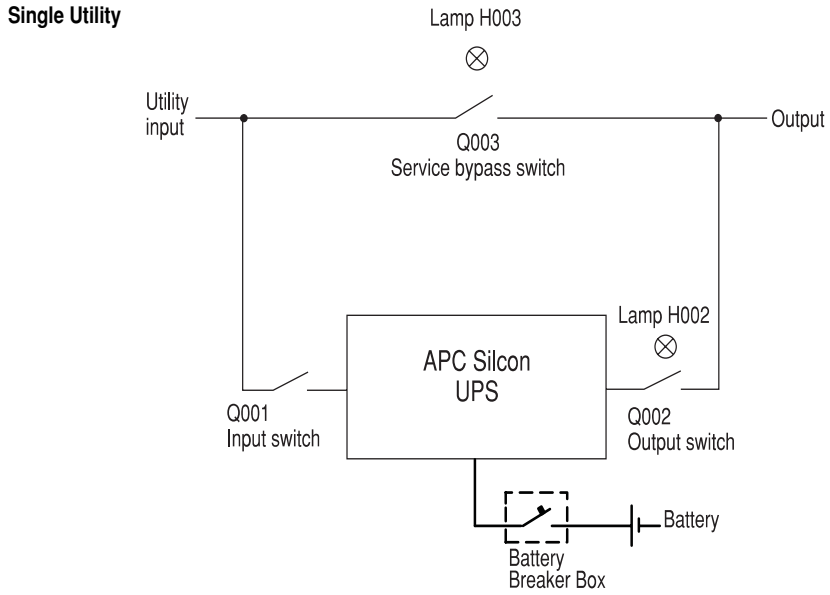
4.1.6.2 Equipment Grounding

Terminals marked ⏚ are intended for equipment grounding.

Provisions must be made as follows:

- The input equipment ground terminal(s) must be connected to grounding elctrode(s) provided for the service entrance(s).

4.2 System Integration Interface



System Integration Interface (SII) is the control link between UPS and system main switches as shown above. The purpose of the SII is to ensure correct operation of switches without losing system output power.

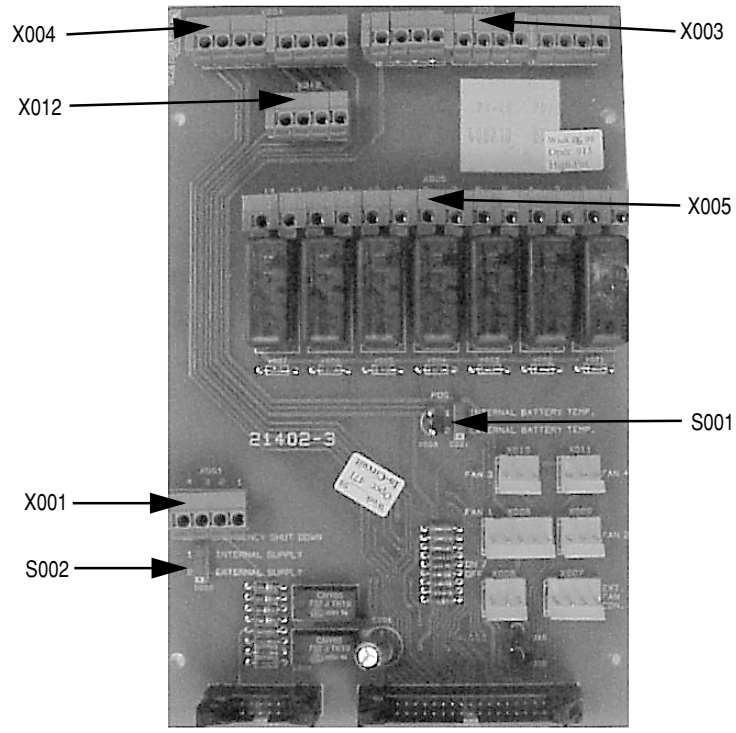
CAUTION!
Even with all AC and DC sources switched off, SII may receive high voltage from external alarm and signal circuit field wiring.

Auxiliary contacts on the main switches transmit SII-board inputs. Lamps on Service Bypass Panel and Battery Breaker Box/Battery Cabinet indicate “green light” for operation of output switches.

SII-board also integrates input facilities for emergency shut-down and temperature compensation of charge voltage for external battery (also used with battery monitoring). “Battery operation” and “Common fault” are the two main status SII-board relay signals.

4.2.1 Connecting the System Integration Interface Board (SII-board)

SII-Board



NOTICE!
If the UPS is equipped with an Emergency Power Off (EPO) facility all input sources must be provided with disconnecting devices.

Terminal rows: X003 and X004 (auxiliary contacts)

When switching Q001, Q002, Q010, Battery Breaker 1 or Battery Breaker 2 from “ON or 1” to “OFF or 0”, the auxiliary contact must open BEFORE the corresponding main contacts are opened. When switching Q001, Q002, Q010, Battery Breaker 1 or Battery Breaker 2 the opposite way from “OFF or 0” to “ON or 1”, the auxiliary contact has to close with a maximum delay of 0.5 seconds from the time the corresponding main contacts are closed.

- This type of auxiliary contact is called a “late make” contact. (This also means that it will “break early” when activated in opposite direction)
- This auxiliary contact is also called “Normally Open” (NO), because the auxiliary contact will be open when the main contacts are open
- Please note that the above term “NORMALLY” has nothing to do with NORMAL UPS OPERATION MODE.

When switching Q003 from “OFF or 0” to “ON or 1”, the auxiliary contact has to open BEFORE the corresponding main contacts are closed. When switching Q003 the opposite way from “ON

or 1" to "OFF or 0", the auxiliary contact has to close with a maximum delay of 0.5 seconds from the time when the corresponding main contacts are opened.

- This type of auxiliary contact is called an "early break" contact. (This also means that it will "make late" when activated in the opposite direction)
- The auxiliary contact is also called "Normally Closed" (NC), because the auxiliary contact will be closed when the main contacts are open
- Please note that the above term "NORMALLY" has nothing to do with NORMAL UPS OPERATION



CAUTION!
All wiring to alarm and signal circuit fields to be rated 300V (minimum).

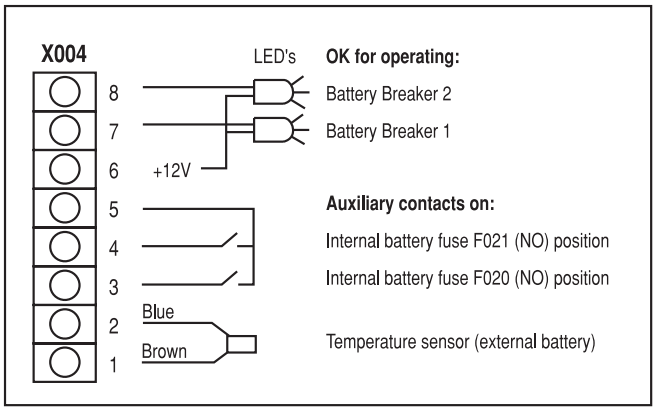
X005 (output relays)
The battery operation signal is received with a 30-second delay. This function is inactive during battery tests. Common fault relay facility is programmable (standard factory setting: 10 sec.) See User Guide for details.

Maximum nominal voltage on contact circuits is 277VAC. If two different phases are involved, maximum phase to neutral voltage should be below 160VAC. Please note that phase L1 is already present on the System Integration Interface board, supplied from the service bypass panel. Therefore, if a phase is needed for alarm or signal purposes, Phase L1 should be used".

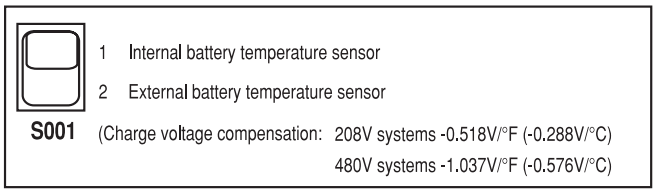
Terminals X001, X003, X005, X004, X012:

Cable size AWG18 to AWG14, use solid copper conductors only.

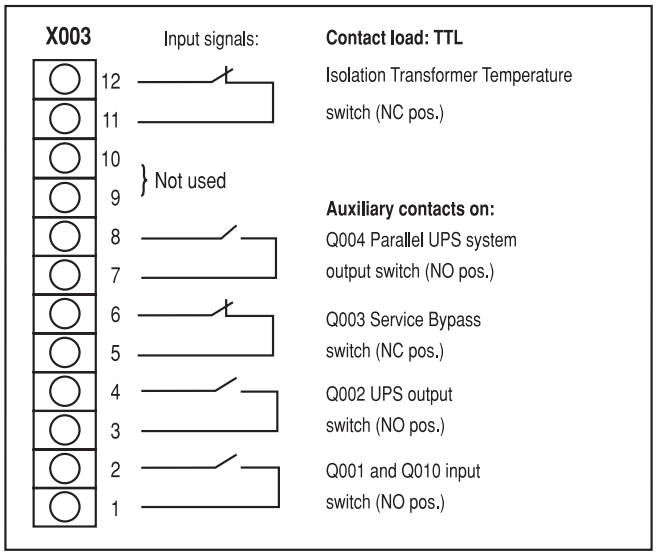
X004



S001

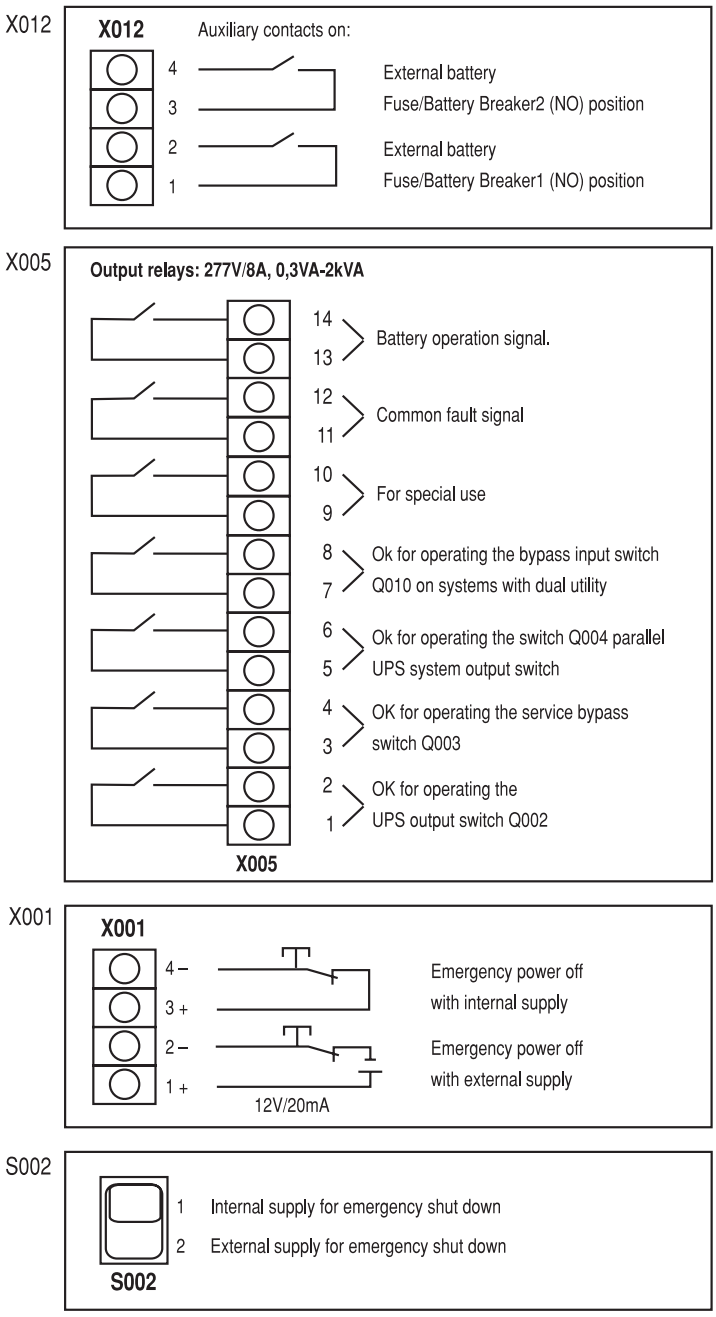


X003



990-4048

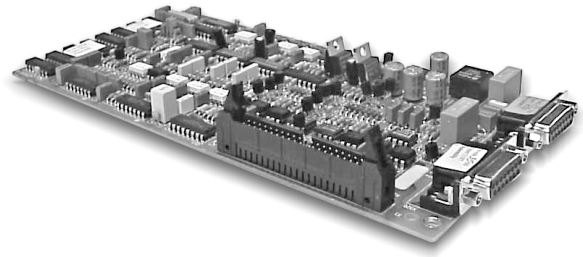
External Connection



990-4048

4.3 Parallel Board

CAUTION!
Control cables must be separated from AC and DC power cables.



Parallel Board

The built-in parallel board connects two or more UPS systems in parallel, either to obtain increased system reliability or to obtain higher output power. The parallel board also ensures correct load-sharing between parallel systems.

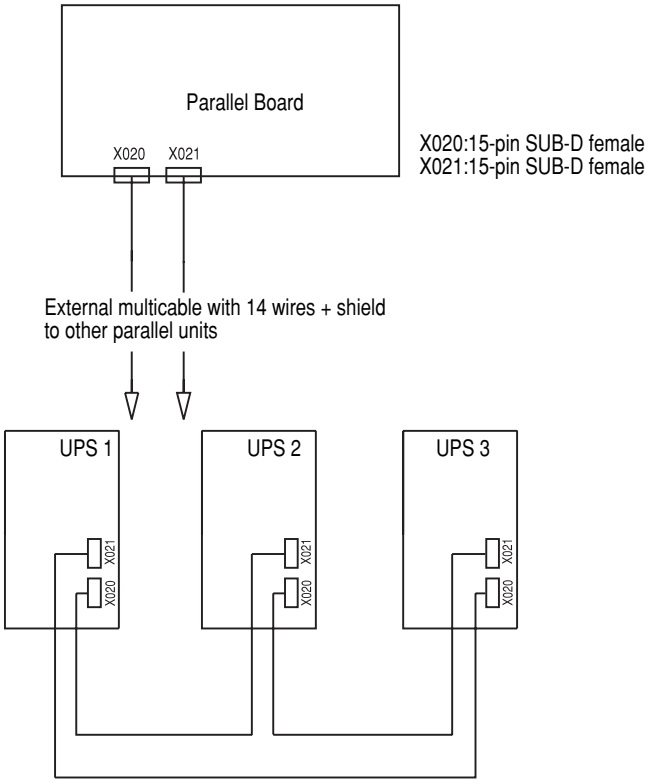
NOTICE!
For reliability reasons, APC recommends separate battery packs in redundant/parallel configurations.

To prepare the UPS for parallel/redundant mode, disconnect all sources of AC and DC power supply to the UPS and connect the ribbon cable from the parallel board to the main controller board. (The ribbon cable is delivered with the UPS).

CAUTION!
Do not connect ribbon cable in single configurations. Ribbon cable is for parallel operation only.

Complete the parallel system set-up by connecting the external control cables (see below). Follow instructions in Section 5.3 of this guide to execute necessary reprogramming.

External Connection



External Control Cables
External multicore cable has a 15-pin SUB-D male connector at either end. Connect pin 1 to pin 1, and pin 2 to pin 2 etc. up to pin 15 - except pin 8, which need not be connected.

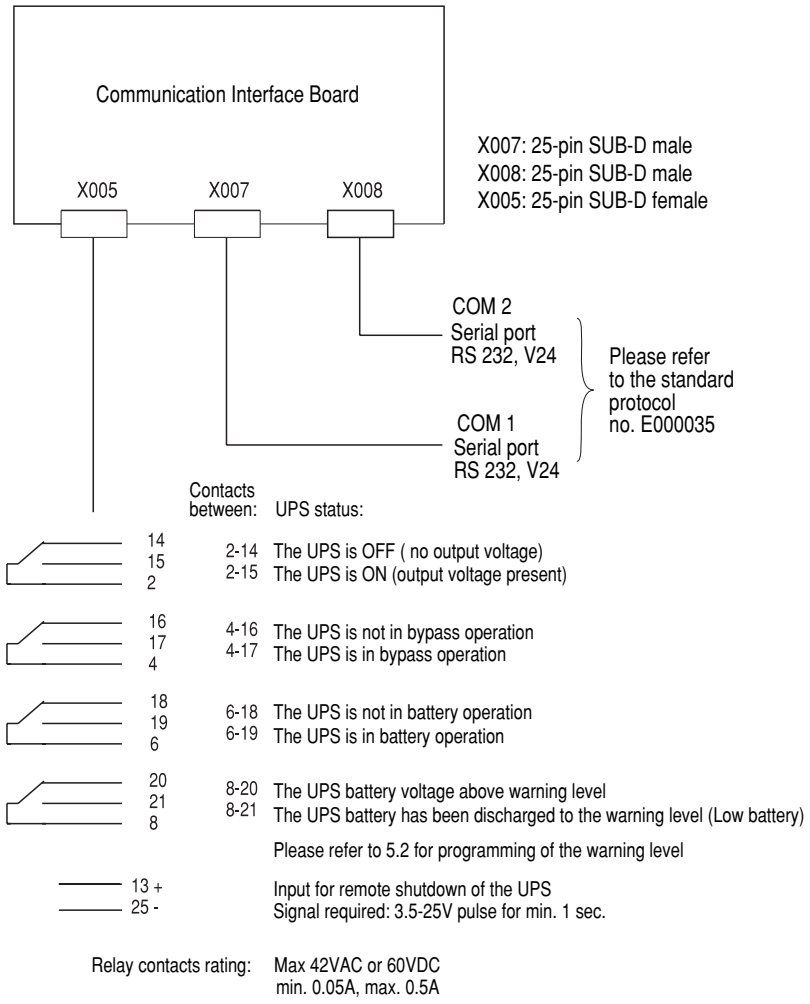
Shield is connected to plug cover at both ends.
Terminals X020 and X021 for control cables are located on parallel board. Connect X020 in UPS1 to X021 in UPS2 and X020 in UPS2 to X021 in UPS3 etc. Connect X020 in last UPS to X021 in UPS1.
(Cable is delivered with the UPS).

Power Cables
To optimize load-sharing in parallel operation, external power circuits must be “symmetrical”: Power input and output cables must have same length and identical cross-sections.

4.4 Communication Interface Board

The 3-port ComInterface is used both to establish interaction between UPS and e.g. a computer system and to monitor the UPS. Main purpose: To ensure a controlled computer shut-down in case of utility supply failure.

4.4.1 Connections

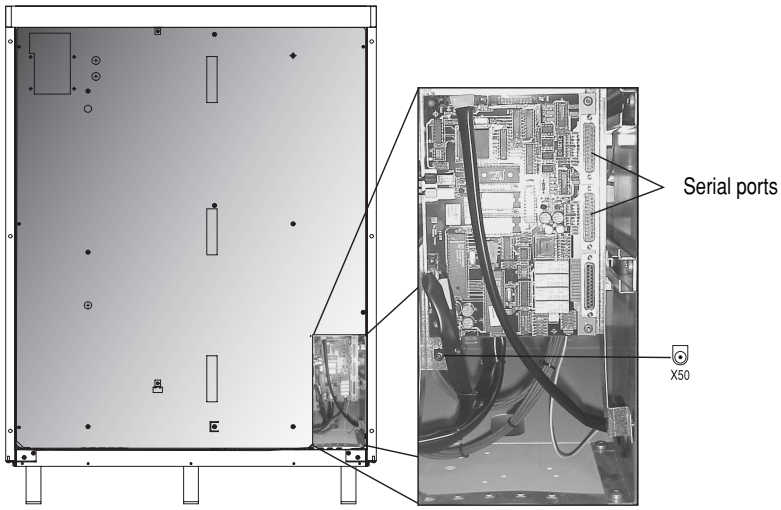


990-4048

4.5 Smart Slot

The enclosed Triple Chassis must be connected to the serial port on the Communication Interface Board, and to the 24V supply (cables included). Terminal locations shown below.

39.37 in/1000mm Cabinet



Front view of Cabinet (doors open)

X50 is a 24V supply for tripple chassis.

Must only be used for this purpose.

Not suitable for telephone equipment

Triple chassis must be connected to both X50 and a serial port.

APC Silcon Triple Chassis



990-4048

4.6 APC Silcon Triple Chassis

The APC Silcon Triple Chassis (AP9604S) is an American Power Conversion (APC) external management peripheral that allows you to use monitoring and control management peripherals with your APC Silcon series UPS. The retrofit model (AP9604SR) is for use with Silcon series UPSs that are not equipped with a 24 VDC power port.

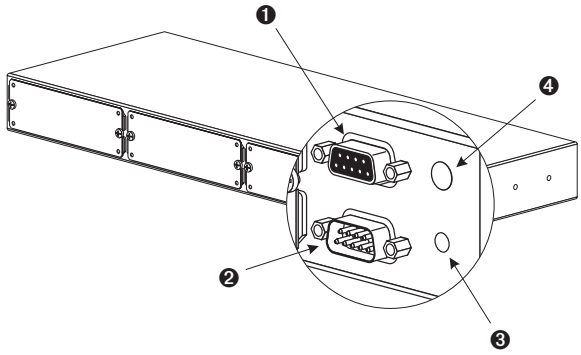
4.6.1 Safety Warnings

Use the APC Silcon Triple Chassis only in conjunction with an APC Silcon UPS.

Do not connect a computer to any APC Silcon Triple Chassis port using a straight-through extension cable. Use the communications cable provided with the APC Silcon Triple Chassis.

Connections using a cable made by any other manufacturer may cause damage or improper operation of the APC Silcon Triple Chassis, the UPS, or the computer.

4.6.2 Product Description



1 Monitoring port **3** Status LED

2 To UPS port **4** Optional Power port

4.6.2.1 Monitoring Port

The Monitoring port has two functions:

- Connecting to a terminal for configuration of the chassis. For direct connection to the Monitoring port, you must use the Monitoring cable supplied with the chassis (APC P/N 940-0024C).
- Connecting to other APC external management peripherals in a daisy chain.

4.6.2.2 To UPS Port

The “To UPS” port connects the chassis to the UPS, using the Silcon UPS cable (APC P/N 940-0071). The cable connector plugs into a communications port on an APC Silcon UPS.

4.6.2.3 LEDs

The APC Silcon Triple Chassis status LED provides important information concerning operation of the chassis. Refer to the table below for a description of the conditions indicated by the LED.

IF the LED is…	THEN the Silcon Triple Chassis…
off	is not receiving power.
flashing quickly (5 times per second)	has not been configured. See the APC Silcon Management Quick Start Guide provided with your chassis or the Web/SNMP Management Card Installation Guide on the CD for more information.
flashing slowly (1 time per second)	is powered on but is not communicating with the UPS.
on	is operating normally.

4.6.2.4 Optional Power Input

With the Optional Power input, you can power the APC Silcon Triple Chassis from an external source, using a 24 VDC power adapter. A universal adapter (AP9505i) or a standard adapter (AP9505) can be purchased separately from APC.

4.6.3 Installing Management Peripherals

There are two basic types of APC management peripherals that work with the APC Silcon Triple Chassis:

- Management peripheral cards, which fit into external management peripherals that are equipped with a card slot.
- External management peripherals, which connect to the Monitoring (or Advanced) port of other external management peripherals.

NOTICE!
The name “Monitoring” port varies from product to product, but its purpose is the same – to replicate the UPS communications port.

4.6.3.1 Order of Management Peripheral Cards

Because UPS signals are passed between management peripherals, you must install management peripheral cards in the correct order for them to work together properly. The card slots are numbered 1 to 3, from left to right, as viewed from the rear of the chassis. The following table lists the management peripheral cards, their priority, and proper position.

Management Peripheral Card	P/N	Priority	Position
Web/SNMP Management Card	AP9606	Highest	High-numbered slot  Low-numbered slot
Out-of-Band Management Card (Call-UPS® II)	AP9608	Second-highest	
Interface Expander	AP9607	Second lowest	
Environmental Monitoring Card (Measure-UPS® II)	AP9612T AP9612TH	Lowest	

4.6.3.2 Installing Management Peripheral Cards

To install management peripherals, perform the following steps.

3) Make sure that the chassis is powered off.
4) Install management peripheral cards into the housings on the rear of the chassis. See the instructions supplied with the cards and the table above.
5) If you are daisy-chaining other APC external management peripherals to the APC Silcon Triple Chassis: Connect the UPS cable (supplied with the management peripheral) to the Monitoring port of the chassis and to the "To UPS" port of the other management peripheral (Share-UPS, MasterSwitch, etc.). See "Daisy-chaining the APC Silcon Triple Chassis".
6) Power the APC Silcon Triple Chassis and all external management peripherals.

NOTICE!
If your configuration requires additional power, connect a 24V AC/DC power adapter available from APC (part number AP9505 or AP9505i) for all models of Triple Chassis.

4.6.3.7 Daisy-chaining the APC Silcon Triple Chassis

If you need more than the three card slots available with the APC Silcon Triple Chassis, or if you want to use other external management peripherals, you can daisy-chain external management peripherals together, provided that the total amperage of all installed management peripherals — cards and external — does not exceed the supplied amperage. (See "Determining Power Requirements:").

NOTICE!
When daisy-chaining Triple Chassis units, you may need to use a power adapter.

990-4048

To add card slots, you can daisy-chain the APC Silcon Triple Chassis with the standard Triple Chassis (AP9604) management peripheral, installing the APC Silcon Triple Chassis closer to the UPS.

4.6.4 Powering the APC Silcon Triple Chassis

The APC Silcon Triple Chassis supplies power to the installed management peripheral cards and to the Monitoring port, allowing you to power multiple management peripherals.

4.6.4.1 AP9604S Power Considerations

The AP9604S model of the APC Silcon Triple Chassis receives its power from the UPS through the power connector of the Silcon UPS cable. If the total current required by all the installed management peripherals exceeds 500 mA, you must use a 24 VDC power adapter. To find out whether you need additional power, see “Determining power requirements”.

4.6.4.2 Power Adapters

APC offers two models of 24 VDC power adapter.

- The standard adapter (AP9505) can provide an additional 400 mA.
- The universal adapter (AP9505i) can provide 850 mA.

4.6.4.3 Using a Power Adapter

To use the adapter, plug it into a protected power outlet and into the Optional Power port of the APC Silcon Triple Chassis.

NOTICE!
If the power adapter loses power because of a UPS shutdown, its attached management peripherals may not operate properly, thus adversely affecting the UPS and its protected equipment.

4.6.4.4 AP9604SR Power Considerations

The AP9604SR model receives its power from the UPS through the supplied 24 VDC universal adapter. The total current required by your management peripherals must not exceed the 850 mA limit of the power adapter. See ““Determining power requirements”.

4.6.4.5 Determining Power Requirements:

To determine the total amount of current required by your management peripherals, add the individual current requirements for each management peripheral to be installed with the APC Silcon Triple Chassis to the current requirements of the chassis itself. Refer to this table

Part #	Management Peripheral	Draw (mA)
AP9207	Share-UPS 8-port Interface Expander	65
AP9600	Expansion Chassis	30
AP9604	Triple Chassis	20

990-4048

AP9604S[R]	APC Silcon Triple Chassis	90
AP9606	Web/SNMP Management Card	110
AP9607	Interface Expander	45
AP9608	Out-of-Band Management Card (Call-UPS II)	35
AP9612	Environmental Monitoring Card (Measure-UPS II)	60
AP9825i	Isolated Extension Cable	50
AP9830	Remote Power-Off Device	35

4.6.5 Troubleshooting

The following table shows the solution to common problems with the operation of the Triple Chassis

Problem	Possible Cause	Solution
Status LED is off	The chassis is not receiving adequate power.	See “Powering the APC Silcon Triple Chassis”, and verify that you are not exceeding current requirements.
Status LED is flashing quickly	The chassis has not been configured.	Configure the Silcon Triple Chassis. See the APC Silcon Management Quick Start Guide provided with your chassis or the Web/SNMP Management Card Installation Guide on the CD for more information.
Status LED is flashing slowly	The chassis is not communicating with the UPS.	Verify that the supplied UPS cable is properly connected to the Triple Chassis and to a communications port on the UPS.
Attached management peripheral cannot identify UPS model or nominal output voltage.	The management peripheral firmware does not support 3-phase UPSs.	You may be able to upgrade the firmware of the management peripheral. Call APC Customer Support.

4.6.5.1 If Problems Persist

For problems not covered in the troubleshooting chart or for persistent problems, follow this procedure:

2) Note the serial number and date of purchase of the APC Silcon Triple Chassis. Contact APC Customer Support at the phone number or address that is listed in this manual.

3) Be prepared to provide a description of the problem. A technician will help solve the problem over the phone, if possible, or will give you a return material authorization (RMA) number.

4) If the APC Silcon Triple Chassis is under warranty, repairs are free of charge. If the warranty has expired, there will be a nominal charge for repair.

990-4048

5) Pack the APC Silcon Triple Chassis carefully in its original packaging, if possible. Do not use polystyrene beads for packing. Damage sustained in transit is not covered under the warranty. Enclose a letter in the package with your name, address, RMA number, a copy of the sales receipt, daytime phone number, and payment (if applicable).

6) Mark the RMA number clearly on the outside of the shipping carton. The factory will not accept any materials without this marking.

7) Return the Triple Chassis by insured, prepaid carrier to the address given to you by APC Customer Support.

4.6.6 Product Specifications

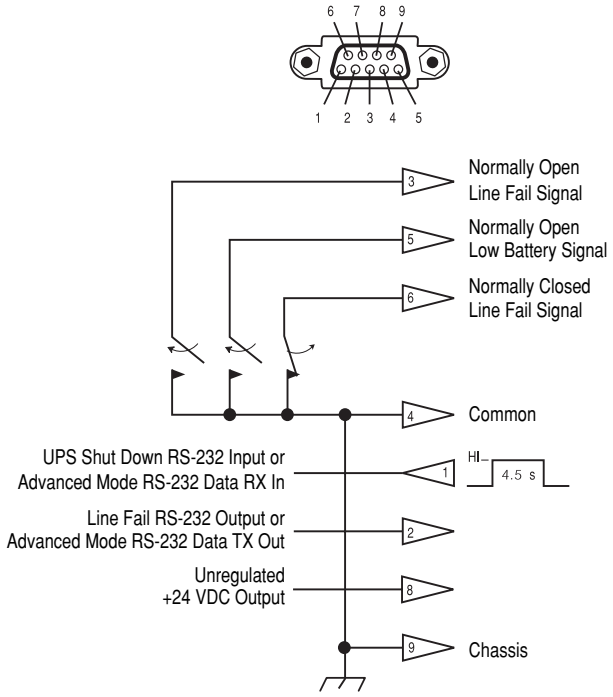
4.6.6.1 Monitoring Port Pin Assignments

The Monitoring port is a 9-pin communications port. The port operates with no flow control at a rate of 2400 baud. The data format is 8 data bits with 1 start bit, 1 stop bit, and no parity. When the Triple Chassis operates with simple signalling, the following limitations and capabilities apply to the Monitoring port:

- Pins 3, 5, and 6 are open collector outputs which must be pulled up to a common referenced supply no greater than +40 VDC. The transistors are capable of a non-inductive load of 25 mA. Use only Pin 4 as the common.
- The output at Pin 2 generates a low-to-high RS-232 level when the device is signalling an On Battery condition. The pin is normally at a low RS-232 level.
- The UPS is signalled to shut down when a high RS-232 level is applied to Pin 1 for 4.5 seconds. Shutdown is also dependent on the UPS status.

When the Triple Chassis operates with advanced signalling, the following limitations and capabilities apply to the Monitoring port:

- Pin 7 is unassigned.
- DC operating voltage is available on Pin 8. This voltage may be from the UPS or from an external adapter, whichever is greater.


6 7 8 9
1 2 3 4 5
Normally Open
Line Fail Signal
Normally Open
Low Battery Signal
Normally Closed
Line Fail Signal
Common
UPS Shut Down RS-232 Input or
Advanced Mode RS-232 Data RX In
HI
4.5 s
Line Fail RS-232 Output or
Advanced Mode RS-232 Data TX Out
Unregulated
+24 VDC Output
Chassis

990-4048

4.6.6.2 Power, Physical, and Environmental Specifications.

Item	Specification
Power	
Turn on voltage:	> 22 VDC
Turn off voltage:	< 16 VDC
Current draw (normal operation):	90 mADC
Current draw (voltage < 16 VDC):	< 1 mADC
Physical	
Size (H xW x D):	1.75 x 17.0 x 5.0 in (44 x 432 x 127 mm)
Weight:	4.02 lb (1.81 kg)
Shipping weight:	8.12 lb (3.65 kg)
Environmental	
Elevation (above MSL): Operating Storage	 0 to 10,000 ft (0 to 3000 m) 0 to 50,000 ft (0 to 15 000 m)
Temperature: Operating Storage	 32 to 113˚F (0 to 45˚C) -4 to 158˚F (-20 to 70˚C)
Relative humidity: Operating Storage	 0 to 95%, non-condensing 0 to 95%, non-condensing
Electromagnetic immunity:	FCC Class A EN50082-1 verified

4.7 APC Silcon Battery Cabinets



IMPORTANT SAFETY INSTRUCTIONS

a) The servicing of batteries requires battery knowledge and should only be carried out/ supervised by qualified electricians familiar with batteries. Keep unauthorized personnel away from batteries.

b) Use identical battery types and numbers when replacing batteries. See battery supplier manual for further details.

c) **CAUTION** - Do not dispose of batteries in a fire. Batteries may explode.

d) **CAUTION** - Avoid rough treatment and opening of batteries. Released electrolyte is harmful to skin and eyes, and may be toxic.

e) **CAUTION** - Batteries may cause electric shocks and high voltage short-circuit current. Follow the precautions below when working with batteries:

1. Remove watches, rings and other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not leave tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting batteries.
6. Determine if the battery is inadvertently grounded. If inadvertently grounded, remove unwanted ground source. Any contact with grounded batteries may result in electric shocks. The likelihood of such shocks will be reduced if grounds are removed during installation and maintenance.

Installation and use of this product must comply with all national, federal, state, municipal or local codes. If you need assistance, please have your UPS model and serial number ready and call APC tool free technical support on 1-877-287-7835 (1-877-2UPS-TEK).

Find more information on the APC World Wide Web site at http://www.appc.com. See also the section “How to contact APC” in this guide.

External Connection



WARNING!
The entire system contains **HAZARDOUS AC/DC VOLTAGES** from several power sources. Some terminals and components are live even with the system being switched off!

ONLY qualified electricians may install batteries and national and local codes must be followed.

NO APC Silcon UPS may have built-in batteries if connected to external batteries!

NEVER install batteries not complying with APC specifications. Falling that, the installer takes over full responsibility!

NEVER lift or transport connected/installed batteries

4.7.0.1 Installation of Batteries

See Installation Guide for Battery Cabinet for:

- Preparing Batteries and UPS
- Dimensions and Weight
- Connecting Batteries

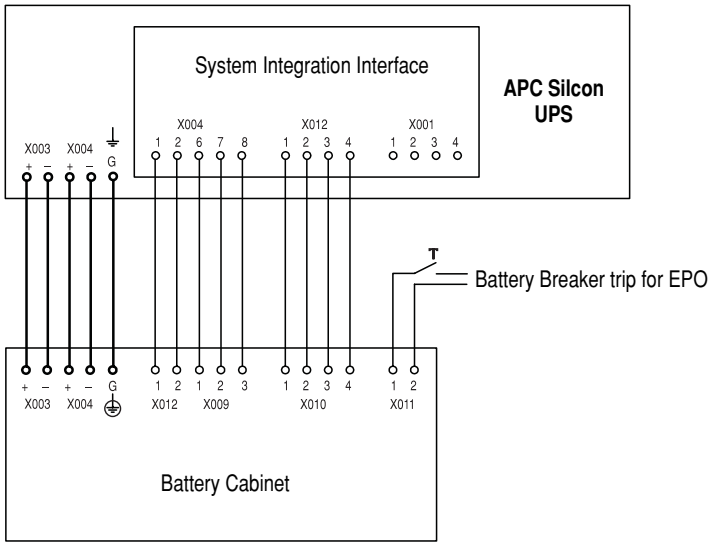


WARNING!
Before proceding, ensure that power supplies have been disconnected from UPS for a minimum of 5 minutes



CAUTION!
Follow “Start-up Procedure” in User Guide, section 2.4.1.

Diagram - UPS with Battery Cabinet

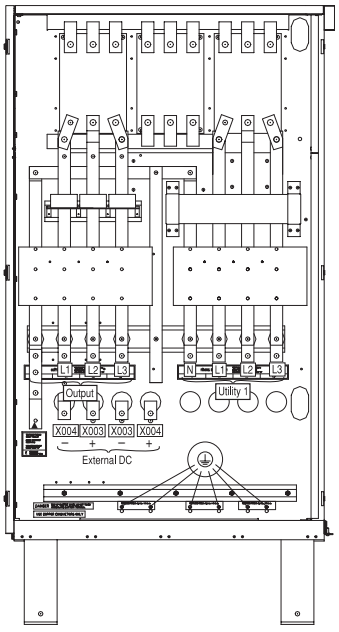


4.8 External DC Connection

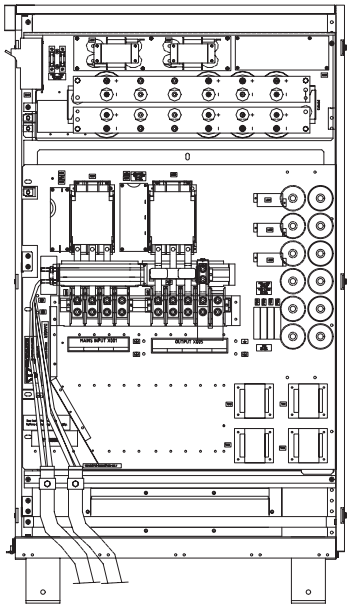
4.8.1 60-80kW 208/480V

Bottom Entry

208V left side view without cover



480V left side view without cover



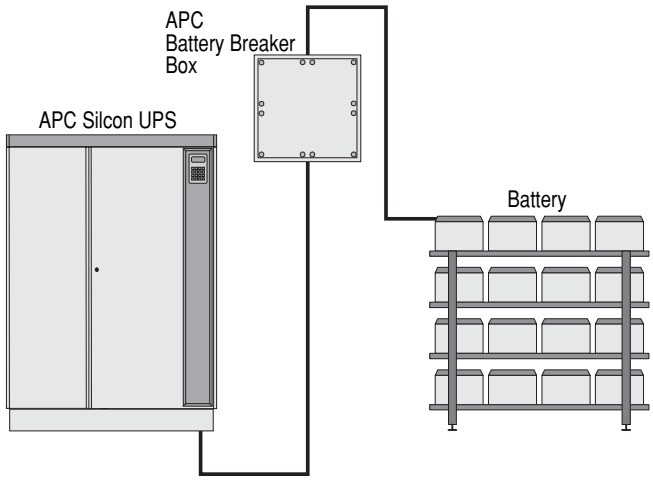
990-4048

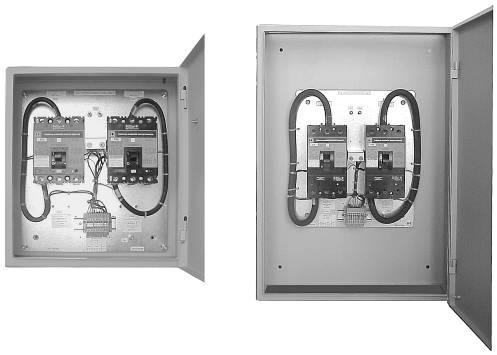
NOTICE!
The bus bar location on 208V units from left to right: X004 – (Batt.2), X003 + (Batt.1), X003 – (Batt.1), X004 + (Batt.2).

For top entry, refer to section 6.7.**7**

4.9 Battery Breaker Box

The APC Battery Breaker Box is required if the UPS is installed with an external battery. The Battery Breaker Box provides overcurrent and short-circuit protection.

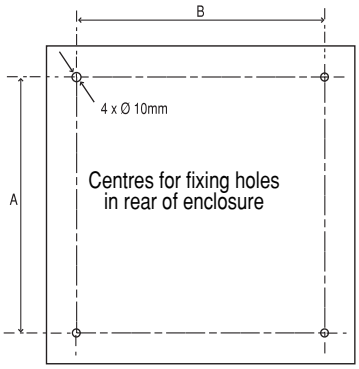




990-4048

4.9.1 Interconnection

NOTICE
Select wire size based on the data in Table 1 and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).



SKU No.	Type	UPS	Dimension HxWxD [in/mm]	Fixing centres AxB [in/mm]	Weight [lbs/kg]
SL0901508	Battery Breaker Box 80kW 480V	60kW 480V 80kW 480V	29.52/750 x 21.65/550 x 6.88/175	25.51/648 x 17.63/448	52.8/24
SL0901512	Battery Breaker Box 80kW 208V	60kW 208V 80kW 208V	29.52/750 x 21.65/550 x 6.88/175	25.51/648 x 17.63/448	52.8/24



CAUTION!
Check correct polarity when connecting DC Cables.

NOTICE
Terminal for Equipment Grounding Conductor is marked 

NOTICE
For grounding, refer to local legal regulations.

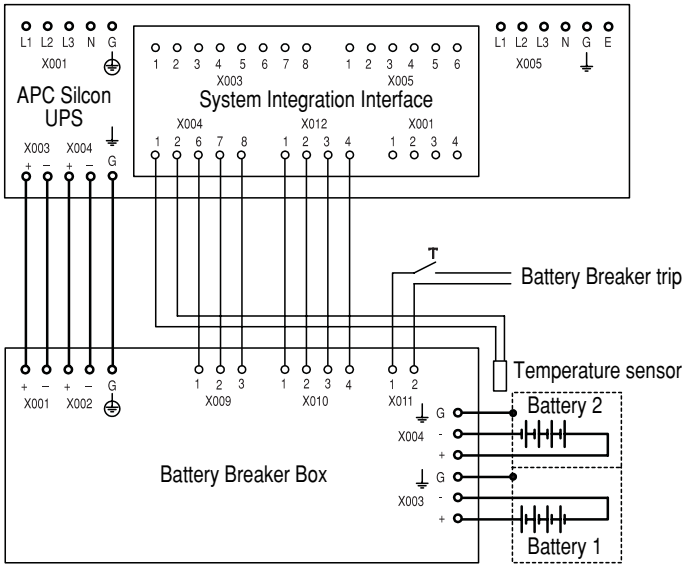
4.9.2 Mounting and Connection

All AC cables rated 600V.

DC cables for 208VAC systems must be rated 600V.

DC cables for 480VAC systems must be rated 1000V, unless otherwise stated.

4.9.3 UPS with External Battery via Battery Breaker Box



4.10 UPS Installations in Computer Rooms

IMPORTANT! Follow the instructions below when installing UPS-systems in computer rooms:

1. - Only systems with external batteries may be installed.
   - All battery cabinets must be UL listed and must be approved for use in computer rooms.
   - Refer to APC Design Guide for correct DC disconnection/overcurrent if alternative battery cabinet makes are used.
   - All batteries used in computer rooms, must comply with R/C (BAZR2) and must be flame rated according to UL 94V2, UL 94V1 or UL 94V0.
2. The system must be provided with switch gear facility with trip function for all switches for Emergency Power Off function (EPO). See principal diagram below.
3. The system must be provided with EPO function for the disconnection of all AC and DC sources. See principal diagram below.

Activate EPO switch to switch off UPS system. All switch gear switches are tripped. UPS will discharge capacitors within 5 minutes.

Test EPO function at yearly service inspection.



CAUTION!
Remember to secure load prior to EPO testing.

Monitor noise level in computer room when all equipment is in operation (UPS, computers, servers, printers, air conditioning etc.) Take precautionary measures according to Occupational Noise Exposure Recommendation if necessary.

4.10.1 EPO Principle

Diagram for Emergency Power Off (EPO) principle has to be established prior to EPO and UPS installations. Battery Breaker Box and switch gear must be installed with “shunt trip”.

Use external power supply from “Utility” and UPS output before reaching Q002, when tripping Battery Breakers and switchgear.

EPO circuit and UPS are interconnected to “OFF” and “ON” push buttons, through the System Integration Interface card terminals X001. On System Integration Interface card, the selection switch S002 for internal or external power supply may be set.

S002	
Choose either:	**Emergency shutdown connection between:**
Position 1, internal supply	X001:3 and X001:4
Position 2, external supply	X001:1, + 12V and X001:2, GND

EPO switches must have break functions. Supply current loop of 20mA internally or externally by selecting switch S002 on System Integration Interface. Use external supply with 12Vdc or 20mA current generator.

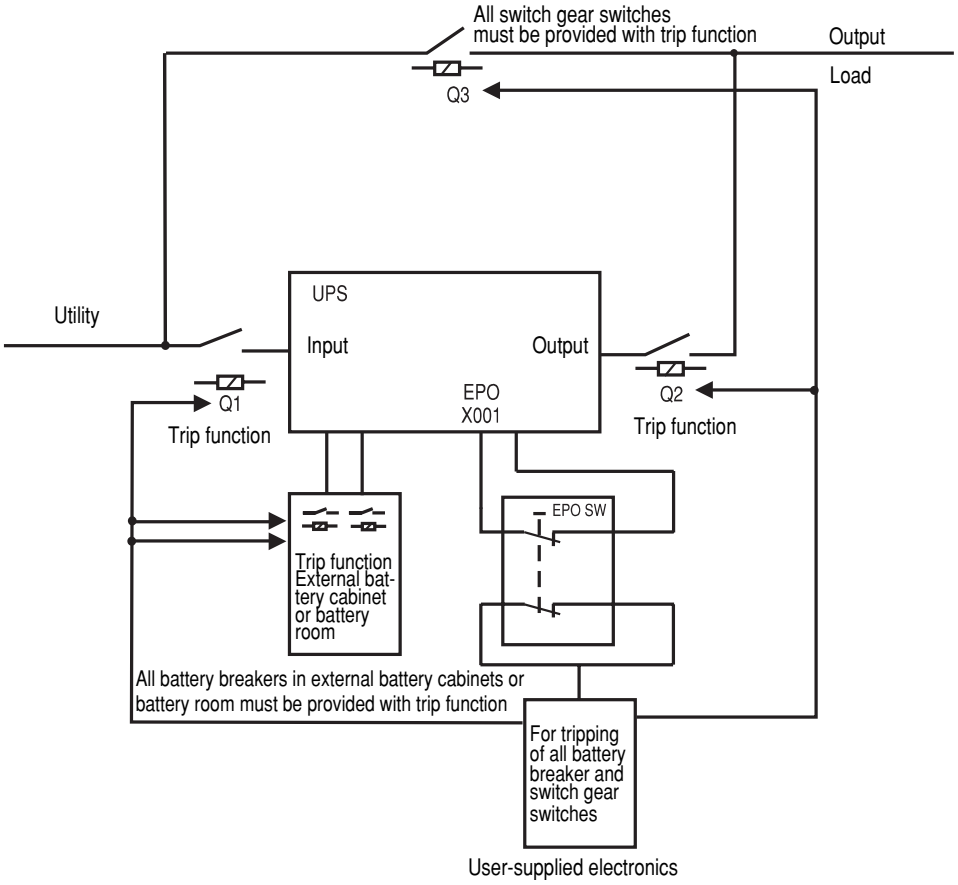
The EPO switch is interconnected to an electronic control system (not available from APC) supplying the Battery Breaker Box and switch gear tripping function with an external 208/120Vac or 480/277Vac 50/60Hz supply from Utility and UPS output before Q002.

The combination of 2 break functions (one for UPS system and one for external switch gear) allows for a quick system shutdown in an emergency situation.

NOTICE!
Emergency **P**ower **O**ff function requires a special Service Bypass Panel with tripp function breakers.

External Connection

Principle diagram

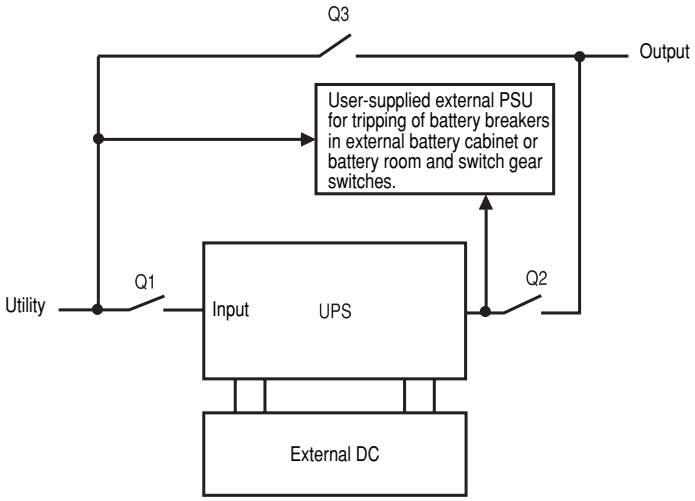


990-4048

4.10.2 Emergency Power Off (EPO) for UPS

UPS systems installed in a computer room MUST have external batteries with EPO trip-function in Battery Breaker Box and in switch gear.

System Configuration for Single Utility



Single Utility Matrix

DC	Utility	Possible UPS operation modes	Tripping Supply	Note
0	0	Off	0	Nothing to trip
0	1	Bypass operation only	1	
1	0	Battery operation only	1	
1	1	Normal / bypass / battery operation	1	

990-4048

5.0 Programming

Below table shows operating parameters programmable from keyboard. Only qualified users should amend programming parameters.

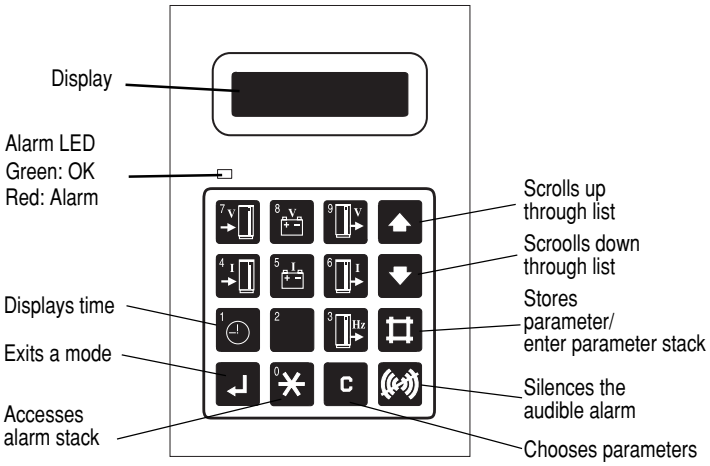
5.1 Parameters

Parameter	Setting*	Comments
Bypass operation	YES, **NO**	YES will switch the system into bypass mode***
Language	GB, D, F, DK, S, SF, NL, PL, CZ, E, P, SK, H	Languages of text in display
Autostart	YES, **NO**	Automatic restart by utility return (1 min. delay). Ensures quick battery recharge.
Remote shutdown active	YES, **NO**	Shutdown of UPS by remote signal when in battery operation. Saves battery energy.
Remote shutdown	**HIGH**, LOW	Nature of remote shutdown signal level
Remote shutdown time	0, 1, **2**, 3, 4, 5, 6, 7, 8, 9, 10 min.	Time delay on remote shutdown of UPS
Battery capacity test	–	Initiates back-up time check. Time measured from start until it reaches low DC warning level (See User Guide, section 6).
Battery monitor test **	–	Initiates checks of battery condition by 25% discharging.
Automatic battery test**	**OFF,** 3,6 months	Activates the battery monitor test in cyclic intervals.
Battery monitor reset**	–	Press the C and ⌗ key to reset alarm (flashing light).
Boost charge	YES, **NO**	YES results in boost charge (10 hours)
Autoboost charge	YES, **NO**	YES results in boost charge after battery operation (10 hours).
Enter new date	YYMMDD	Set to local date
Enter new time	HHMMSS	Set to local time (24 hour clock)

* Factory settings in bold
** For stystems with avctive Battery Monitor only
*** Do not leave system running in bypass mode (static bypass) for extended periods of time, as batteries are not recharged in bypass mode.

990-4048

5.1.1 Programming Keys



NOTICE!
Display accuracy is ± 1%, ± 1 digit.

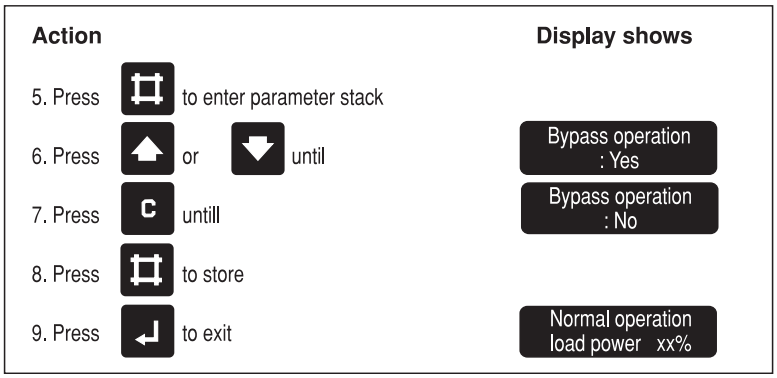
5.1.2 Programming Example - Switch to Bypass Operation

NOTICE!
Do not leave in bypass mode for extended periods in order not to affect battery capacity.

Action				Display shows
1. Press		to enter parameter stack		
2. Press		or	until	Bypass operation : No
3. Press	C	untill		Bypass operation : Yes
4. Press		to store		

990-4048

Return to normal operation



Follow same procedure to program other parameters.

5.2 System Configuration

System configuration parameters are vital for correct system operation and are password-protected.

Incorrect programming may damage battery or cause output voltage to be lost during operation!

System Configuration Parameters (password protected)

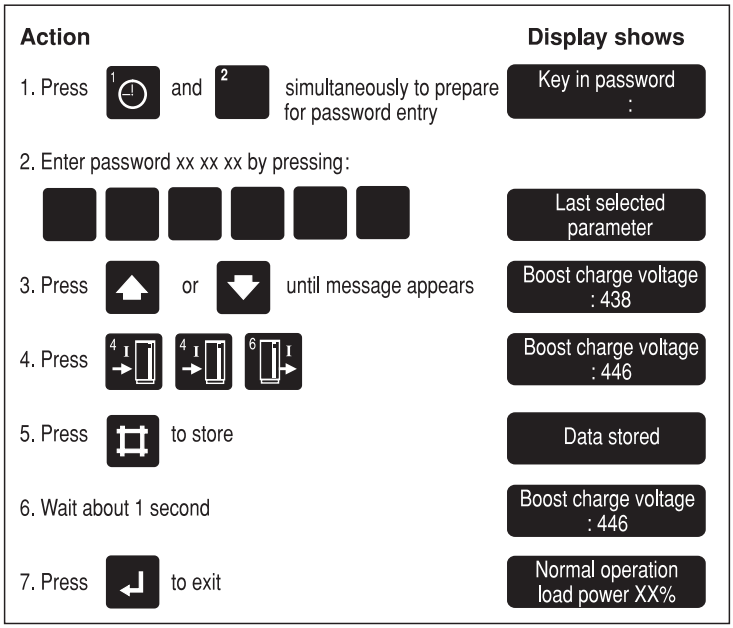
Parameter	Setting*	Comments
Isolation Transformer Input	YES, **NO**	YES, if optional input isolation transformer is available
Isolation Transformer Output	YES, **NO**	YES, if optional output isolation transformer is available
Delta Soft Start Time	1, **10**, 20, 40 sec.	Input current switching in ramp function. Use higher values for smaller/unstable diesel generators
External SSW present	YES, **NO**	YES, for systems with external static bypass switch
Normal Charge Voltage	205-230V **219V** 410-460V **438V**	Setting of float charge voltage at 20°C/68°F (Automatic compensation for temperature deviations)
Boost Charge Voltage	219-230V **219V** 438-460V **438V**	Setting of boost charge voltage at 20°C/68°F (Automatic compensation for temperature deviations)
Low Battery warning	168-192V **173V (183V)** 336-384V **346V**	Discharged Battery warning
Low Battery shut-down	155-168V **163V (173V)** 310-336V **326V**	Switches off system at minimum permissible battery voltage
Synchronization	0.25, 0.5, **1**, 2, 4 Hz/sec.	Synchronization speed. Higher values used at unstable utility frequencies.
High Battery Temperature	15-40°C/59-104°F **35°C/95°F**	Alarm - Ambient battery temperature too high
Common fault delay	0, **10**, 20, 30 sec.	Delay before common fault alarm relay is activated
Reset operation mode lock	YES, **NO**	YES resets system locked in bypass or battery operation mode caused by system failures (only applicable for service personnel)
Expected back-up time (min.)	0.1-999.9 **5.0**	Expected UPS back-up time in minutes when running at 100% ohmic load. Time used by ABM**
Battery Capacity in (Ah)	0.1-999.9 **7.0**	Total Battery capacity in Ah. Setting used by ABM**.
Highest Station Address	2-9	Highest station address in parallel system
Station Address	1-9	Station address in parallel system

990-4048

Parameter	Setting*	Comments
APM*** Mode Active ()	Disabled Redundant +1 Parallel +1	Use only in parallel systems. Disabled: APM off. Redundant +1: Redundant operation with one unit being inactive in parallel system Parallel +1: Redundant operation with all units in operation.
APM Test Mode Active	YES, **NO**	YES, if APM test mode is active
Battery Connection	Common, **Separate**	Common: if common battery is used in parallel system. Separate: if separate battery is used

* Bold text refers to standard factory setting
(bold text i parantes refers to factory setting for 220V)
** Advanced Battery Monitor
*** Advanced Power Management

5.2.1 Programming Example - Change Boost Charge Voltage to 446V

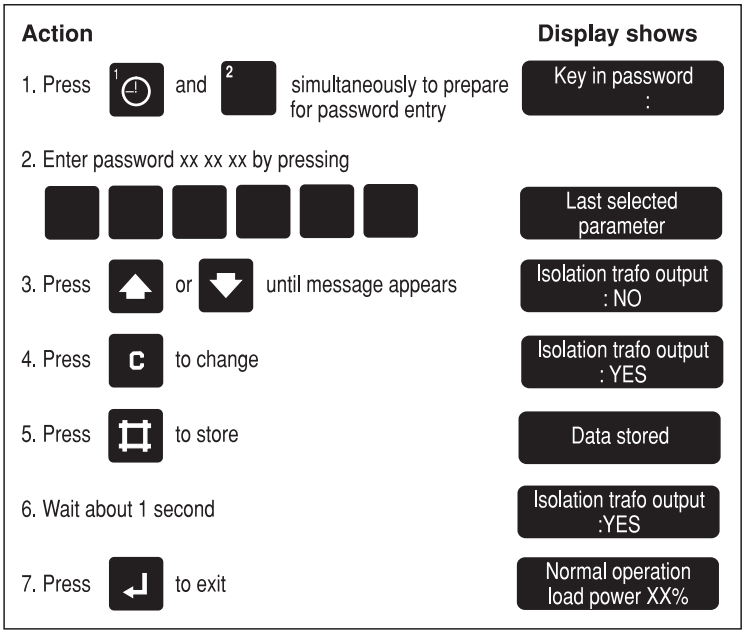


NOTICE!
The voltage level used in the programming example is applicable only for 480V versions. Correct voltage level for 208V versions is 223V.

NOTICE!
Change charge voltages, battery warning limit, shut down voltages and high battery temperature limit by entering the actual value. See example above.

990-4048

5.2.2 Programming Example - Change to Output Isolation Transformer Available



NOTICE!
Change parameters by pressing the C key once or several times. See example above.

990-4048

5.3 Programming Parameters for Advanced Parallel Operation

To use the advanced parallel functions, the following parameters must be programmed:

1. “Station number”
2. “Highest station address”
3. “Advanced power management”
4. “APM test mode active”
5. “Battery connection”

5.3.1 Description of Settings

1. “Station number”
   - Valid station numbers: 1-9 stating the UPS parallel address in system.
2. “Highest station number”
   - Valid station numbers: 2-9 stating the number of UPSs in system.
3. “Advanced power management”
   - “Disabled”: Advanced power management is inactive.
   - “PARALLEL+1”: Advanced Power Management is activated when the system operates as PARALLEL N+1, meaning that one system can be isolated without overloading the remaining systems (N systems/UPSs).
   - “REDUNDANT+1”: Advanced Power Management is activated when the system operates as REDUNDANT N+1, meaning that one system can be isolated without overloading the remaining systems (N systems/UPSs) with one spare system.
4. “APM test mode active”
   - “No”: Stand-by-time will be 24 hours - on-line time will be 48 hours. (xN systems).
   - “Yes”: Stand-by-time will be 1 min. - on-line time will be 2 min. (xN systems).
5. “Battery connection”
   - “Separate”: Separate battery for this UPS.
   - “Common”: Common battery in a parallel system.

NOTICE!
“Common”: Common battery in a parallel system. When this setting is chosen, the highest battery temperature that can be found in the parallelled systems is used for charge voltage compensation.

NOTICE!
Common battery pack is a technical possibility.
However, APC recommends separate battery pack due to a higher safety degree in connection with redundant/parallel operation.
The UPS system is designed for both situations.

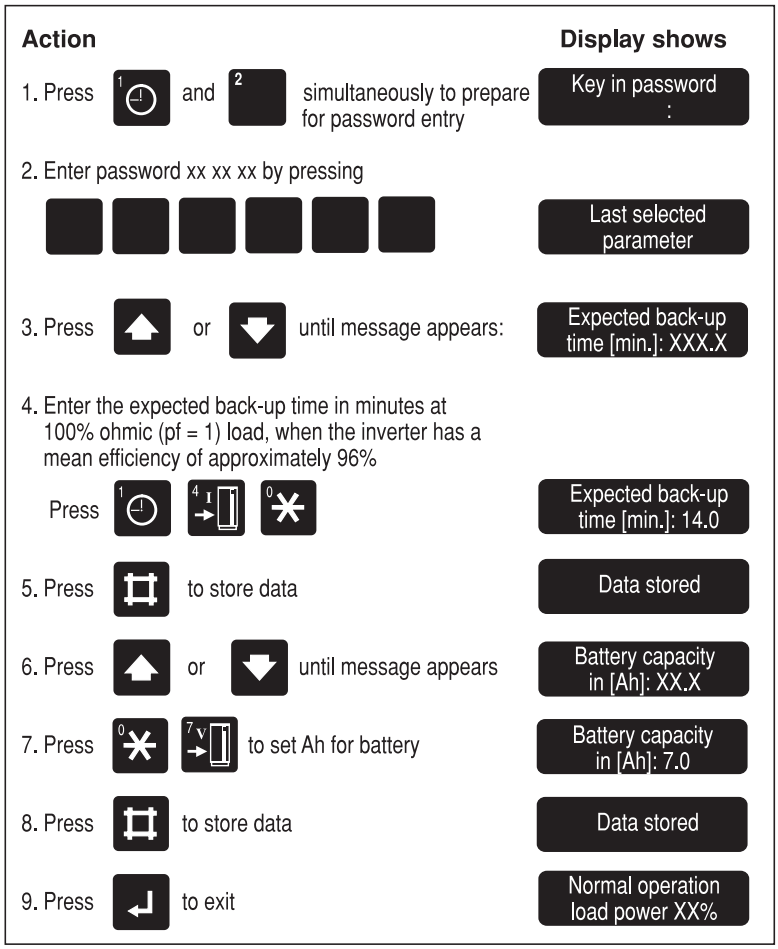
5.3.2 Programming Example

Example with four systems in parallel with separate batteries.

- Program the station addresses 1-4: 1 for UPS 1, 2 for UPS 2, 3 for UPS 3, and 4 for UPS 4.

- All UPS systems have to be programmed to “Highest station address”:4.
- If APM is not to be tested, “APM test mode active” must be “NO”.
- If a system is isolated due to service, the station numbers must be reprogrammed for the remaining active systems starting with number 1 and ending with maximum number of active systems. No number must be left in this sequence. Furthermore, “Highest station address” must be changed to number of active UPSs in parallel.

5.4 Battery Monitor



5.4.1 Installation of new batteries:

To avoid false alarms, the above procedure MUST be followed.

NOTICE!
Contact your local dealer if you have any questions regarding changing parameters.

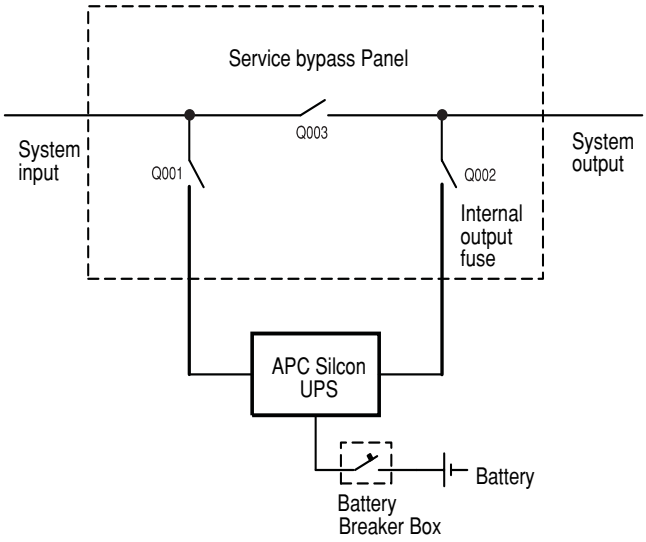
990-4048

6.0 Options/Accessories

6.1 Service Bypass Panel for Single Operation

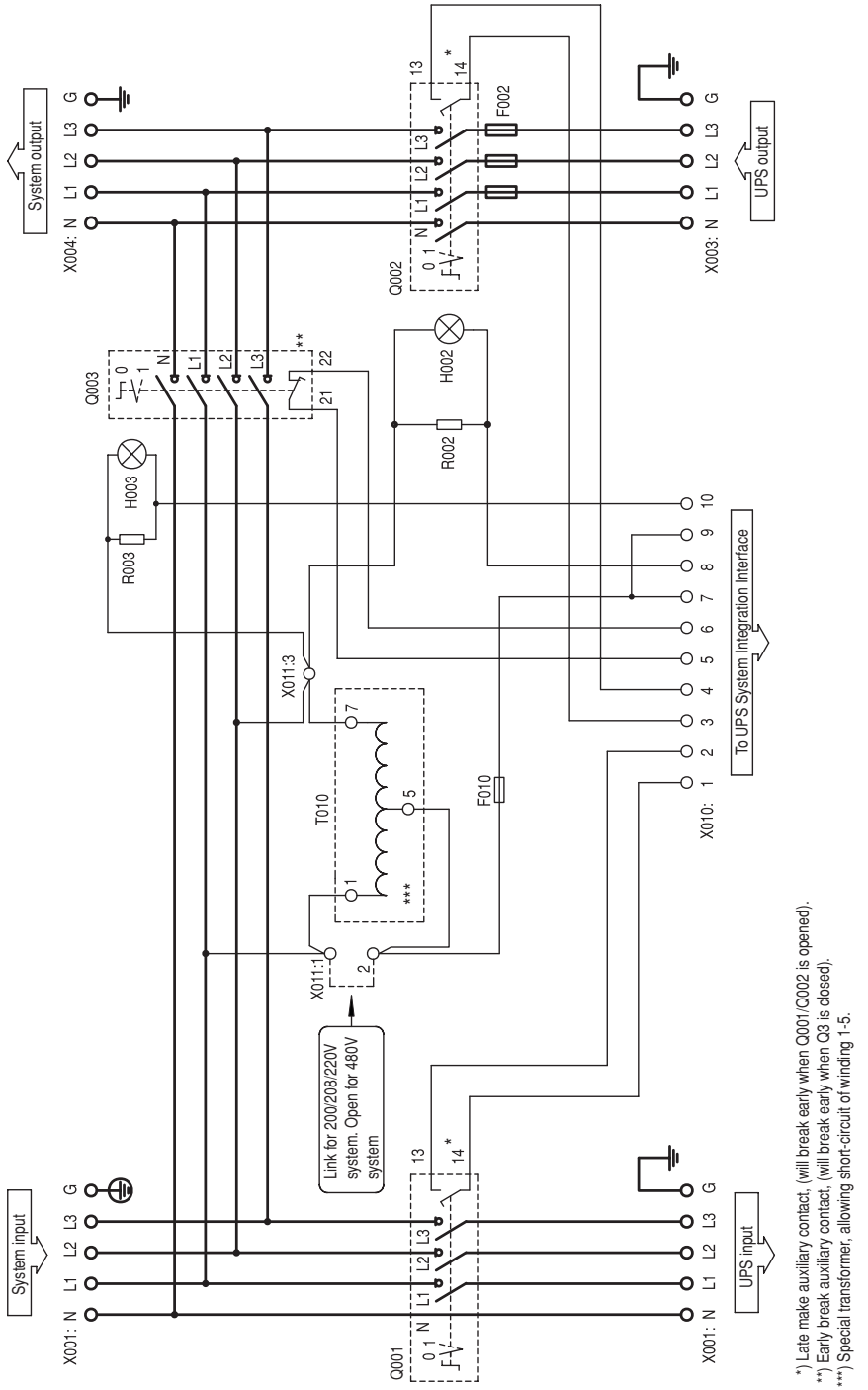
The SBP-xxxA-SS series include 2 models, SBP-175A-SS and SBP-300A-SS.

Principle diagram: Service Bypass Panel for single operation



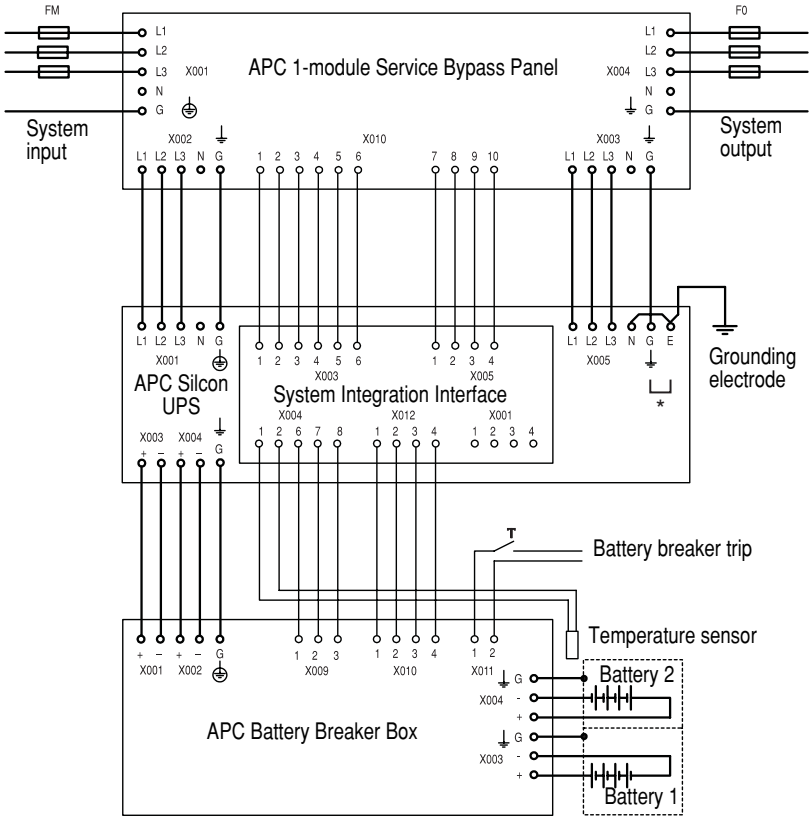
990-4048

Service Bypass Panel for single operation



990-4048

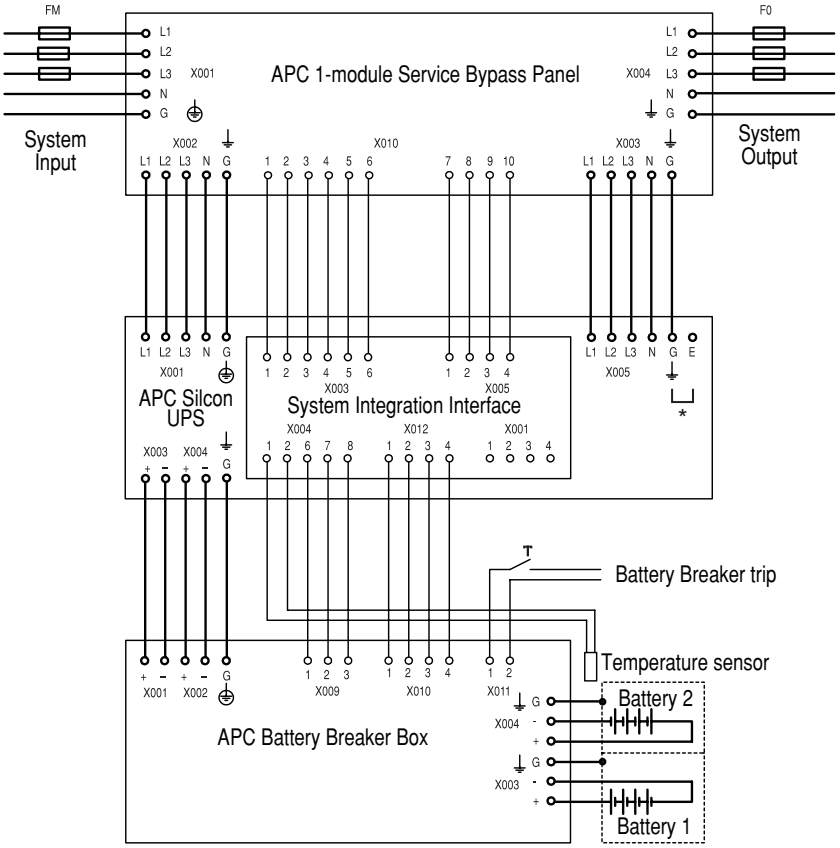
6.1.1 UPS with 1-module SBP and External Battery via Battery Breaker Box - Single Utility - 3-wire Grounded WYE Service



*) Terminals marked “E” and “G” are connected internally in the UPS

990-4048

6.1.2 UPS with 1-module SBP and External Battery via Battery Breaker Box - Single Utility - 4-wire Grounded WYE service



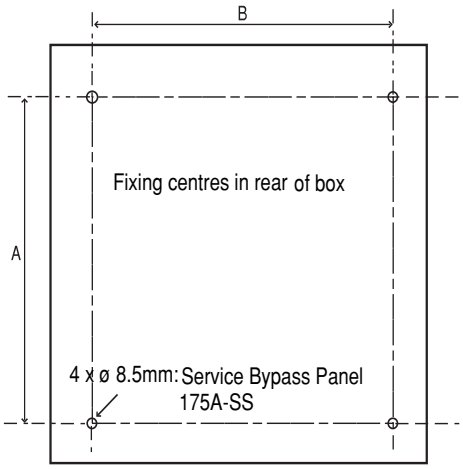
*) Terminals marked “E” and “G” are connected internally in the UPS

6.1.3 Mounting and Connecting

SKU No.	Service Bypass Panel	UPS	Dimension HxWxD* [in/mm]	Fixing centres AxB [in/mm]	Weight [lbs/kg]
SL0901484	SBP-175A-SS	60kW- 480V 80kW - 480V	37.79/960 x 29.52/750 x 6.88/175(9.25/235)	33.85/860 x 25.98/660	130/59
SL0901625	SBP-300A-SS	60kW- 208V 80kW - 208V	49.21/1250 x 45.47/1155 x 16.14/410 (18.5/470)	For floor mounting	200/91

* Measurements in brackets include switch handles

990-4048



NOTICE!

ϕ	"phase"
	"risk of electric shock"
	Terminal for Equipment Grounding Conductor
"E"	Terminal for Grounding Electrode Conductor

NOTICE!
For grounding, refer to local legal regulations.

NOTICE!
Check correct phase connection of inputs and outputs.

Wiring
Select wire size based on the data in Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

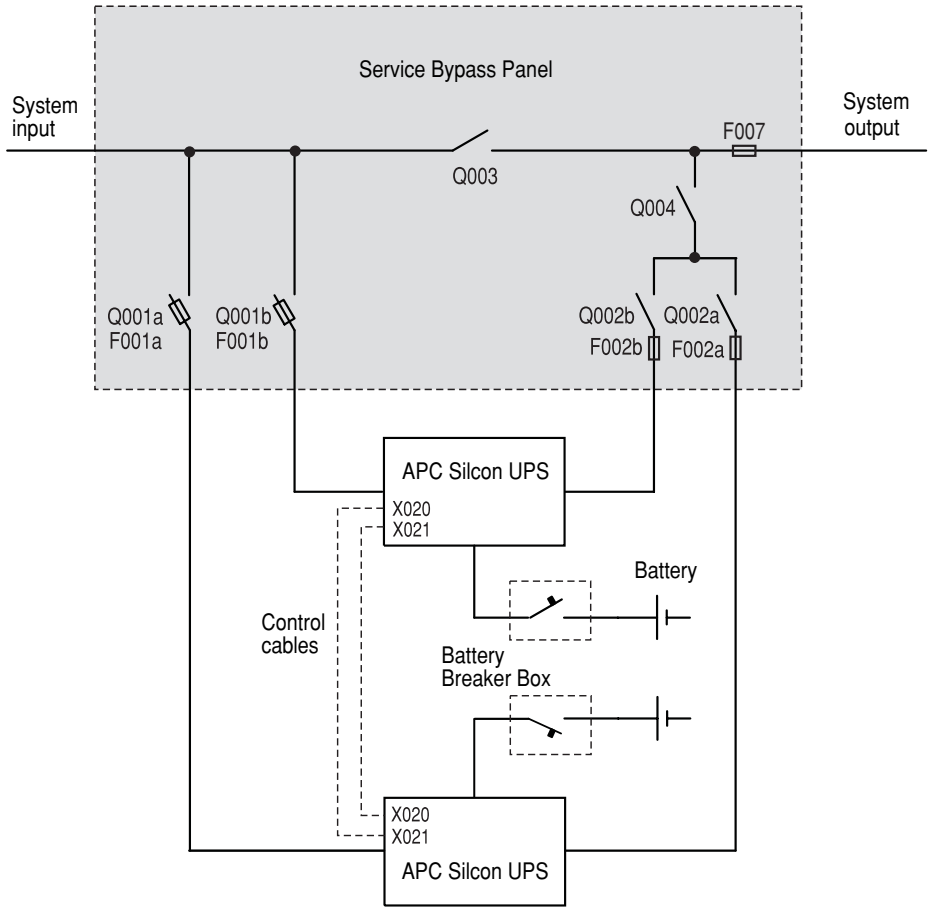
Use commercially available UL approved solderless lugs for the wire size required for your application. Connect wire to the lug using tool and procedure specified by the lug manufacurer.

990-4048

6.2 Service Bypass Panel for Parallel Redundant Operation

The SBP-xxxA-SR series includes 1 model, SBP-175A-SR rating from 60-80kW (480V).

Principle Diagram: Service Bypass Panel for parallel redundant operation.

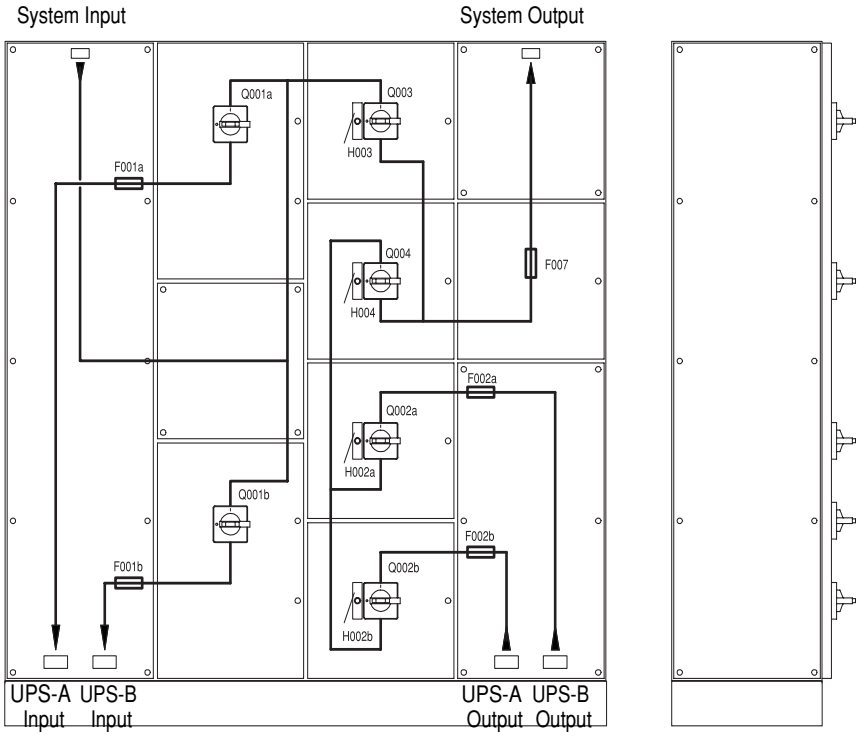


990-4048

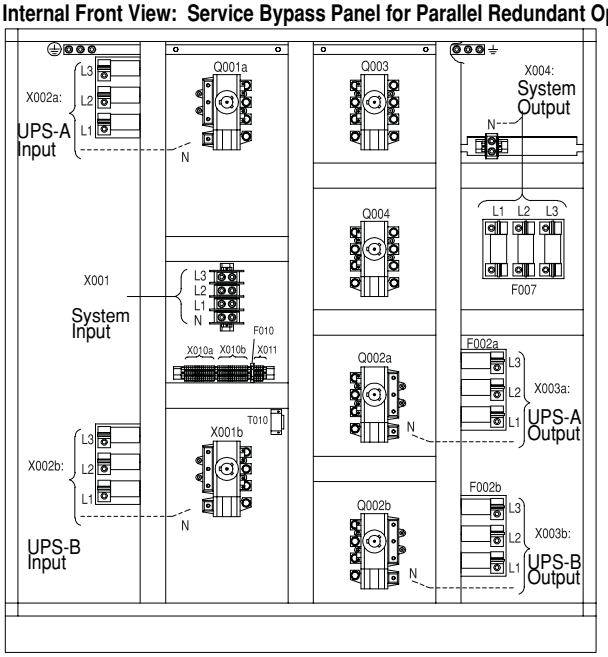
Service Bypass Panel for Parallel Redundant Operation, 175A.

Front View

Side view

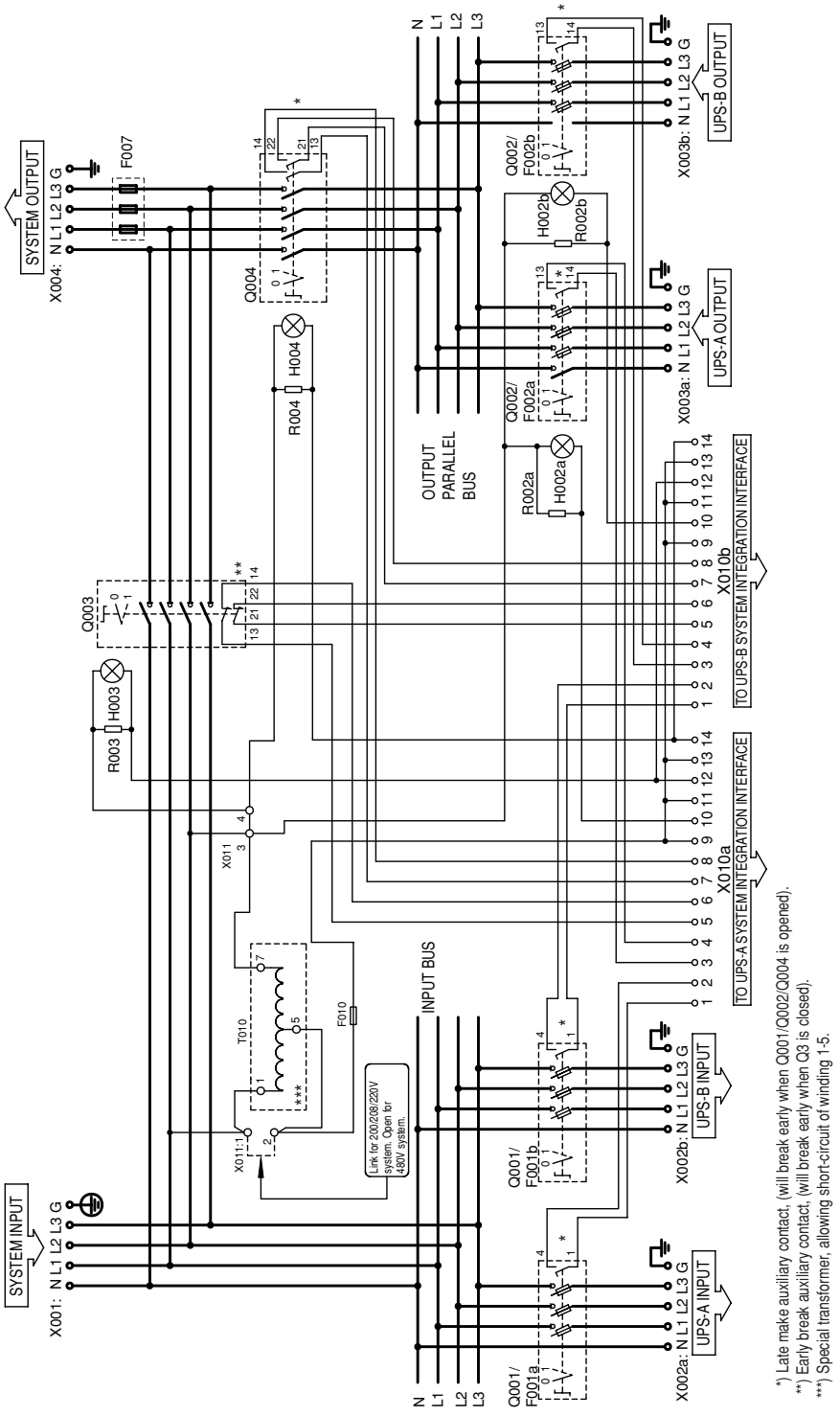


Internal Front View: Service Bypass Panel for Parallel Redundant Operation, 175A.



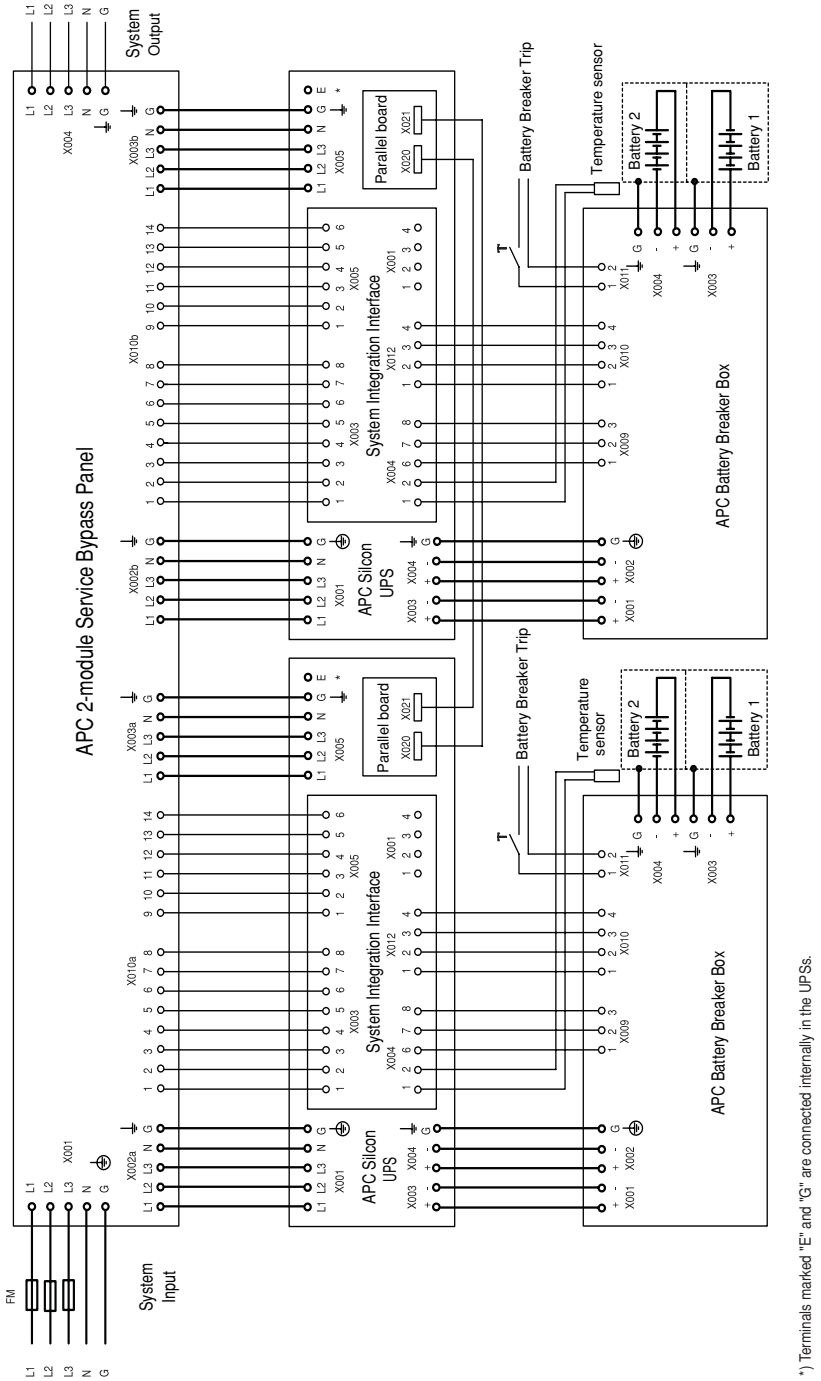
990-4048

Diagram: Service Bypass Panel for parallel redundant operation.



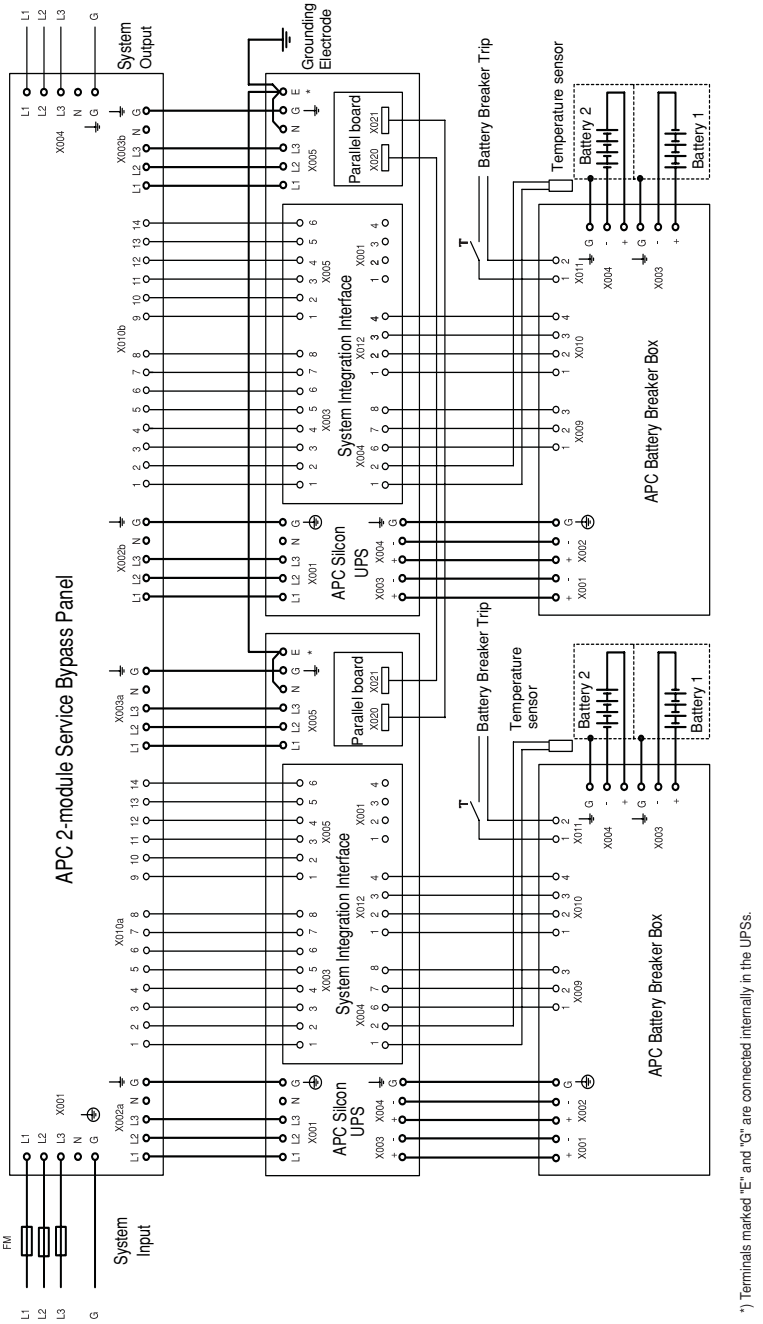
990-4048

6.2.1 Parallel/Redundant UPS with 2-module SBP and External Battery via Battery Breaker Box - Single Utility - 4-wire Grounded WYE Service



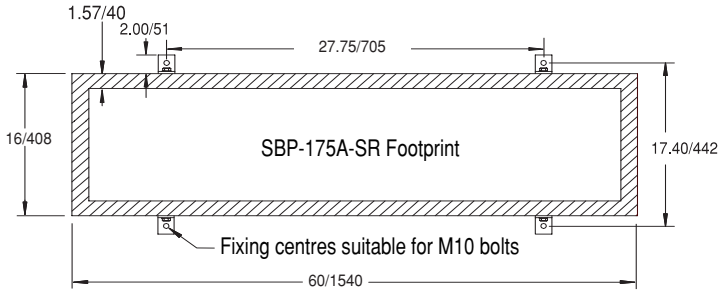
990-4048

6.2.2 Parallel/Redundant UPS with 2-module SBP and External Battery via Battery Breaker Box - Single Utility - 3-wire Grounded WYE Service



990-4048

6.2.3 Mounting and Connection



Allow for gap behind plinth for covers and screws. Applies to both left and right hand ends.

SKU No.	APC Service Bypass Panel	UPS	Dimensions HxWxD [inch/mm]	Weight [lbs/ kg]
SL0901487	SBP-175A-PR	60kW - 480V	64/1632 x 60/1540 x 16/ 408	551/250
		80kW - 480V		

NOTICE!

ϕ "phase"

"risk of electric shock"

Terminal for Equipment Grounding Conductor

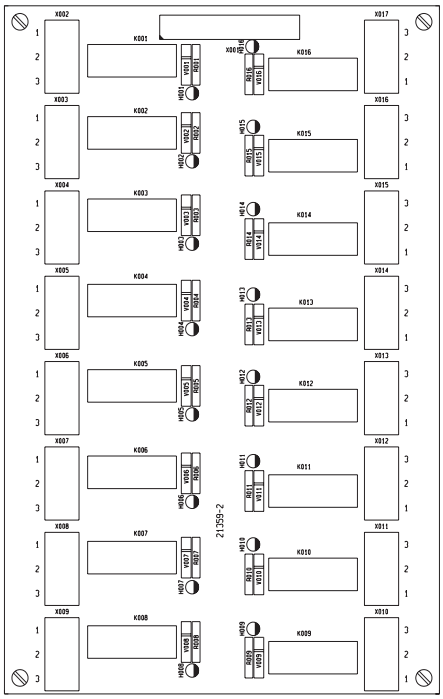
"E" Terminal for Grounding Electrode Conductor

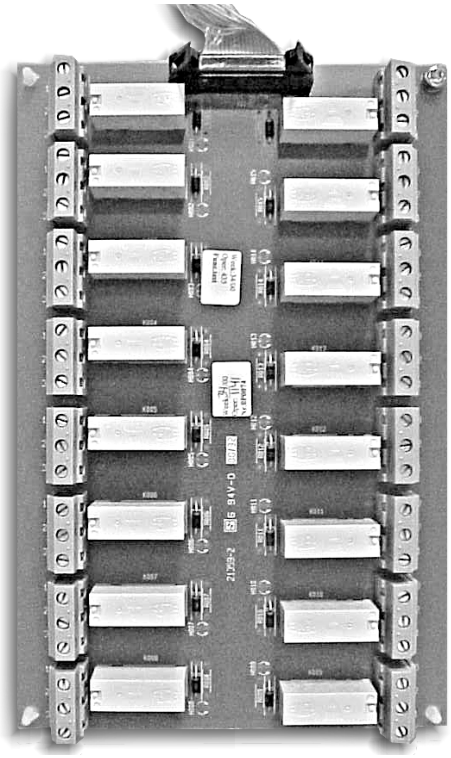
CAUTION!
Check correct phase connection of inputs and outputs.

Wiring
Select wire size based on the data in the Appendix Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

Use commercially available UL approved solderless lugs for the wire size required for your application. Connect wire to the lug using tool and procedure specified by the lug manufacurer.

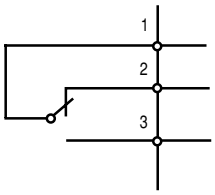
6.3 Relay Board





Relays
All relays are “fail safe”: in alarm modes, relay coil will be de-energized.

Relay shown in alarm position



Maximum load: 8.0A – 250VAC
0.3A – 60VDC

Minimum load: 0.05A – 6VAC
0.05A – 6VDC

6.3.1 Relay Board Functions

NOTICE!
If “communication to controller lost” alarm is active, ALL relays will indicate failure.

Relay Number	Message	Alarm Trigging Events
1 ## (X002)	Utility Outside Tolerance	Utility voltage RMS value outside tolerance Utility wave form (fast detector) outside tolerance Utility frequency outside limits
2 ## (X003)	Bypass Outside Tolerance	Bypass voltage RMS value outside tolerance Bypass wave form (fast detector) outside tolerance Bypass frequency outside tolerance
3 ## (X004)	Output Outside Tolerance	Output voltage RMS value outside tolerance Output wave form (fast detector) outside tolerance Output frequency outside tolerance
4 (X005)	System Overload	Output load over 100% Delta inverter current limiter active Main inverter current limiter active
5 (X006)	Fan Fault	Blocked or faulty fan
6 (X007)	High Equipment Temperature or Inverter Fuse Blown	Static switch temperature too high Main inverter failure (temperature too high or fuse blown) Delta inverter temperature too high Magnetics temperature too high Isolation transformer optional temperature too high Battery temperature too high
7 (X008)	Battery Breaker Box Battery OFF	Battery Breaker Box battery OFF
8 (X009)	Normal Operation	UPS running in normal operation (Status)
9 ## (X010)	Battery Operation	UPS running in battery operation (Status)
10 ## (X011)	Bypass Operation	UPS running in bypass operation (Status)
11 ## (X012)	Stand-by Operation	UPS in stand-by mode (Hot stand-by, parallel systems only)
12 (X013)	Service Bypass Operation	Service bypass switch active
13 ## (X014)	Boost Charge Operation	UPS boost charging on battery
14 (X015)	Battery Voltage Outside Tolerance	DC voltage too high (shut down) DC voltage under warning level DC voltage too low (shut down)
15 (X016)	Battery Condition Fault	ABM detected battery weak ABM detected defective battery (ABM = Advanced Battery Monitor)
16 ## (X017)	Common Fault	All alarms as mentioned above (except relays 8+9+10+11) Internal power supply fault System locked in operation mode Internal memory fault Internal communication fault

Delay programmable in 282828 stack “Common fault delay”. Settings 0,10,20,30 seconds.

See section 5.2: System configuration.

990-4048

NOTICE!
Alarm Trigging Events 1-2-3-9-10-11-13 activates the corresponding alarm relay after the delay.

Alarm Trigging Events 4-5-6-7-8-12-14-15 activates the corresponding alarm relay momentarily.

Common fault relay 16 is activated at the same time as relay 1-2-3-4-5-6-7-12-13-14-15, or in any of the below situations:
- Internal power supply fault
- System locked in operation mode
- Internal memory fault
- Internal communication fault

6.3.2 Cable Sizes

Cable sizes 24 AWG - 12 AWG are suitable. Use copper conductors only. Cable sizes depend on current demand and ambient temperature.

6.4 Seismic Anchoring

6.4.1 Mounting Seismic Anchoring without Conduit Box

8 holes for Ø 0.4 inch/10mm bolts to be drilled on installation site according to dimensioned sketch below.

The 4 seismic anchoring squares may be loosely tightened in holes prior to UPS installation. Position UPS and tighten squares in holes and in UPS feet.

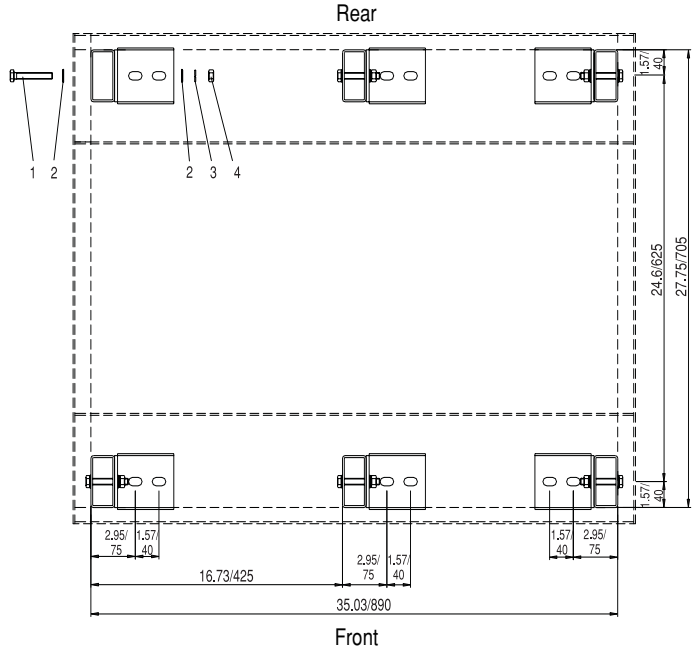
Or:

1) Drill holes, position UPS and tighten the 4 squares in holes and in UPS feet. In a 39.37 inch /1000 mm cabinet, seismic anchoring may be bolted in either the 4 extreme right/left feet or in the 2 middle feet plus the 2 right or left feet.
2) Position seismic anchoring square and fasten bolt elements: bolt (1), 2 plain washers (2), string washer (3), nut (4), as illustrated below:

6.4.1.3 Seismic Anchoring 39.37 inch/1000 mm Cabinet Mounted under Frame

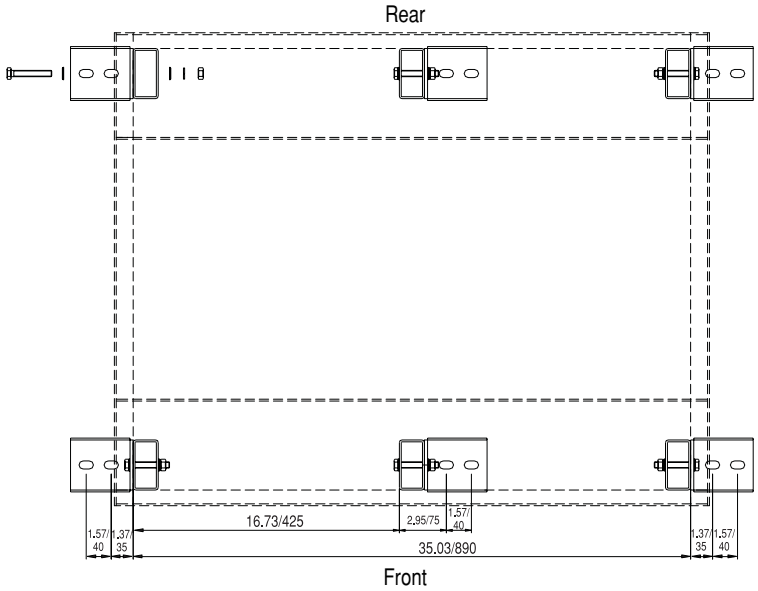
NOTICE!
Tighten all bolts in the 4 squares, both in floor and in UPS feet. Floor bolts not enclosed.

(Measurements in inch/mm)



6.4.1.4 Seismic Anchoring 39.37 inch /1000 mm Cabinet Mounted outside Frame

(Measurements in inch/mm)



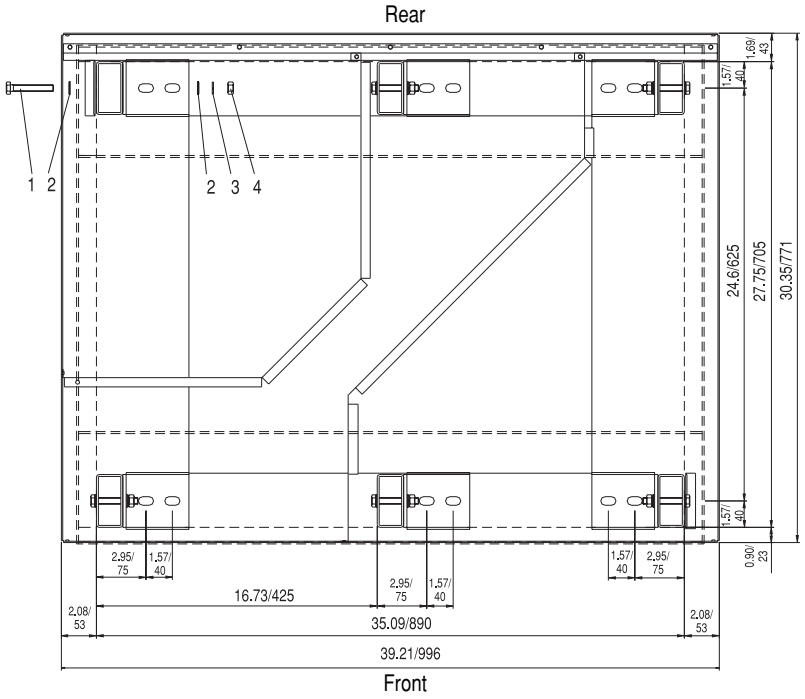
990-4048

6.4.1.5 Mounting Seismic Anchoring with Conduit Box

Conduit box is located on UPS installation site. Follow mounting procedure described in the section Mounting Seismic Anchoring without Conduit Box in this manual.

6.4.1.6 Seismic Anchoring for 39.37 inch/1000 mm Cabinet with Conduit Box

(Measurements in inch/mm)



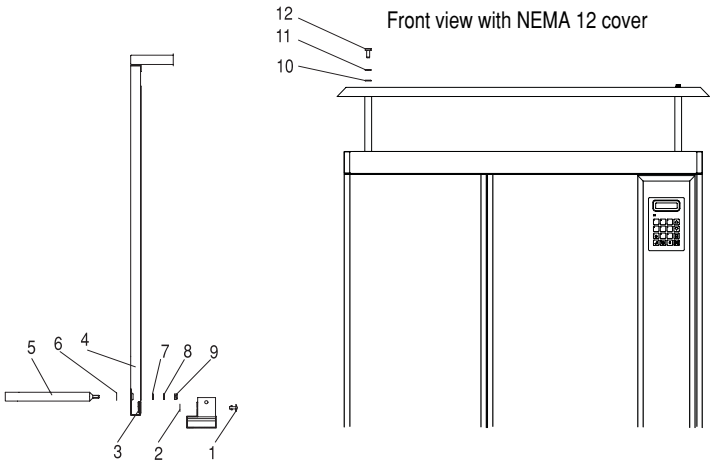
6.5 NEMA 12 Cover

6.5.1 Mounting NEMA 12 Cover

- Remove front cover as described in section 4.1 for 23.62 inch/600 mm cabinet and 39.37 inch/1000 mm cabinet.
- Remove top covers. Covers are fixed with screws from below near cabinet front.
- Replace locking screw and metal locking washer for top entry with locking screw (1) and metal locking washer (2) for narrow top cover (3).
- Connect earth cable from top entry and fasten clips (4) on narrow top cover.
- Unscrew 2 screws from wide top cover (3).
- Mount 2 distance stays (5) with plastic locking washer (6), plain washer (7), spring washer (8), and nut (9) on narrow and wide top cover.
- Mount both top covers on system, connect both earth cables and lock both top covers with locking screws *)
- Mount the NEMA 12 cover with plain washer (10), spring washer (11) and screw (12) on the 4 distance stays.

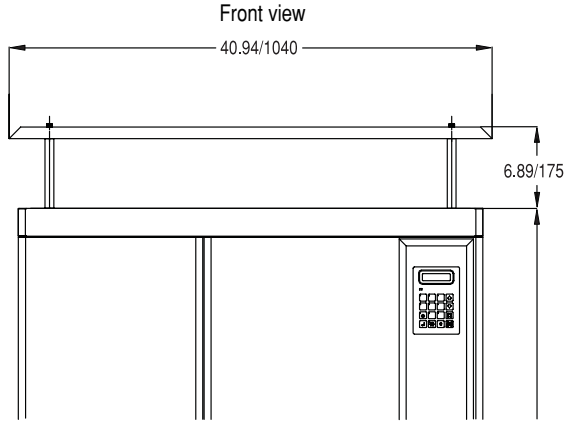
990-4048

*) 39.37 inch/1000 mm cabinet has no top entry. Mount 4 distance stays on top cover.



6.5.1.1 UPS with NEMA 12 cover, 39.37 inch/1000 mm Cabinet

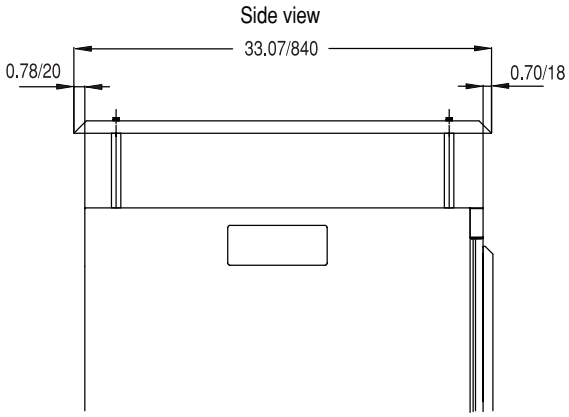
(Measurements in inch/mm)



990-4048

6.5.1.2 UPS with NEMA12 Cover, 39.37 inch/1000 mm Cabinet

(Measurements in inch/mm)



6.6 Remote Display



With the remote display unit data may be displayed at distances of up to 25m from UPS. For extended communication distance, see below.

Remote display may easily be connected to UPS via one of the two serial communication ports on the communication interface board.

To obtain a transmission distance of up to 3.2km normal RS232C signal levels must be converted to a long distance communication standard. The converter must be placed outside the UPS cabinet.

6.6.1 Extension of Remote Display Communication Distance

The remote display communicates with the UPS through a 3-wire RS232 interface. The remote display is a DTE (Data Terminal Equipment) employing a SUB-D 9-pin female connector. Communication speed: 9600 bps.

990-4048

For communication distances, see table below. Insert converters if longer distances are necessary, or if communication cables are led through magnetically noisy areas. Converters must comply with local regulations

Remote Display Communication Extensions

	Standard (RS232)	**Short-haul Modem Async**
Max. distance	80/25 ft/m	10000/3200 ft/m
Converter Manufacture Art. Code	No converter	BLACK BOX ME800A-R2
RS232 BLACK BOX connector		Sub-D 25-pin female
BLACK BOX interconnector		4-screw terminal

Two converter boxes are required for a communication distance extension: One box near the UPS for the conversion from RS232C to a long distance communication standard, and another box at the other end to convert back to RS232C, which is to be connected to the Remote Display. The converter provides optical signal isolation. Both converter boxes must be supplied by an uninterruptible power source.

6.6.1.1 Connections Without Converter

Connect a 25-pin female Sub-D and a 9-pin male Sub-D connector with a 3-wire shielded cable, as shown in table below. Connect shield at one end only.

Pin Connection for Interconnection Cable (without converter)

Host (DTE)	**Remote Display (DTE)**
25-pin female pin No.	9-pin male pin No.
2 (TXD)	2 (RXD)
3 (RXD)	3 (TXD)
7 (GND)	5 (GND)
House (shield)	No Connection

6.6.1.2 Connections With Converter

Connections to be made according to converter manual.

Pin connection – Example only:

Pin Connections for cable from host to ME800A-R2.

Pin connection for cable from ME800A-R2 to Remote Display

990-4048

Host (DTE)	ME800A-R2 (DCE)
25-pin female pin No.	25-pin male pin No
2 (TXD)	3
3 (RXD)	2
7 (GND)	7
House (Shield)	No connection

ME800A-R2 (DCE)	Remote Display (DTE)
25-pin male pin No	9-pin male pin No
3	2 (RXD)
2	3 (TXD)
7	5 (GND)
No connection	House (Shield)

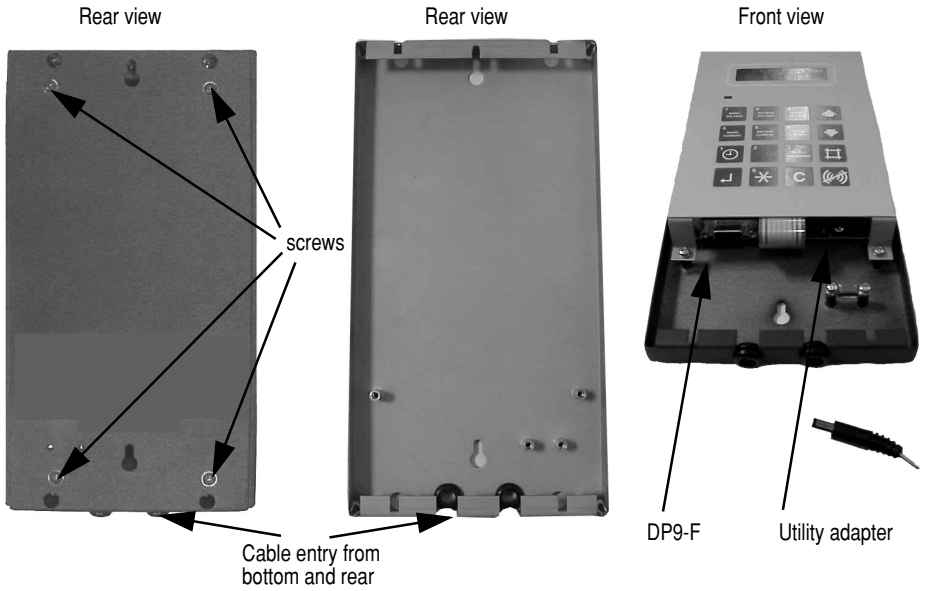
The ME800A-R2 must be set up as a DCE with no RTS/DTR control.

The interconnection cable between the two ME800A-R2 boxes is a 4-wire twisted pair telephone cable with or without shield. The shield improves noise immunity but reduces maximum communication distance.

6.6.2 Remote Display Installation

6.6.2.1 Connecting RS232C and Utility Adapter

CAUTION!
Wiring for alarm and signal circuit field to be rated 300V (minimum).



1. Turn 180° to loosen the 4 screws
2. Remove front cover
3. Mount back plate
4. Connect cables

990-4048

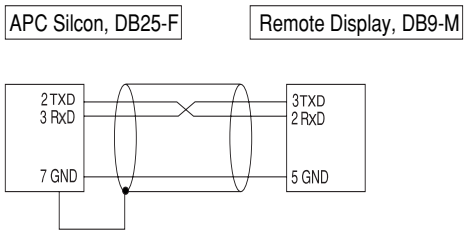
6.6.2.2 Remote Display Power Supply

The remote display is supplied by normal AC power with no battery back-up. For UPS data transmission to remote display to remain unaffected during power failure, the remote display must be supplied from an uninterruptible power source.

Converters used to extend communication distance must also be supplied from uninterruptible power sources.

6.6.2.3 Remote Display Cables

RS232C to RS232C cable:



Connect shield at one end only!
Rating: Refer to Local/National electrical codes.
Communication voltage ±15V_{DC}

6.6.3 Remote Display Use

The remote display is an inactive unit unable to influence the operation of the UPS: Some of the alarms visible on the internal display are also available on the remote display (See the Alarm section in the APC Silcon User Guide).

6.6.3.1 Initiating the Remote Display

After having connected the supply the display will show:

Remote Display: “APC Silcon UPS”

6.6.3.2 Communication Fault

Communication fault between UPS and remote display will appear in the display as follows:

“Data transmission interrupted”

6.6.3.3 Remote Display Setting

Use # Stack to select language and type of UPS connected to remote display.

Parameter	Setting	Comments
Language	GB,D,F,DK, S, SF,NL, PL, CZ, E, P, SK, H, I	Language
Host	SDC charger, DP300E, 300E	Type of UPS connected to remote display

990-4048

6.6.3.4 Operation

See Operation section in the APC Silcon User Guide.

6.6.3.5 Display of Measured Value

See Display of Measured Value in the APC Silcon User Guide.
Time reading and utility 2 current not visible from remote display.

6.6.3.6 Alarms

See Alarm section in the APC Silcon User Guide.

6.7 Isolation Transformer Module

Isolation transformer modules can be used in the following configurations:

1. Between utility supply and UPS input, in 3-phase Delta-service systems, and in systems with grounded phase or grounded at midpoint of 2 phases.
2. Between utility supply and UPS input for galvanic isolation
3. Between UPS output and load for galvanic isolation
4. Between UPS output and load when voltage stepping is required

Do not use switch gear to bypass isolation transformers. If bypassed, damaging circulation currents may occur, even with a unity turn ratio.

Coupling Methods:
Configure isolation transformers as Delta-WYE with accessible neutral (Dyn11).



CAUTION!
Check correct phase connection of inputs and outputs.



CAUTION!
At 100% switch mode load, the neutral must be rated for 173% output phase current.

Recommended use:

- 3 wires in/out
- 3 wires in/4 wires out
- 4 wires in/out

NOTICE!
All external cable dimensions are recommeded sizes only.

6.7.1 Requirements on Site

All isolation transformer parts are accessible from front or top (cable entries accessible from bottom). Isolation transformer may be placed close to walls, allowing free space for the front door to open. Allow free space for ventilation slots for sufficient cooling.
Do not expose isolation transformers to direct sunlight.

NOTICE!
For grounding, refer to local legal regulations.

NOTICE!

ϕ “phase”

“risk of electric shock”

Terminal for Equipment Grounding Conductor

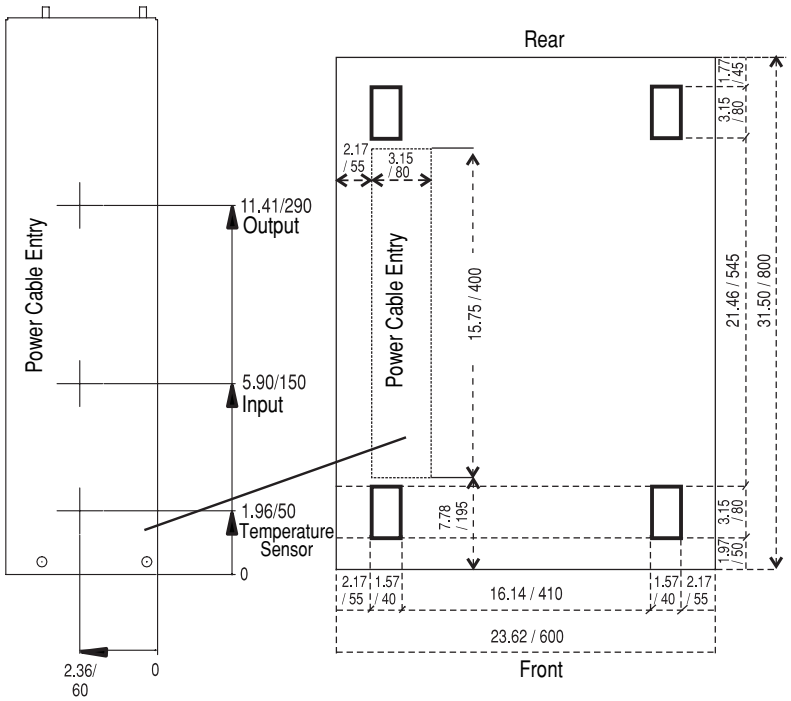
“E” Terminal for Grounding Electrode Conductor

NOTICE!

Terminals marked ⏚ and ⏚ are electrically connected to the terminal marked “E”.

6.7.2 Footprint

Recommended cable routing

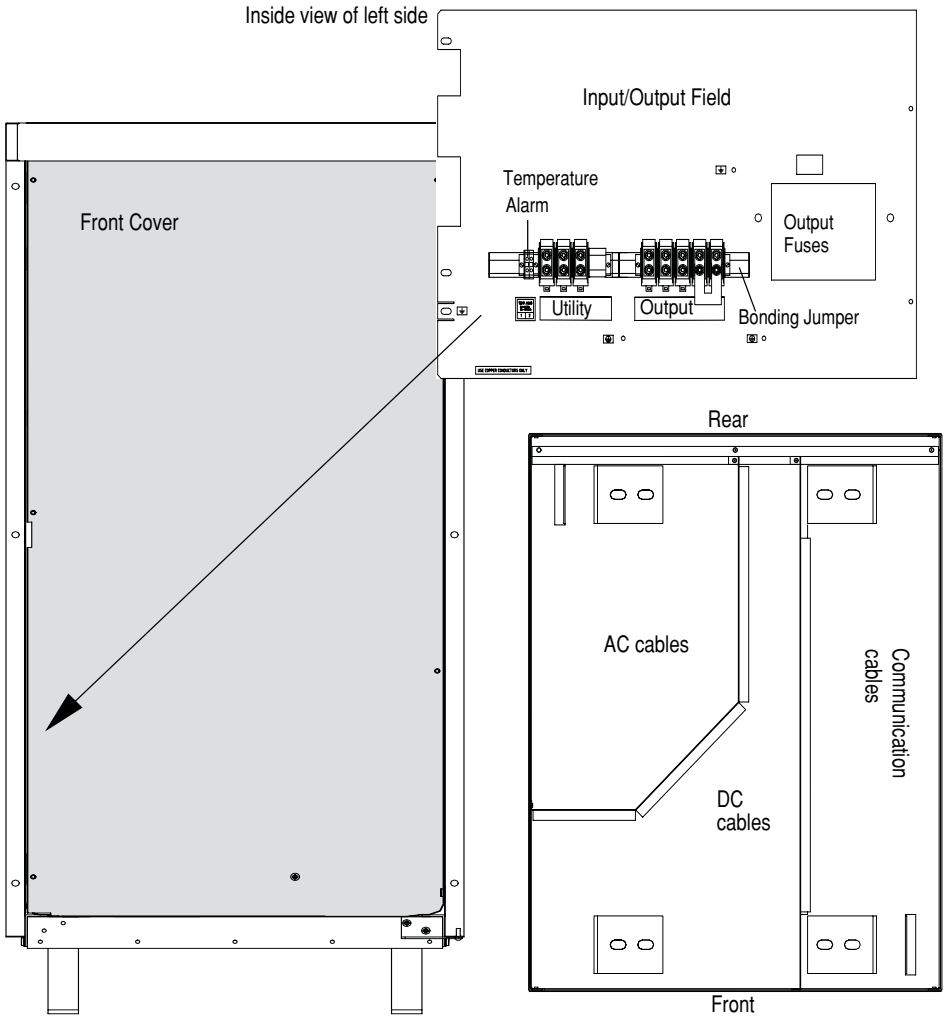


990-4048

6.7.3 Connecting Isolation Transformer

Remove screws to open front door for access to cable terminals. Lifting off front cover, remember earth wire on rear side.

23.62 inch/600 mm Cabinet front view door open and Conduit Box for 23.62 inch/600 mm Cabinet



Remember to remount front cover (and earth wire) before starting up system.

The Conduit Box is placed under the Isolation Transformer Cabinet, the solid plate facing to the rear, and perforated plate facing to the front.

Conduits can be attached to the rear side of the conduit box, containing cable channels to separate AC, DC and communication cables.

990-4048

NOTICE!
Supply transformer from 3-wire Delta or WYE-service.



CAUTION!
Check correct phase connection of inputs and outputs. Max. power cables size: 250 kcmil.

NOTICE!
Gland plate in bottom of system must be mounted.

NOTICE!

ϕ "phase"

 "risk of electric shock"

 Terminal for Equipment Grounding Conductor

"E" Terminal for Grounding Electrode Conductor

NOTICE!

Terminals marked  and  are electrically connected to the terminal marked "E".

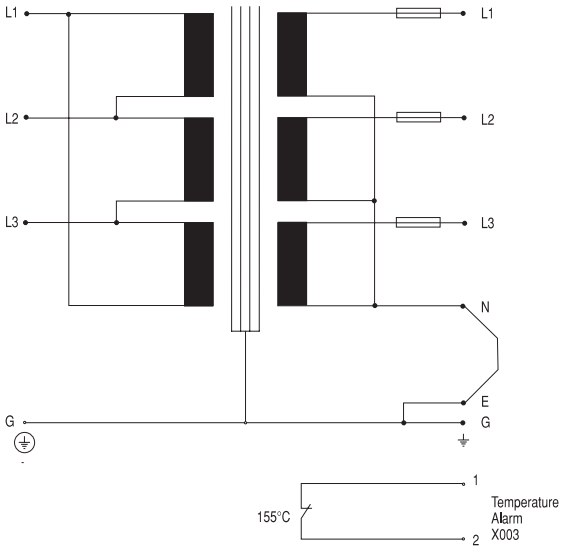
Wiring
Select wire size based on the data in the Appendix Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

Use commercially available UL approved solderless lugs for the wire size required for your application. Connect wire to the lug using tool and procedure specified by the lug manufacurer.

6.7.3.1 External Temperature Alarm Cable

Voltage rating 600V. Cable sizes ranging from 18-14 AWG.

6.7.4 Isolation Transformer - Diagram Delta WYE Configuration (Dyn11)



6.7.5 Grounding of Isolation Transformer

6.7.5.1 System Grounding

a) If not already mounted, mount bounding jumper between output terminal X002:N and X002:E
Bonding jumper not required on isolation transformer as X002:N and X002:E are common terminals

b) Output terminal X002:E marked “Grounding Electrode Terminal” is connected via grounding electrode conductor to local grounding electrode according to NEC1999 250-26.

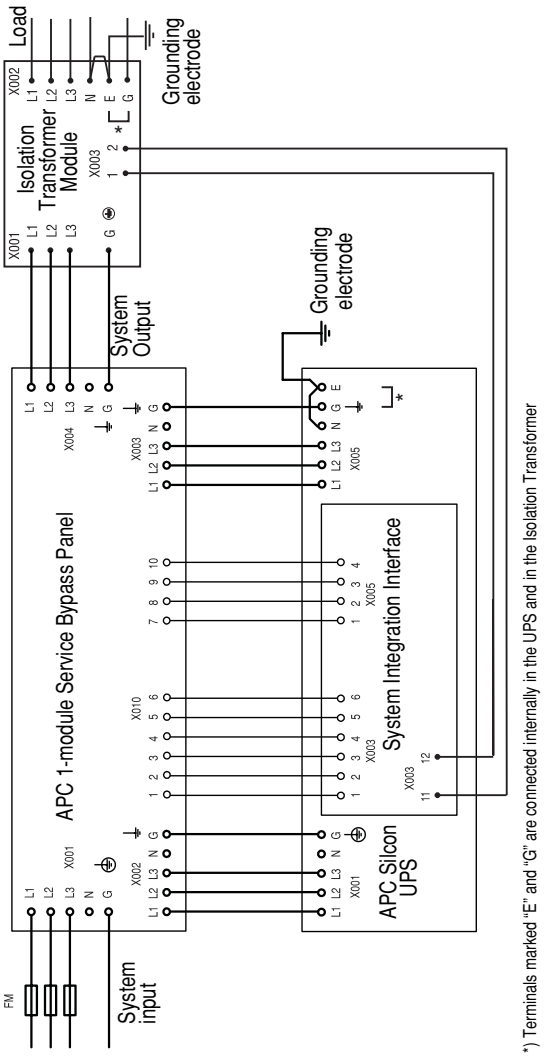
6.7.5.2 Equipment Grounding

a) Terminal marked ⏚ for equipment grounding.

990-4048

6.7.6 Wiring up UPS system with Optional Dyn11 Isolation Transformer

6.7.6.1 UPS with 1-module SBP and Isolation Transformer Module at Output, Single Utility 3-wire Grounded WYE-Service

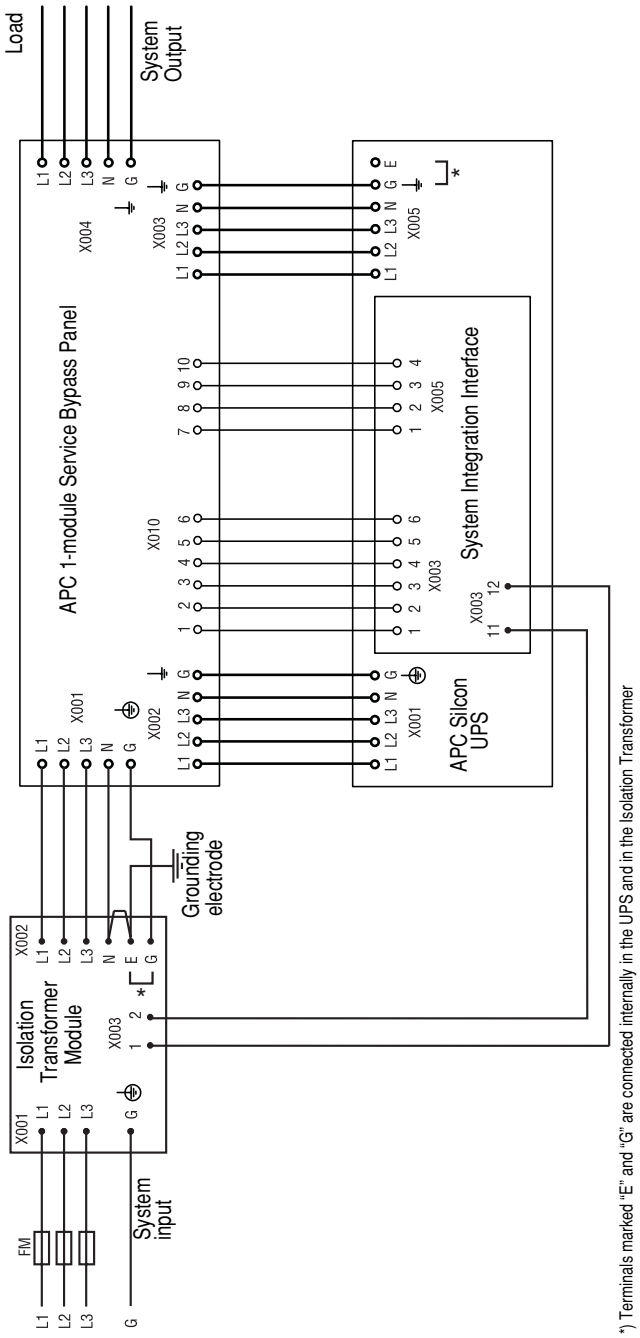


WARNING!
The phaseshifting Dyn11 isolation transformer ensures galvanic isolation between utility supply and load. To avoid damaging circulation currents and to prevent load from loosing galvanic isolation, do not bypass isolation transformer.

NOTICE!
Grounding electrode for UPS and isolation transformer may be the same.

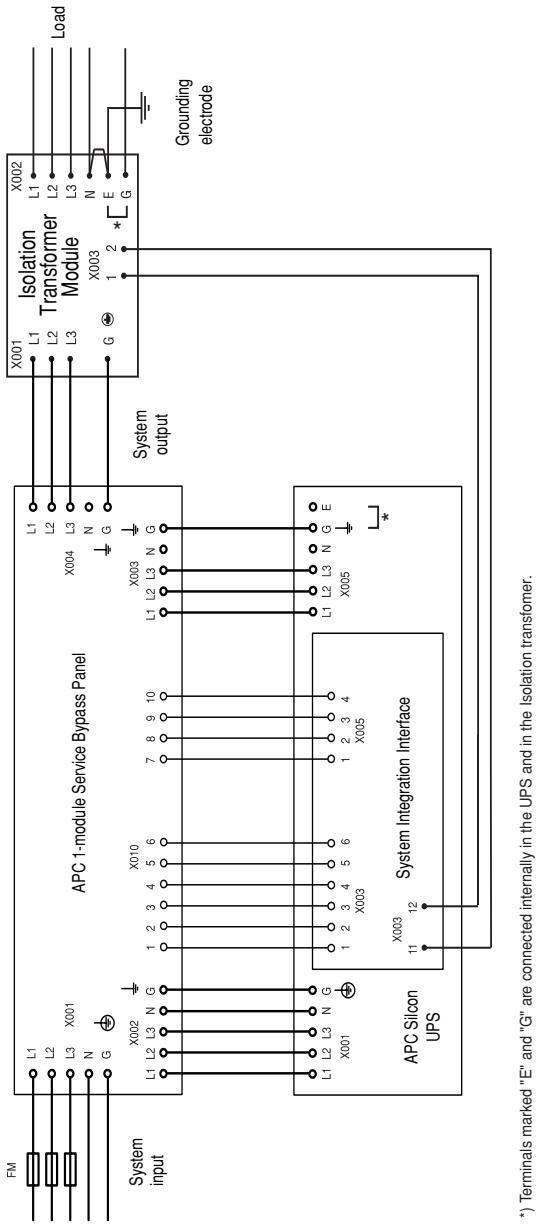
990-4048

6.7.6.2 UPS with 1-module SBP and Isolation Transformer Module at Input, Single Utility 3-wire Grounded WYE-service



990-4048

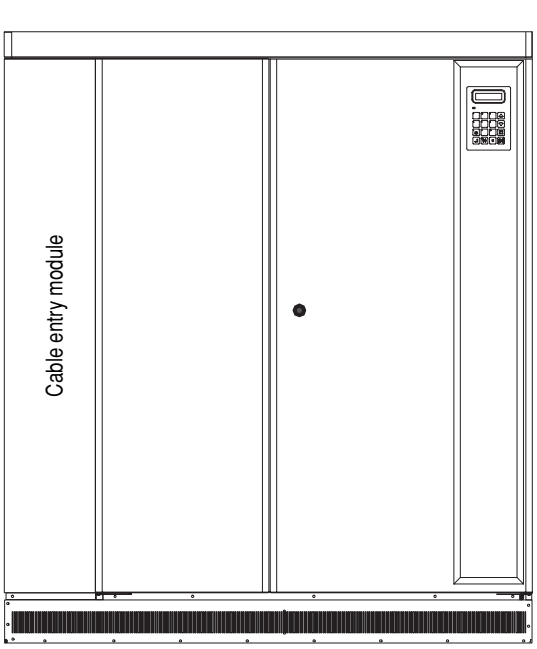
6.7.6.3 UPS with 1-module SBP and Isolation Transformer Module at Output Single Utility 4-wire Grounded WYE-service

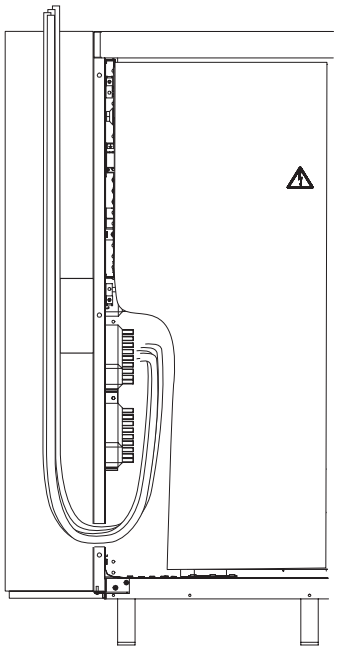


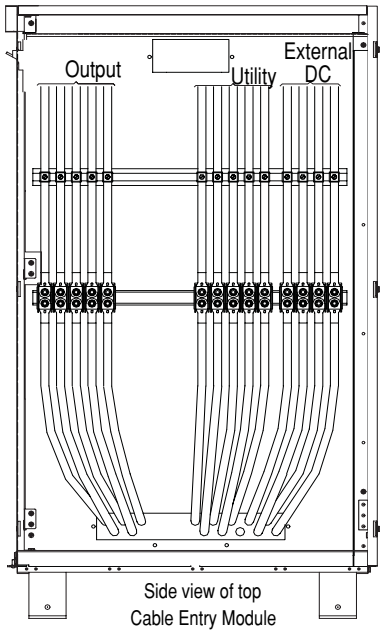
990-4048

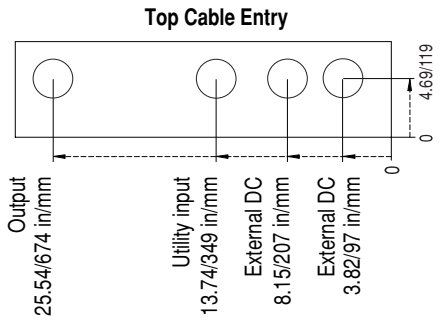
6.7.7 Top Cable Entry Modules

6.7.7.1 Top Cable Entry for (39.37 inch/1000 mm Cabinet) 60kW, 80kW 480V





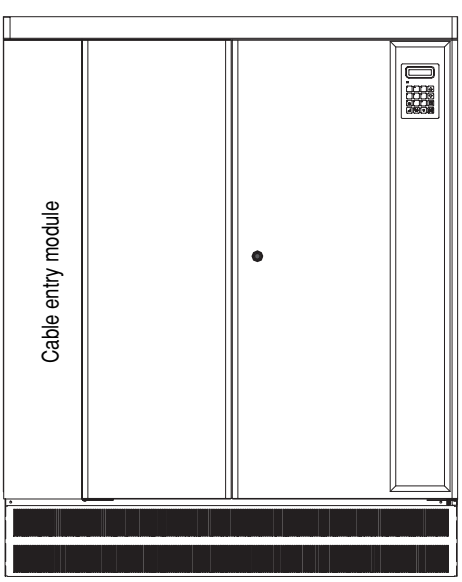


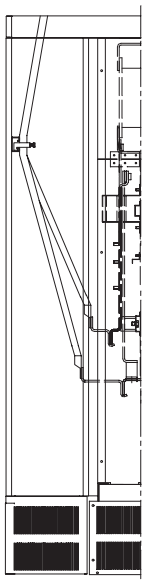


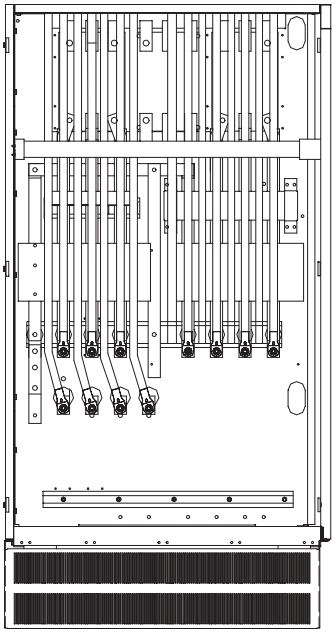
NOTICE!
For top cable entry modules for 39. 37 inch/1000 mm cabinets allow 3 ft. of free space on left side for cable connection.

990-4048

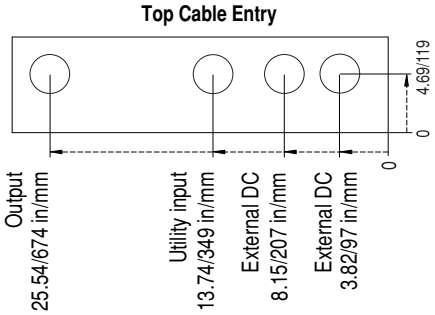
6.7.7.2 External Connection 60kW, 80kW 208V (39.37 inch/1000 mm Cabinet)





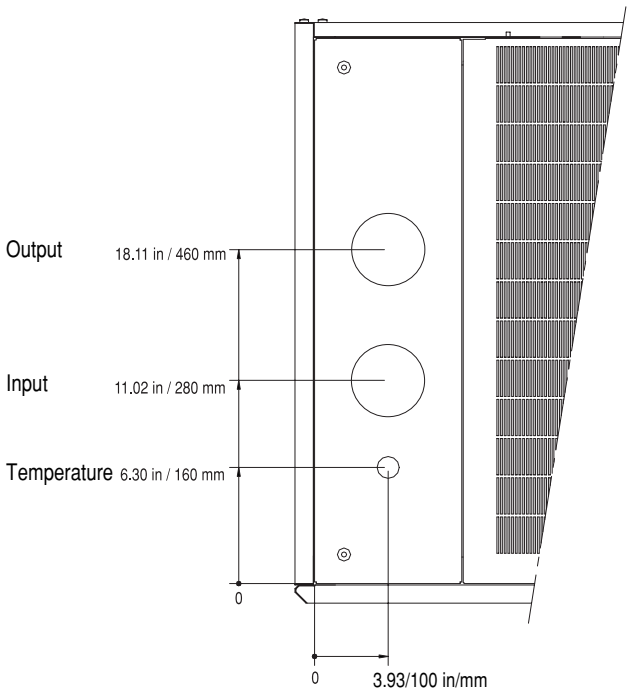


Side view of top Cable Entry Module



990-4048

6.7.7.3 Top Cable Entry Module for Isolation Transformer Module



990-4048

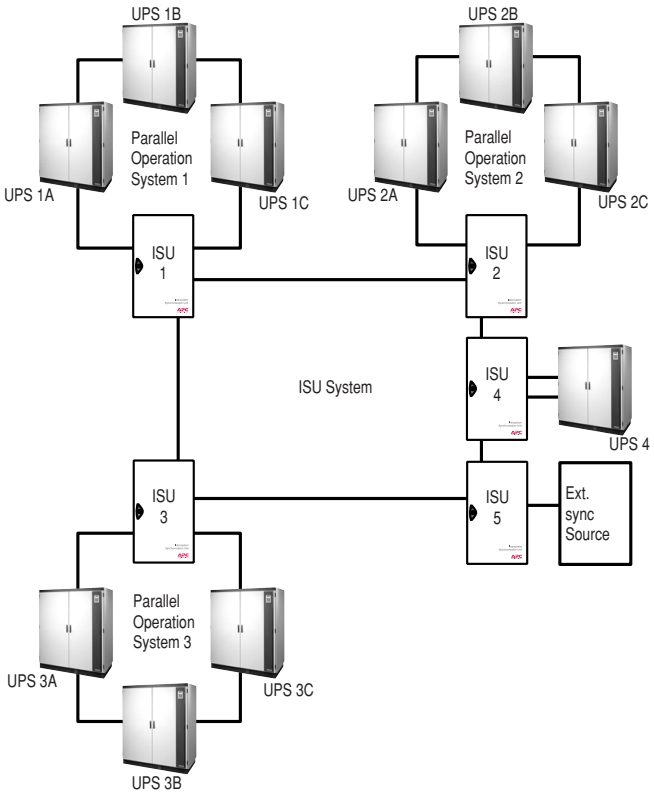
6.8 Intersystem Synchronization Unit

Intersystem Synchronization Unit System (ISU System)
The ISU system consists of inter-connected ISUs. One ISU system may consist of up to 5 ISUs, regardles of ISU configuration. The ISU system synchronizes the voltage of parallel operation systems running in battery operation.

The ISU system may also include one or more external synchronization sources, e.g. a gen-set or a non-APC Silcon UPS system.

Synchronization accuracy of the ISU is better than 2°.

Schematic overview of ISU system (example):



Intersystem Synchronization Unit (ISU)
The ISU is an active part of an ISU system, serving as the interface to the sources and the ISU system.

The ISU can be connected to a parallel UPS configuration, using the standard parallel communication controller in the parallel operation system.

(See Intersystem Synchronization Unit User's Manual for further details.)

7.0 System Specifications

7.1 Technical Data

	Voltage	3x208V / 3x220V / 3x480V
Input	Voltage tolerance Normal operation Bypass operation	±15% (220V: +10/-15%) ±10% ±4, 6, 8% (programmable)
	Frequency	60Hz ±6% standard ±0.5-8% (programmable)
	Input Power Factor	Load 25% min. 0.97 Load 100% min. 0.99
	Current distortion	Max. 5%
Output	Voltage	3x208V / 3x220V / 3x480V
	Voltage tolerance	±1% static, symmetrical load ±3% static, asymmetrical load ±5% 0-100% load step
	Voltage distortion	Max. 3%, linear load Max. 5%, non-linear load
	Load power factor	0.9 lead to 0.8 lag
	Frequency	60Hz (utility synchronized) ±0.1% free running
	Overload capacity: Normal operation Normal operation Battery operation Bypass operation	 200% - 60 secs. 125% - 10 min. 150% - 30 secs. 125% - cont.
General	Ambient temperature	0-40°C/32-104°F (Above 25°C/77°F battery life time is reduced)
	Humidity Protection class Safety Emission and Immunity Static bypass switch Auto restart Economy mode	Max. 95%, non condensing NEMA 1 UL 1778 FCC ClassA Built-in Programmable Programmable

8.0 Warranty

8.1 APC Silcon Series® Limited Factory Warranty

APC warrants that the unit, when properly installed and commissioned by APC or APC authorized service personnel, shall be free from defects in materials and workmanship for a period of (1) year from the date of installation or maximum 18 months after manufacturing. In the event that the unit fails to meet the foregoing warranty, APC shall for a period of one (1) year repair or replace any defective parts, without charge for on-site labor and travel if trained & authorized APC personnel has conducted start-up of the unit.

An APC Start-Up Service must be performed/completed by APC or APC authorized service personnel or the on-site factory warranty will be voided and replacement of defective parts only will be covered. APC shall have no liability and no obligation to repair the installed unit if non-authorized APC personnel performed the start-up and such start-up caused the unit to be defective.

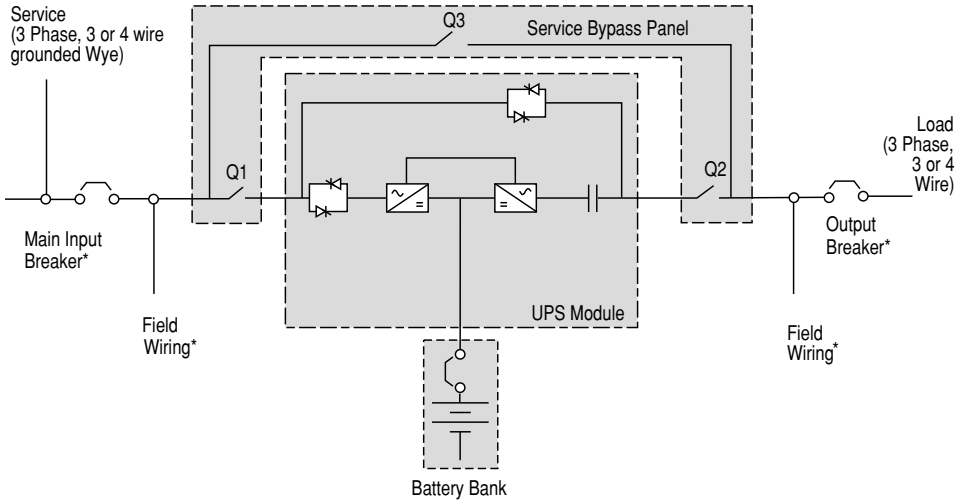
APC SHALL NOT BE LIABLE UNDER THE WARRANTY IF ITS TESTING AND EXAMINATION DISCLOSE THAT THE ALLEGED DEFECT IN THE PRODUCT DOES NOT EXIST OR WAS CAUSED BY PURCHASER'S OR ANY THIRD PERSON'S MISUSE, NEGLIGENCE, IMPROPER INSTALLATION OR TESTING, UNAUTHORIZED ATTEMPTS TO REPAIR OR MODIFY, OR ANY OTHER CAUSE BEYOND THE RANGE OF THE INTENDED USE, OR BY ACCIDENT, FIRE, LIGHTNING OR OTHER HAZARD.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE, OF PRODUCTS SOLD, SERVICED OR FURNISHED UNDER THIS AGREEMENT OR IN CONNECTION HEREWITH. APC DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY, SATISFACTION AND FITNESS FOR A PARTICULAR PURPOSE. APC'S EXPRESS WARRANTIES WILL NOT BE ENLARGED, DIMINISHED, OR AFFECTED BY AND NO OBLIGATION OR LIABILITY WILL ARISE OUT OF, APC'S RENDERING OF TECHNICAL OR OTHER ADVICE OR SERVICE IN CONNECTION WITH THE PRODUCTS. THE FOREGOING WARRANTIES AND REMEDIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES AND REMEDIES. THE WARRANTIES SET FORTH ABOVE, CONSTITUTE APC'S SOLE LIABILITY AND PURCHASER'S EXCLUSIVE REMEDY FOR ANY BREACH OF SUCH WARRANTIES. APC'S WARRANTIES RUN ONLY TO PURCHASER AND ARE NOT EXTENDED TO ANY THIRD PARTIES.

IN NO EVENT SHALL APC, ITS OFFICERS, DIRECTORS, AFFILIATES OR EMPLOYEES BE LIABLE FOR ANY FORM OF INDIRECT, SPECIAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, ARISING OUT OF THE USE, SERVICE OR INSTALLATION, OF THE PRODUCTS, WHETHER SUCH DAMAGES ARISE IN CONTRACT OR TORT, IRRESPECTIVE OF FAULT, NEGLIGENCE OR STRICT LIABILITY OR WHETHER APC HAS BEEN ADVISED IN ADVANCE OF THE POSSIBILITY OF SUCH DAMAGES.

9.0 Appendix

9.1 Table 1 - Installation Planning Data



* Not supplied by APC
Input must be limited to less than 30 kAIC

Installation Planning Data

APC Silcon Series

Power rating			AC Input (208V)								Battery System DC				AC Output (208V)		
			Source		P (kW)		I (A)		Min. Input	Service Over-		Full	I_{Nom}	I_{Max}		Load side Over-	Heat Rejec-
kW	kVA	Pf	V	Hz	Nom.	Max.	Nom.	Max.	Cable (per phase)	current Protection*	V_n (Vdc)	load P(kW)	Disch (A)	Disch (A)	I_n (A)	current Protection[1]	tion kBTU/hr
60	60	1	208	60	63.2	69.9	175.4	193.0	1 x 250 mcm	225AT	2x192	64.3	166	194	167.0	225AT	10.918
80	80	1	208	60	84.1	92.8	233.4	257.0	1x500 mcm	300AT	2x192	85.5	220	258	222.0	250AT	13.989
			AC Input (480V)								Battery System DC				AC Output (480V)		
60	60	1	480	60	63.8	69.2	76.7	84.0	1 x 2AWG	100AT	2x384	64.9	82	99	72	80AT	12.966
80	80	1	480	60	84.2	92.2	101.3	112.0	1 x 1/0	125AT	2x384	86.2	114	132	96	110AT	14.33
Notes							1	2	3,6,8,A,B,C,D	4,7,9,D	5		6,10	6,11		4,6,8,D	12

* Not provided by APC
Class J-fast acting in accordance with UL248-8.

Notes:

1. Nominal (Nom) Input current based on rated load.
2. Maximum (Max) Input current based on full battery recharge + nominal load.
3. Recommendation: Input and Output cables run in separate conduits.
4. Suggested Input overcurrent protection based on continuous full load.
   Maximum Input current. Suggested Load Side Overcurrent Protection based on Nominal current. Breakers sized per NEC 220-3 and NEC 240-3(b). 80% rated breakers assumed. Trip rating based on NEC 240-6(a) standard breaker sizes.
5. Nominal battery voltage assumed to be 2.0 volts/cell (lead technology).
6. Recommendation: All cables should be sized in accordance with NEC 210-19 FPN No. 4 branch feeder voltage drop of 3%. Voltage drop not considered in above chart. Application

990-4048

specific Input Cable ampacities may vary from above chart.

7. Breaker/Fuse selection based on Nom Input current is acceptable provided battery recharge time is short.
   Consult factory for application specific assistance.
8. Grounding conductor ampacities: Refer to NEC Article 250-122 and NEC Table 250-122.
   Neutral conductors ampacities: Refer to NEC Article 310-15.
9. All wiring to be in accordance with all applicable national and/or local electrical codes.
10. Nominal Battery Discharge current based on full rated load, and nominal Battery voltage.
11. Maximum Battery Discharge current based on full rated load at end of Discharge.
12. Heat rejection calculated at nominal full load capacity.

A. Not more than 3 current carrying conductors in raceway assumed; ambient temperature of 30°C (86°F) assumed. Cable ampacity next size above Overcurrent Protection provided by others.
B. Temperature rating of conductors: 90°C (194°F). Reference Table 310-16 of NEC, 75°C column, using copper conductors. 75°C (167°F) cable terminal connectors assumed.
C. Reference: NEC handbook 1999. Consult local codes for possible variations.
D. All cable and breaker/fuse ratings are supplied as guidelines only. These guidelines are minimum recommendations only not substitutes for review and compliance with NEC and local codes. Consult with your licensed engineer for site specific applications.

9.2 Table 2 – Table 310-16

Allowable Ampacities of Insulated Conductors rated 0-2000 Volts, 60° to 90°C (140° to 194°F)[1]
Not More than Three Conductors in Raceway or Cable or Earth (Directly Buried), based on Ambient Temperature of 30° (86°F)

Size	Temperature Rating of Conductor (See Table 310-13)						Size
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
AWG or kcmil	Types TW UF	Types FEPW, RH,RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS,SA, SIS,FEP, FEPB,MI, RHH,RHW-2 THHN, THHW, THW-2, THWN-2, USE-2, XHH,XHHW, XHHW-2, ZW-2	Types TW UF	Types RH, RHW, THHW, THW, THWN, XHHW, USE	Types TBS,SA SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	AWG or kcmil
	Copper [A]			Aluminum or Copper-Clad Aluminum [A]			
18	–	–	14	–	–	–	–
16	–	–	18	–	–	–	–
14*	20	20	25	–	–	–	–
12*	25	25	30	20	20	25	12*
10*	30	35	40	25	30	35	10*
8*	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1

990-4048

1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000

CORRECTION FACTORS

Ambient Temp. (°C)	**For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.**						**Ambient Temp. (°F)**
21-25	1.08	1.05	1.04	1.08	1.05	1.04	70-77
26-30	1.00	1.00	1.00	1.00	1.00	1.00	78-86
31-35	0.91	0.94	0.96	0.91	0.94	0.96	87-95
36-40	0.82	0.88	0.91	0.82	0.88	0.91	96-104
41-45	0.71	0.82	0.87	0.71	0.82	0.87	105-113
46-50	0.58	0.75	0.82	0.58	0.75	0.82	114-122
51-55	0.41	0.67	0.76	0.41	0.67	0.76	123-131
56-60	–	0.58	0.71	–	0.58	0.71	132-140
61-70	–	0.33	0.58	–	0.33	0.58	141-158
71-80	–	–	0.41	–	-	0.41	159-176

[1)]Reprinted with permisson of NFPA 70 - 1999, National Electrical Code ®, copyright © 2000. This reprinted material is not the complete and official position of the NFPA on the referenced subject, which is represented only by the standard in its entirety.

How to Contact APC

10.0 How to Contact APC

www.apcc.com

APC Corporate
132 Fairgrounds Road
West Kingston, RI 02892
USA

Telephone: 401 789-5735
Fax: 401 789-3710

PowerFax™: 800 347-FAXX

Pre-sales Technical Support
877-474-5266 (1-877-4Silcon)

Post-sales Technical Support
877-287-7835 (1-877-2UPS-TEK)

Web: www.apcc.com/support/contact/contact_support.cfm

APC Denmark
Silcon Allé
DK-6000 Kolding
Denmark

Telephone: + 45 75 54 22 55
Fax: + 45 72 19 03 50

Pre-sales Technical Support
+ 45 72 19 04 90

Post-sales Technical Support
+ 353 91 70 2000

Web: www.apcc.com/support/contact/contact_support.cfm

990-4048