

APC Silcon 240-320kW 480V UPS Installation Guide



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a commitment on the part of the vendor.



Thank You!

Thank you for choosing an APC Silcon 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 risk of 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 "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 or DC terminals, 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 damage to electronic components.



PLEASE RECYCLE

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

Contents:

1.0	Introduction	5
1.1	Tools and Equipment	5
2.0	Unpacking/Identification of Equipment	6
3.0	Installation	9
3.1	Requirements on Site	9
3.2	Dimensions and Weight	9
3.2.1	Dimensions and Weight of UPS	9
3.3	Footprints	10
3.3.1	UPS Cabinet Footprints	10
3.3.2	Conduit Entrance Plate in bottom of the system	11
3.3.3	Top Cable Entry	12
4.0	External Connection	13
4.1	Connecting the UPS	13
4.1.1	Connecting AC and DC Power Cables (Dual Utility Connection)	14
4.1.2	Separation of AC from DC1 and DC2	16
4.1.3	Top or Bottom Cable Entry	17
4.1.4	Dual and Single Utility Supply	18
4.1.5	Switching from Dual to Single Utility Input	20
4.1.6	Connection Terminals	22
4.1.7	Torque Specifications	22
4.1.8	Grounding	22
4.2	System Integration Interface	24
4.2.1	Connecting the System Integration Interface Board (SII-board)	25
4.3	Parallel Board	29
4.4	Relay Board	31
4.4.1	Relay Board Functions	31
4.4.2	Cable Sizes	33
4.5	Communication Interface / Smart Slot	34
4.5.1	Connections	34
4.6	SmartSlot for APC Silcon 240-320kW UPS	34
4.6.1	SmartSlot Accessories	35
4.6.2	Multiple SmartSlot Installation - introduction	35
4.6.3	APC Silcon Battery Cabinets	37
4.7	Battery Breaker Box	39
4.7.1	Interconnection	40
4.7.2	Mounting and Connection of Battery Breaker Box	40
4.7.3	UPS with External Battery via Battery Breaker Box	41
4.8	UPS Installations in Computer Rooms	41
4.8.1	EPO Principle	42
4.8.2	Emergency Power Off (EPO) for UPS	44
5.0	Programming	46
5.1	Parameters	46
5.1.1	Programming Keys	47

5.1.2	Programming Example - Switch to Bypass Operation	47
5.2	System Configuration	49
5.2.1	Programming Example - Change Boost Charge Voltage to 446V	50
5.2.2	Programming Example - Change to Output Isolation Transformer Available	51
5.3	Programming Parameters for Advanced Parallel Operation.	52
5.3.1	Description of Settings.	52
5.3.2	Programming Example	52
5.4	Battery Monitor	53
6.0	Options/Accessories	54
6.1	Diagrams for Service Bypass Panel for Single Operation, Single and Dual Utility	54
6.2	Seismic Anchoring	62
6.2.1	Mounting Seismic Anchoring	63
6.3	NEMA 12 Cover (IP31)	64
6.3.1	Mounting NEMA 12 Cover	64
6.4	Remote Display	65
6.4.1	Extension of Remote Display Communication Distance	65
6.4.2	Remote Display Installation	67
6.4.3	Remote Display Use	68
6.5	Isolation Transformer Module	69
6.5.1	Requirements on Site	69
6.5.2	Cabinets and Dimensions	70
6.5.3	Footprints	70
6.5.4	Connecting Isolation Transformer	70
6.5.5	Recommended Cable Lugs and Crimping Tools	70
6.5.6	Isolation Transformer - Diagram Delta WYE configuration (Dyn11)	71
6.5.7	Isolation Transformer Grounding	71
6.5.8	Principale Diagrams for Isolation Transformer	72
6.6	Intersystem Synchronization Unit	74
7.0	System Specifications	75
7.1	Technical Data	75
8.0	Appendix	76
8.1	Table 1. Installation Planning Data	76
8.2	Table 2 – Table 310-16	77
9.0	Warranty	79
9.1	APC Silcon Series® Limited Factory Warranty	79
10.0	How to Contact APC	80

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.

**WARNING!**

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

1.1 Tools and Equipment

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

**WARNING!**

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

Tools:

- 10mm socket
- 13mm socket-deep
- 17mm socket
- 3/4" or 19mm socket-deep
- 3/4" or 19mm combo wrench
- Small flathead/regular screwdriver
- #3 philips screwdriver
- Compression lug crimping 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 wire to UPS from Service Bypass Panel
- Solid core, control wire to UPS from external batteries/external Battery Breaker Box
- Conduit necessary for above listed cabling

Unpacking/Identification of Equipment


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.

Copy of type label (without battery):

 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		
	SL120KG	APC SILCON 120KW 480V UPS W/TERMINALS F. EXT. BATTERIES 120kVA 120kW	480	168A / 144A	3086 LBS	±384	N/A	164A	N/A	N/A
	SL160KG	APC SILCON 160KW 480V UPS W/TERMINALS F. EXT. BATTERIES 160kVA 160kW	480	224A / 192A	3086 LBS	±384	N/A	220A	N/A	N/A
	SL240KG	APC SILCON 240KW 480V UPS W/TERMINALS F. EXT. BATTERIES 240kVA 240kW	480	336A / 289A	4432 LBS	±384	N/A	330A	N/A	N/A
	SL320KG	APC SILCON 320KW 480V UPS W/TERMINALS F. EXT. BATTERIES 320kVA 320kW	480	448A / 385A	4432 LBS	±384	N/A	440A	N/A	N/A
	SL400KG	APC SILCON 400KW 480V UPS W/TERMINALS F. EXT. BATTERIES 400kVA 400kW	480	560A / 482A	5512 LBS	±384	N/A	551A	N/A	N/A
	SL500KG	APC SILCON 500KW 480V UPS W/TERMINALS F. EXT. BATTERIES 500kVA 500kW	480	700A / 602A	5512 LBS	±384	N/A	688A	N/A	N/A
TEST PERSONNEL DATE AND SIGNATURE _____										

865-4515

Unpacking/Identification of Equipment

Main UPS system

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

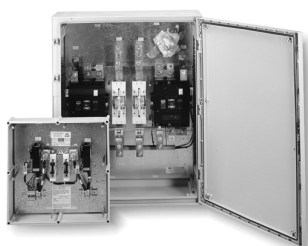


Service Bypass Panel

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

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.



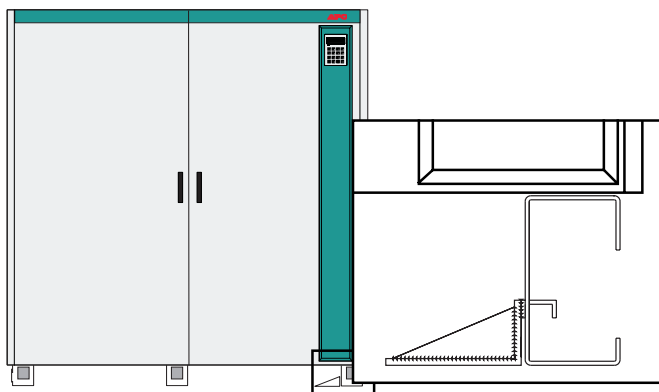
Unpacking/Identification of Equipment

Isolation Transformer

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

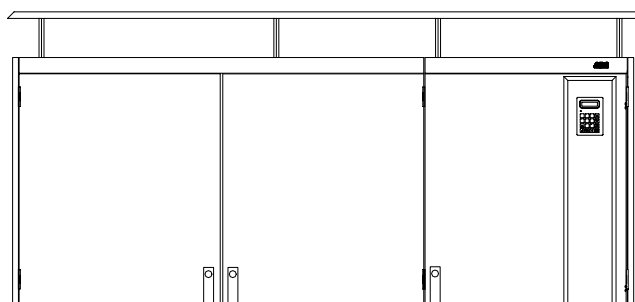
Seismic Anchoring

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



NOTICE!

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

3.0 Installation

3.1 Requirements on Site

All system parts are accessible from front or top of UPS. Cable entries are accessible from top or bottom. The system may be installed close to walls as long as free space is allowed for system doors to open.

For ventilation and service purposes allow for free space of a minimum of 3 foot above and in front of UPS. Never install systems in direct sunlight.



WARNING!

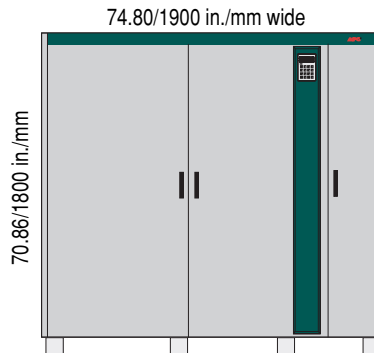
For safety reasons do not stand on UPS. Keep UPS cabinet surface free of any objects

3.2 Dimensions and Weight

3.2.1 Dimensions and Weight of UPS

UPS	Height inch/mm	Width inch/mm	Depth inch/mm	Weight lbs./kgs
240kW 480V	70.86/1800	74.80/1900	31.50/800	4432/2014,5
320kW 480V	70.86/1800	74.80/1900	31.50/800	4432/2014,5

Cabinet



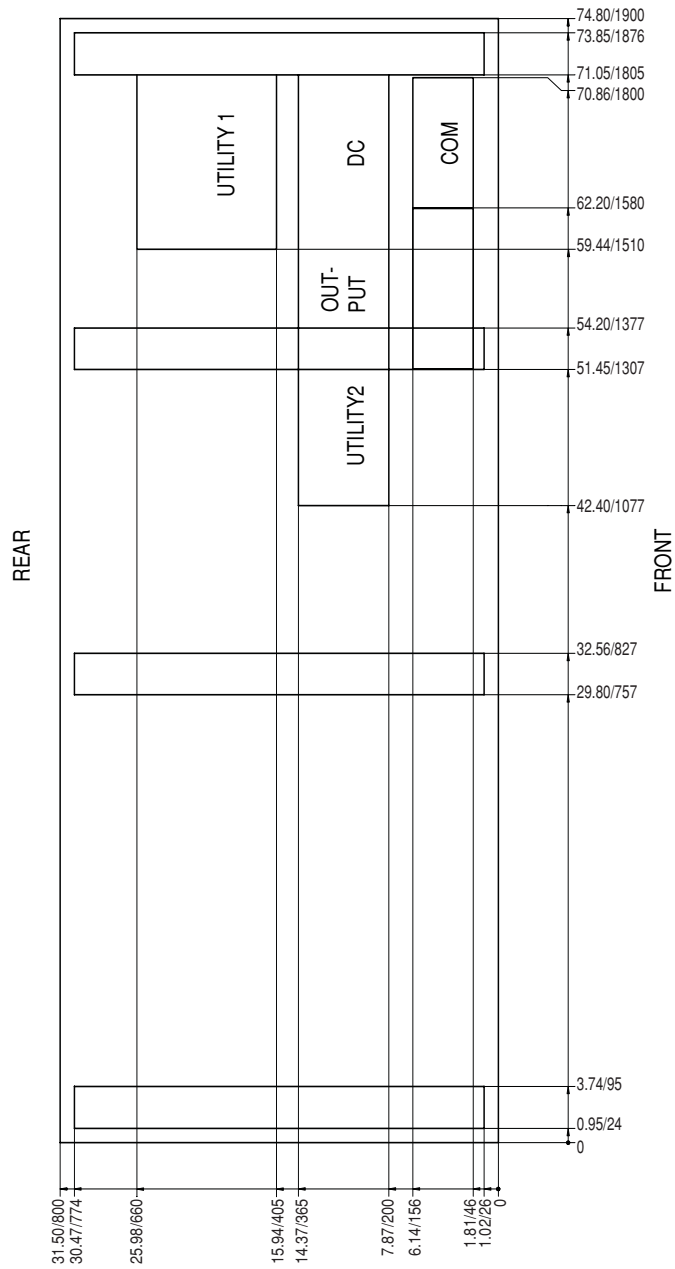
Installation

3.3 Footprints

3.3.1 UPS Cabinet Footprints

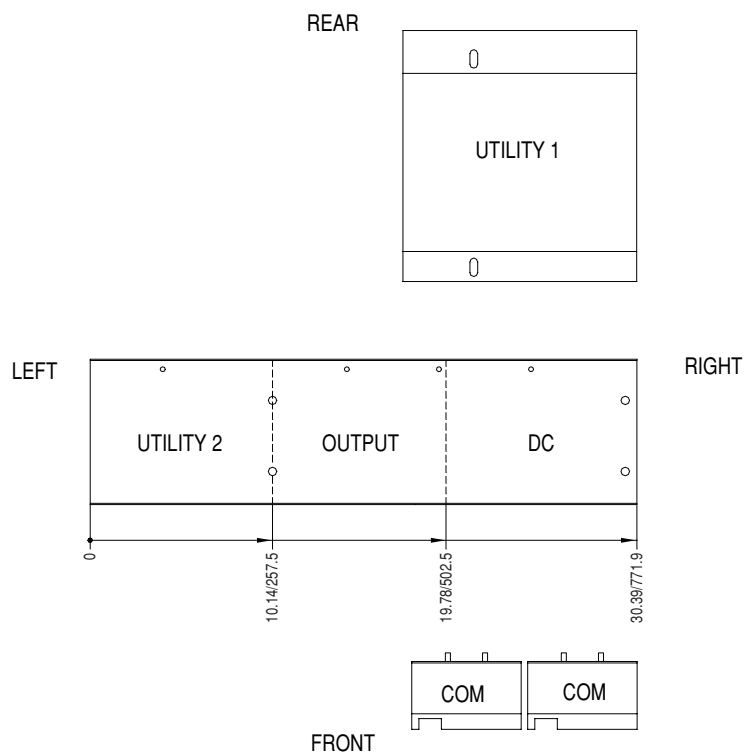
NOTICE!

Dimensions indicated in inches / millimeters and lbs. / kgs



Installation

3.3.2 Conduit Entrance Plate in bottom of the system

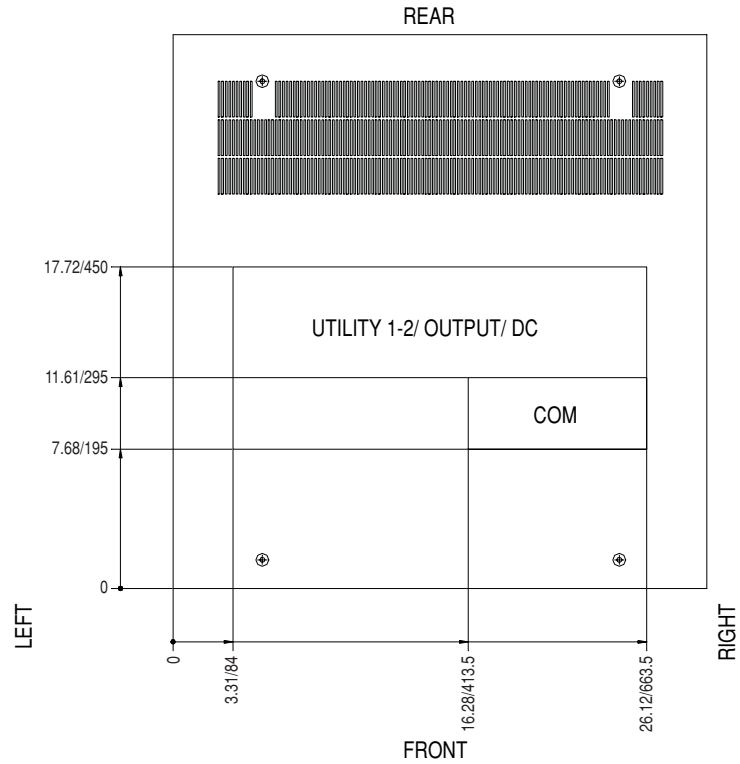


Cable entries need to be punched in the UPS cabinet. Follow diagram for correct orientation of power and control cables to be led into the UPS.

Installation

3.3.3 Top Cable Entry

Cable entries need to be punched in the UPS cabinet. Follow diagram for correct orientation of power and control cables to be led into the UPS.



External Connection

4.0 External Connection

4.1 Connecting the UPS

Prior to connecting the UPS, refer to section 6: Options and Accessories to ensure that UPS options are correctly interphased.



WARNING!

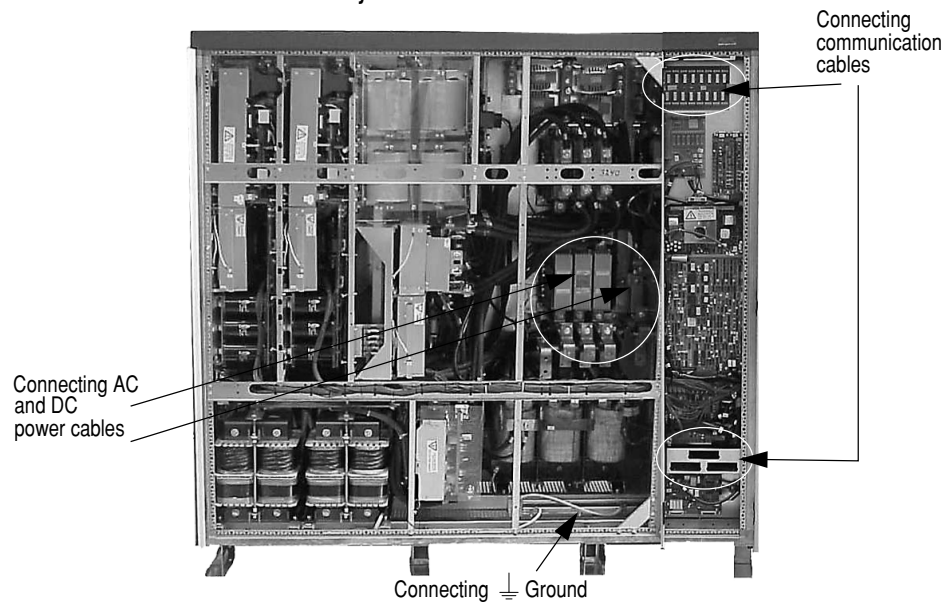
Read warnings on page 2 of this manual before continuing.

To access cable terminals, open front door, remove screws and lift off the 4 front covers (remember earth wire on rear side). Power cable entry at bottom: Remove front covers 2 and 3. Power cable entry at top: Remove front covers 1 and 2. Remove cover 4.

UPS system with cover- doors open



UPS system without cover and doors



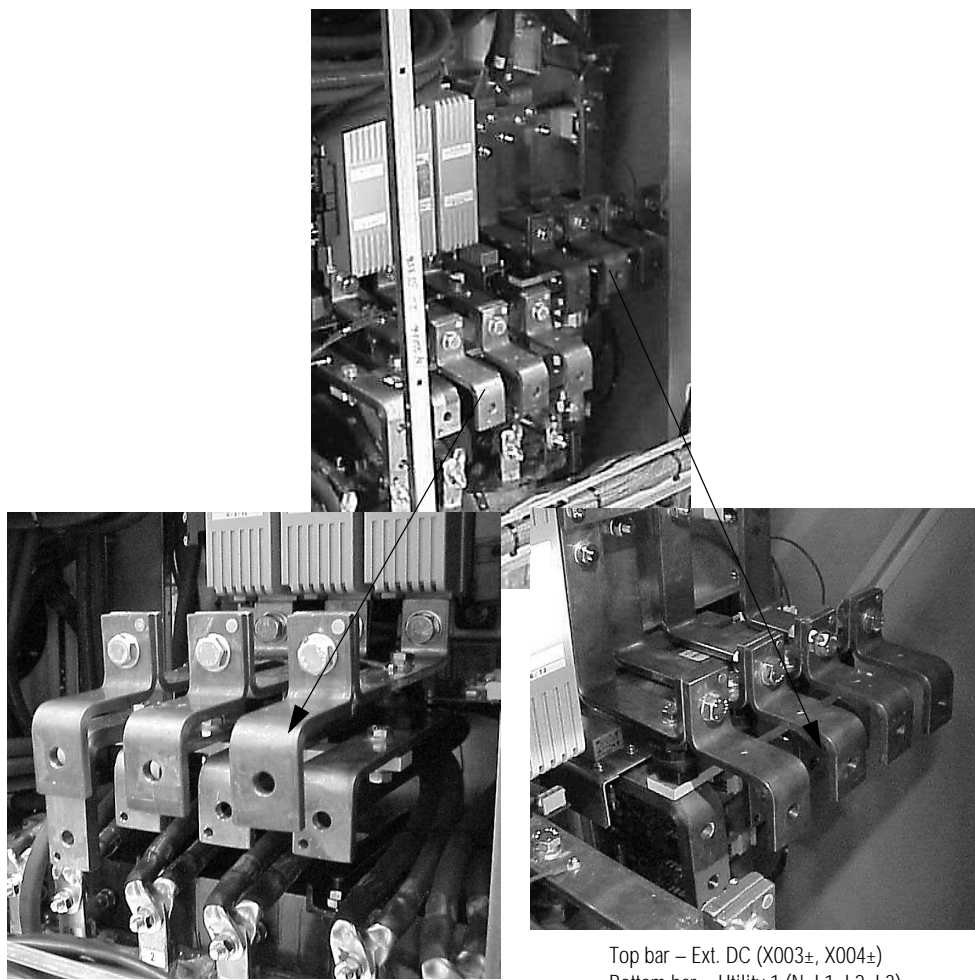
NOTICE!

Always keep AC, DC and communication cables separate.

990-4049

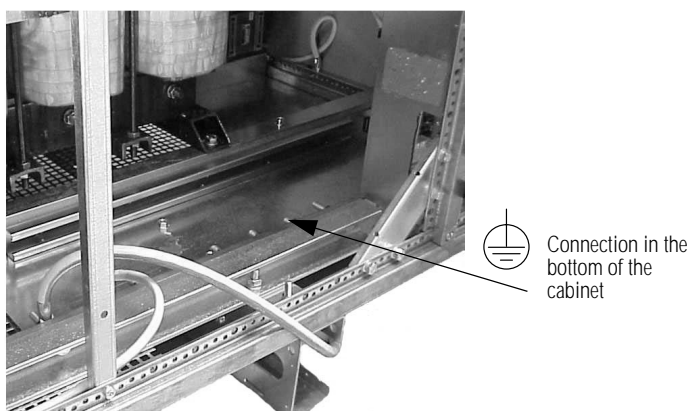
External Connection

4.1.1 Connecting AC and DC Power Cables (Dual Utility Connection)

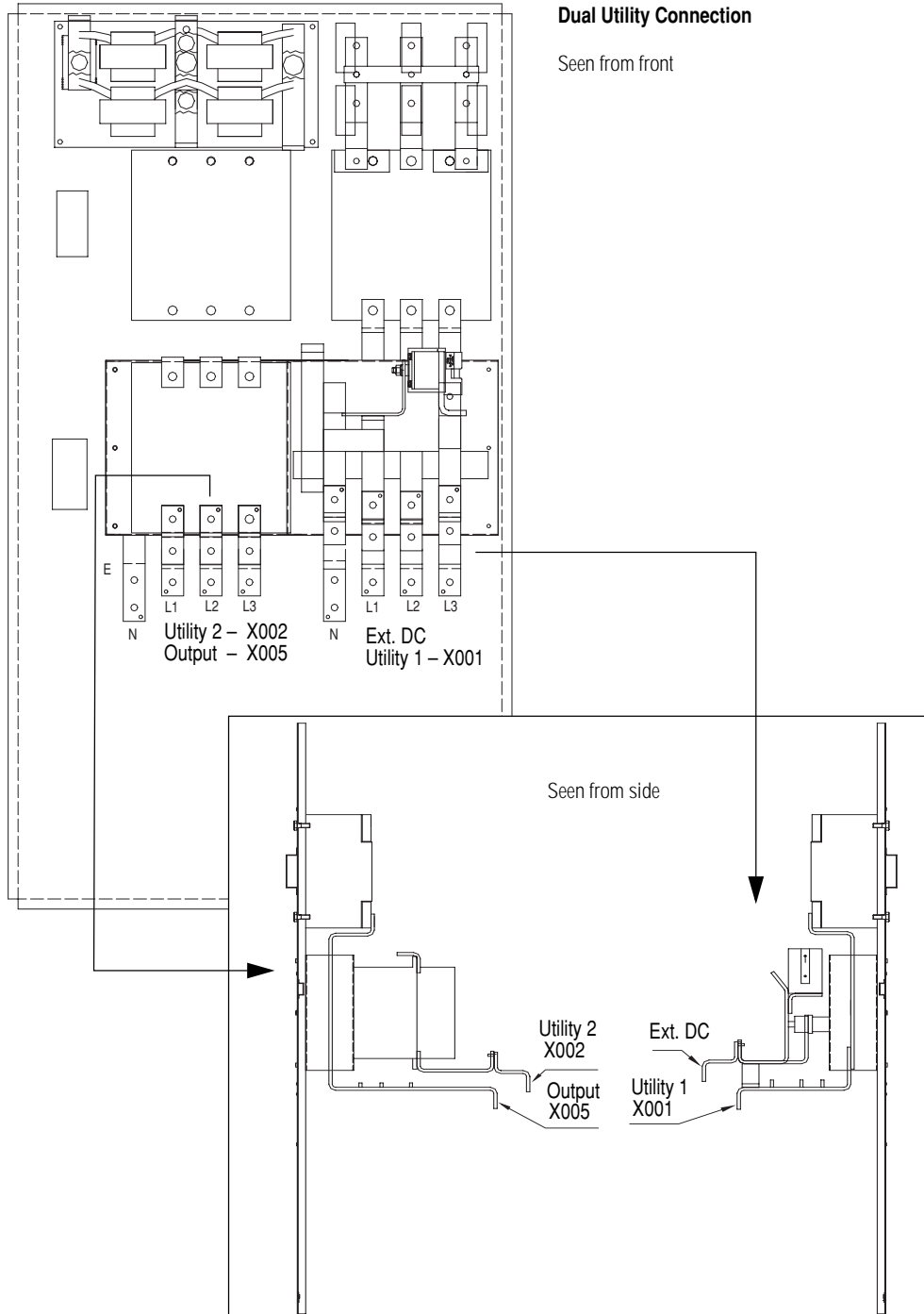


Top bar – Utility 2 (L1, L2, L3)
Bottom bar – Output (N/E, L1, L2, L3)

Top bar – Ext. DC (X003±, X004±)
Bottom bar – Utility 1 (N, L1, L2, L3)



External Connection



WARNING!
Bottom cabinet connection must be grounded.

990-4049

External Connection



WARNING!

Supply the UPS from grounded 3-wire/4-wire WYE service.

NOTICE!

Ensure correct phase rotation of input voltage.

NOTICE!

Keep UPS input and output conductors in separate conduits.

NOTICE!

Keep AC and DC conductors in separate conduits.

NOTICE!

Keep batteries 1 and 2 (DC conductors) in separate conduits.

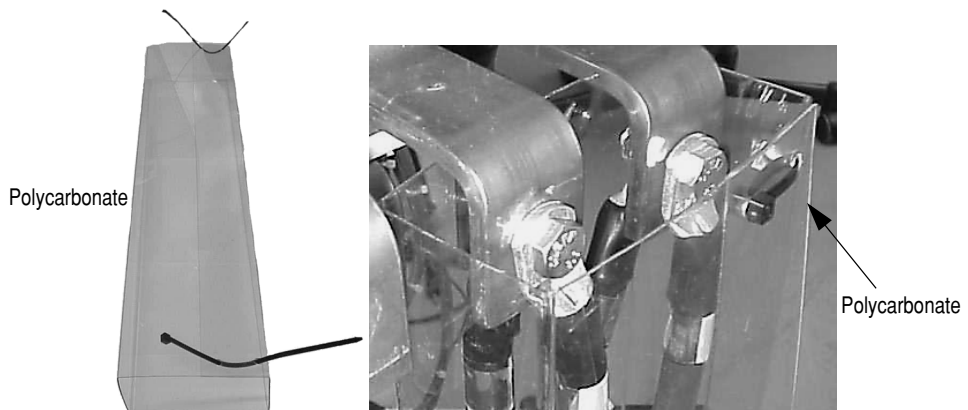


WARNING!

Keep UPS power conductors and UPS control wiring in separate conduits.

4.1.2 Separation of AC from DC1 and DC2

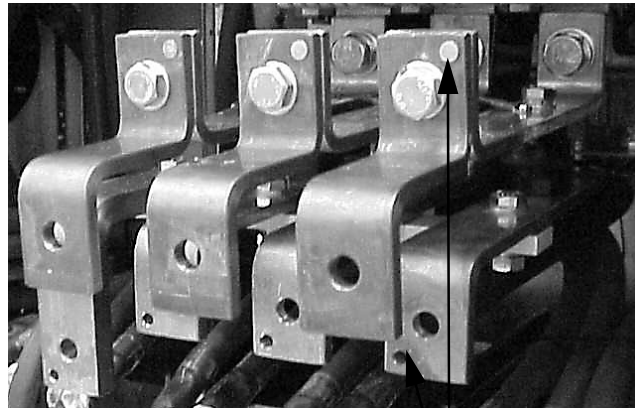
Use the 2 pieces of polycarbonate (supplied with the UPS) to separate AC from DC1 and DC2. Standard length of polycarbonate adjusted for top cable entry. Adjust length of polycarbonate to fit bottom entry where applicable.



External Connection

4.1.3 Top or Bottom Cable Entry

For top cable entry, move copper angle bar to bottom.



Unscrew bolt, take out the split, move the angle bar down, insert split, and tighten the bolt

External Connection

4.1.4 Dual and Single Utility Supply



WARNING!

UPS units contain hazardous AC and DC voltages. Only qualified electricians should install 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 wording as follows:

“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 risk of 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 “Programming Parameters” 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 or 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 with working near batteries.



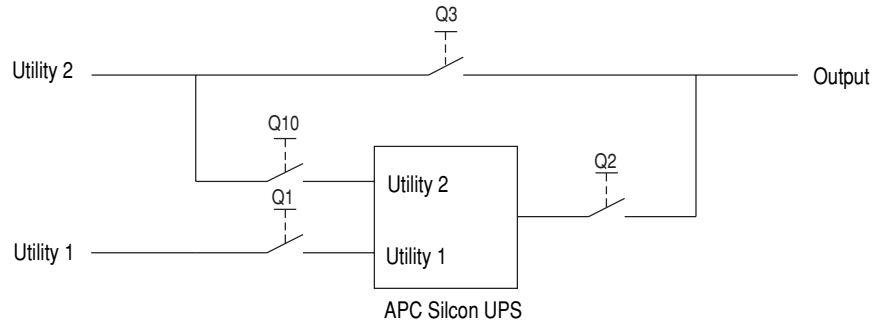
CAUTION!

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

The UPS is fitted with dual utility input as standard. If dual utility is not available or not needed, a small modification has to be made. See section 4.1.5 switching from dual to single utility input.

External Connection

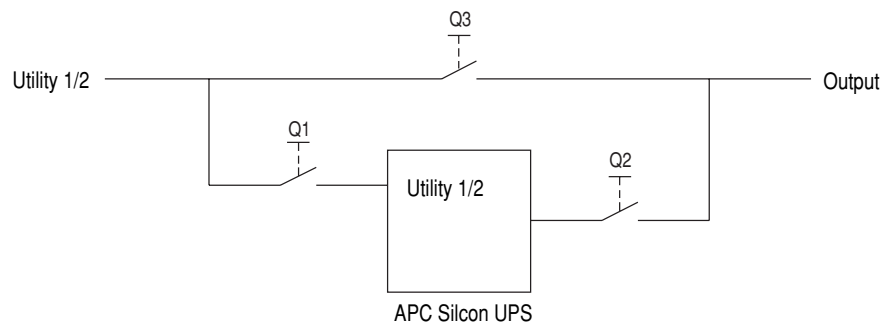
Working Principle of Dual Utility (2 utility supplies)



NOTICE!

Max. phase shift between utility 1 and 2: less than ± 3 .
Refer to section 7.0 System Specifications for frequency tolerance of utility 1 and 2, and voltage.
Utility 1 supports the load in normal operation. Utility 2 supports the load through the static and service bypass switch.

Working Principle of Single Utility (1 utility supply)



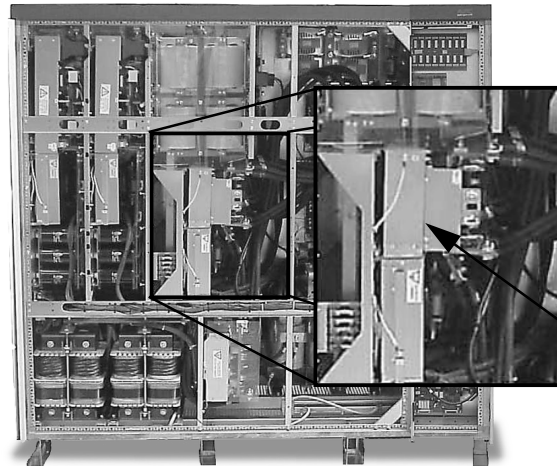
NOTICE!

Refer to section 7.0 System Specifications for frequency and voltage tolerance of utility 1.
Utility 1 or 2 supports the load in normal operation or through the static service bypass switch.

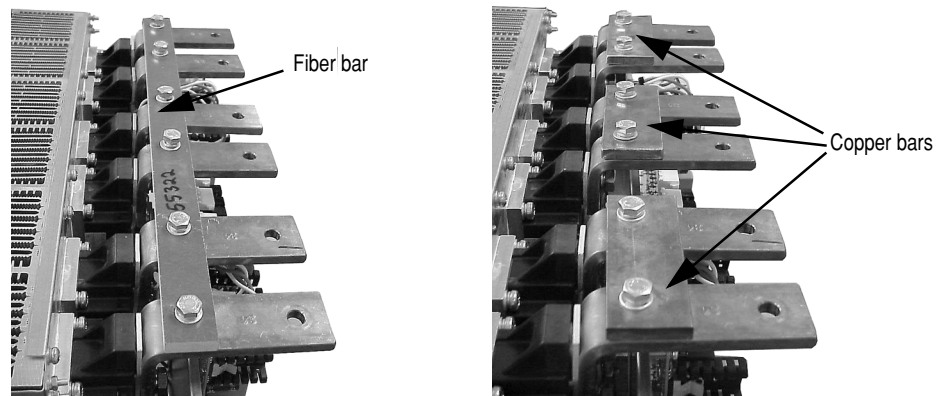
External Connection

4.1.5 Switching from Dual to Single Utility Input

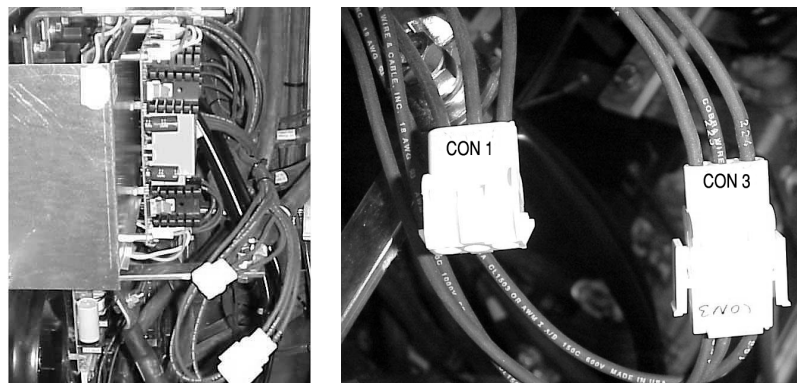
Follow steps 1 and 2 to switch from dual to single input.



- 1) Remove fiber bar (55322) by unscrewing bolts and by mounting copper bars as below



- 2) Switch the connector in Con3 to Con1.



External Connection

**CAUTION!**

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

NOTICE!

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

NOTICE!

If an MCCB is used in stead of external input fuses, the MCCB load capacity must be $8 \times I_n$ (nominal current) for min.10 ms.

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). See section 8.0 Appendix.

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 480V 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 2 of this manual before continuing.

External Connection

4.1.6 Connection Terminals

Terminals – 480V

Terminal Type	Input stud size	Battery stud size	Output stud size	PE stud size	System earth stud size
240kW	M12	M12	M12	M10	M12
320kW	M12	M12	M12	M10	M12

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

4.1.7 Torque Specifications

Stud size	M6	M8	M10	M12
Torque	66/7.5 lb-in/Nm	133/15 lb-in/Nm	266/30 lb-in/Nm	443/50 lb-in/Nm

4.1.8 Grounding

4.1.8.1 System Grounding

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

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

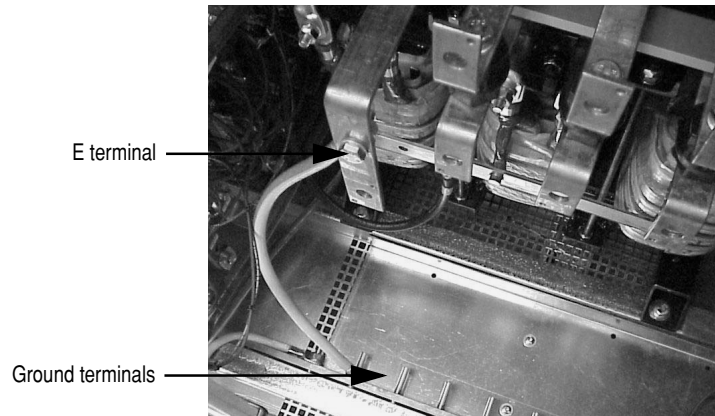
4.1.8.2 Equipment Grounding

Terminals marked  intended for equipment grounding.

Provisions must be made as follows:

Input equipment ground terminal(s) must be connected to grounding electrode(s) provided for the service entrance(s)

External Connection



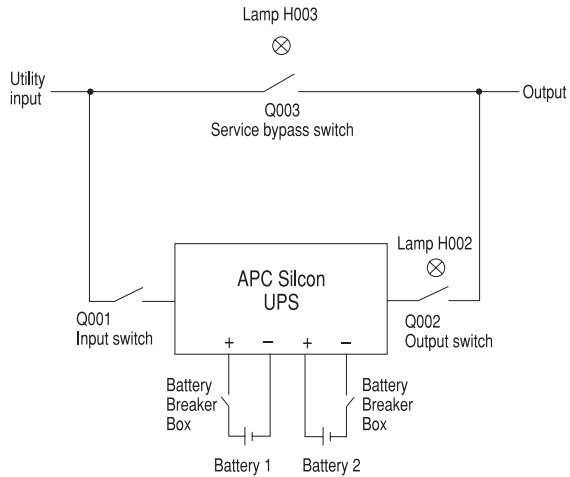
External Connection

4.2 System Integration Interface

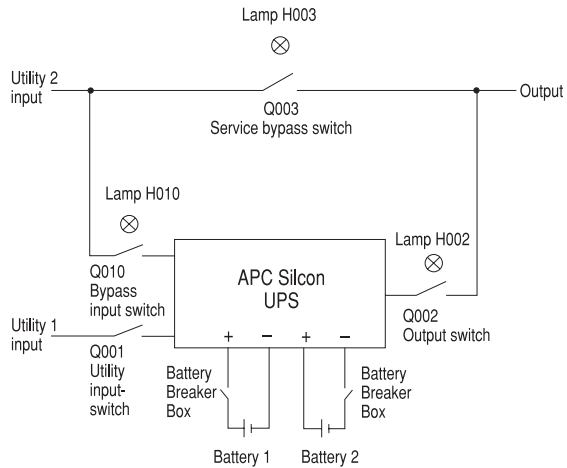
NOTICE!

Refer to chapter 4.1.5 Changing from dual to single utility input

Single Utility



Dual Utility



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.



WARNING!

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

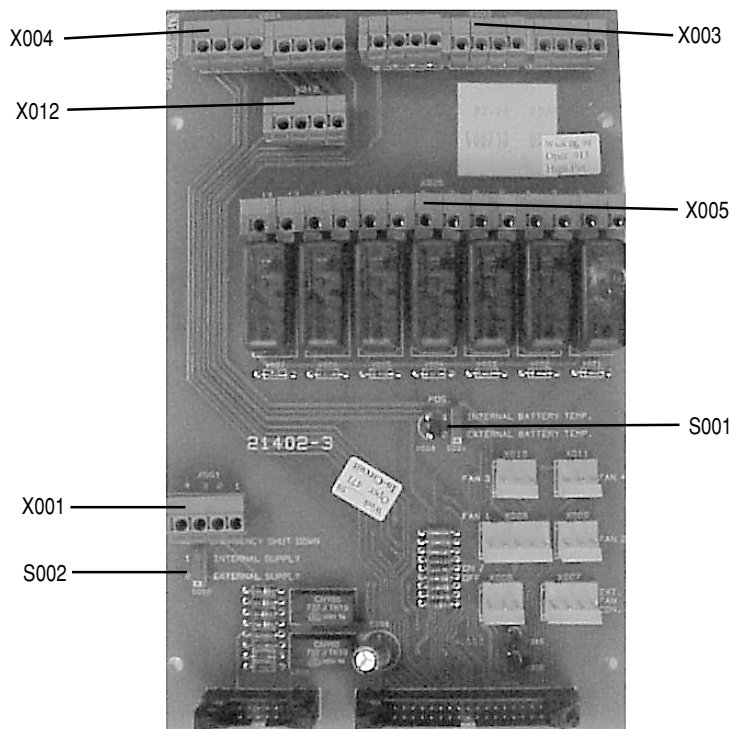
External Connection

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 equipped 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)

External Connection

- 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)

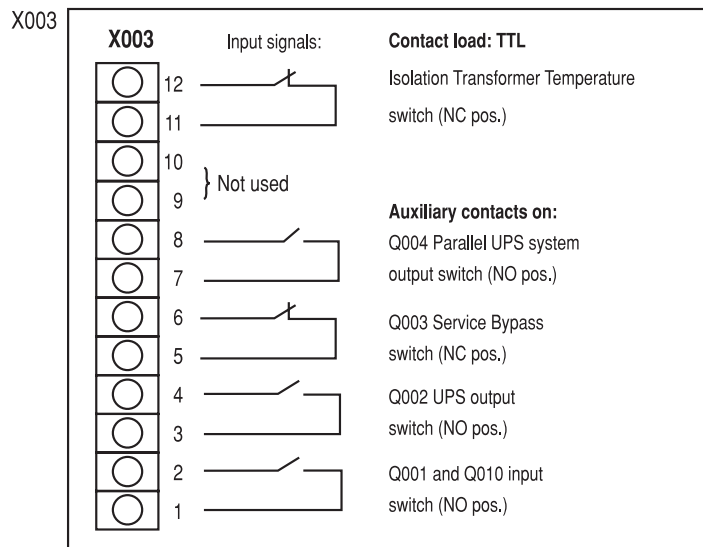
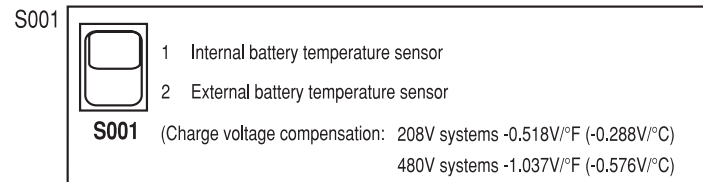
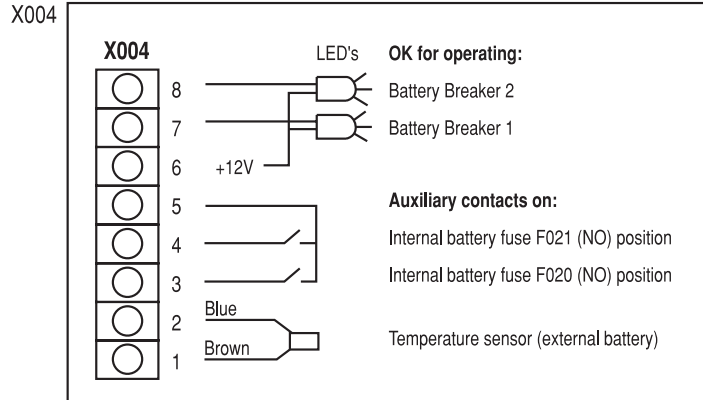
The battery operation signal is received with a 30-second delay. This function is inactive during battery tests. Common fault relay facility is programmable (standard factory setting: 10 sec.) See APC Silcon User Guide for details.

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”.

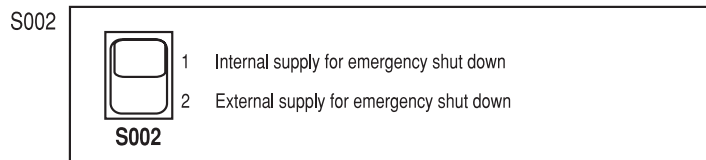
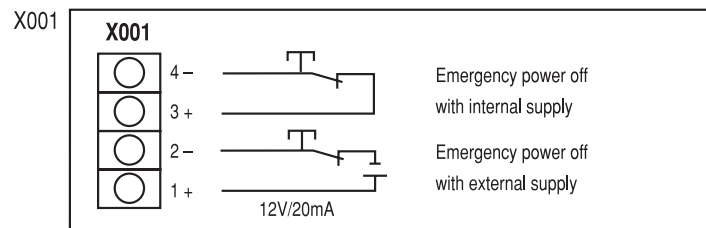
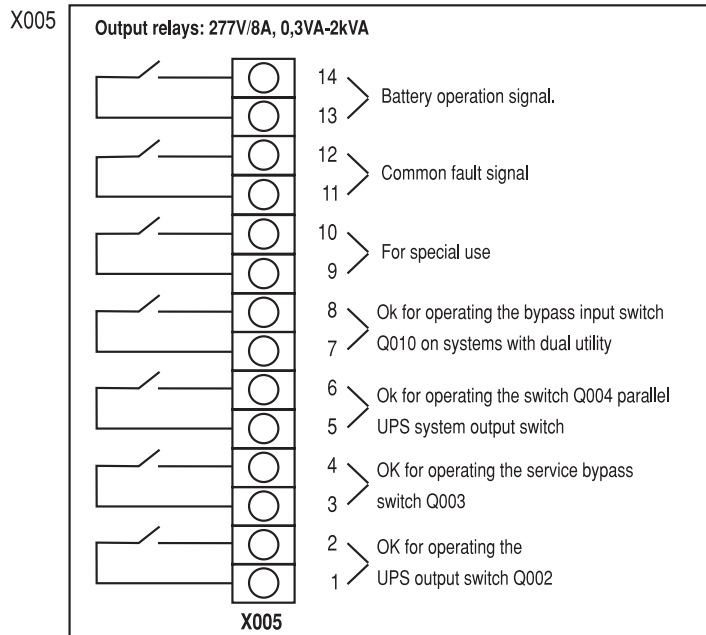
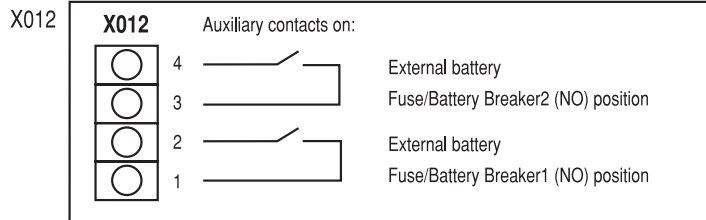
Terminals X001, X003, X005, X004, X012:

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

External Connection



External Connection

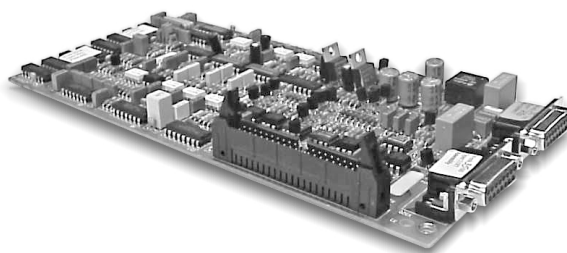


External Connection

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.

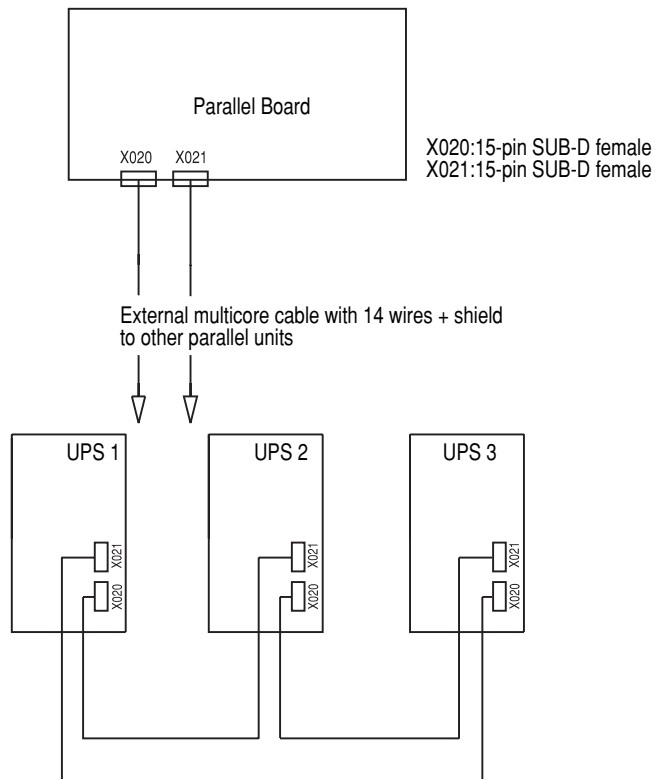
To prepare the UPS for parallel/redundant mode, disconnect all sources of AC and DC power supply to the UPS and connect the ribbon cable from the parallel board to the main controller board. (The ribbon cable is delivered with the UPS).

**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 Programming 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.

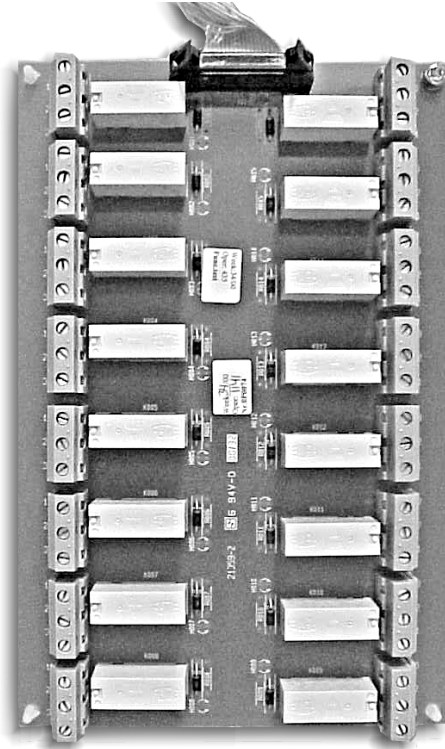
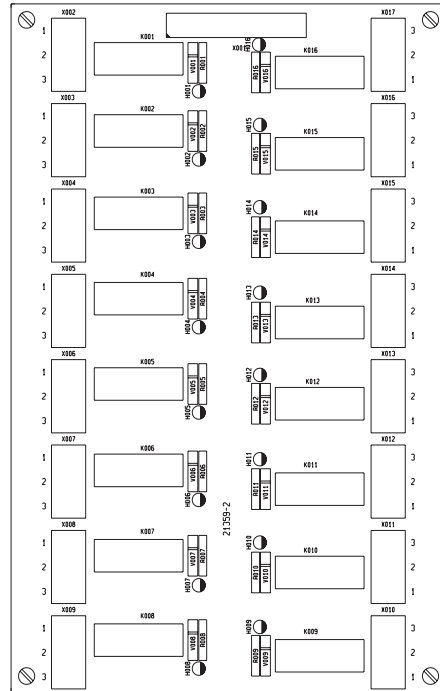
(Cable is delivered with the UPS).

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.

External Connection

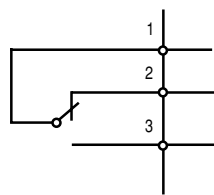
4.4 Relay Board



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

4.4.1 Relay Board Functions

NOTICE!

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

Relay Number	Message	Alarm Triggering Events
1 ## (X002)	Utility Outside Tolerance	Utility voltage RMS value outside tolerance Utility wave form (fast detector) outside tolerance Utility frequency outside limits

990-4049

External Connection

Relay Number	Message	Alarm Triggering Events
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 XXXXXX stack "Common fault delay". Settings 0,10,20,30 seconds. See section 5.2: System configuration in this guide.

External Connection

NOTICE!

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

Alarm Triggering 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

4.4.2 Cable Sizes

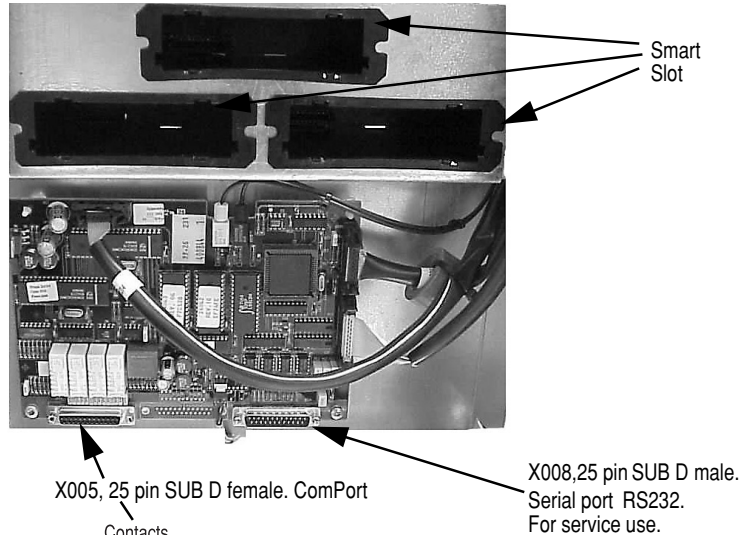
Cable sizes 24 AWG - 12 AWG are suitable. Use copper conductors only. Cable sizes depend on current demand and ambient temperature.

External Connection

4.5 Communication Interface / Smart Slot

The ComInterface having 2 ports - is used when an interaction between UPS and e.g. a computer system has to be established. The main purpose is to ensure monitoring and if needed, a controlled shut down of the computer in case of failures in the utility supply.

4.5.1 Connections



	Contacts between:	UPS status:
	14 2-14	The UPS is OFF, no output voltage
	15 2-15	The UPS is ON, output voltage present
	16 4-16	The UPS is not in bypass operation
	17 4-17	The UPS is in bypass operation
	18 6-18	The UPS is not in battery operation
	19 6-19	The UPS is in battery operation
	20 8-20	The UPS battery voltage is above the warning level
	21 8-21	The UPS battery has been discharged to the warning level
	13 +	Input for remote shutting down of the UPS Signal required: 3.5-25V pulse for min. 1 sec.
	25 -	
Relay contacts rating:		Max 42VAC or 60VDC Min. 0.01A, Max. 0.5A

4.6 SmartSlot for APC Silcon 240-320kW UPS

A UPS system alone provides excellent protection from brief power problems. However, during an extended power outage an unattended computer system will eventually shut down due to battery capacity exhaustion. To prevent data corruption when the UPS shuts down, the computer must be informed by the UPS of impending shut down and take appropriate file-saving measures. This important function is called UPS monitoring. The UPS's computer interface port is the means by which your UPS communicates with a computer system.

External Connection

Some computer operating systems have built-in UPS monitoring. These systems require various hardware interfaces. Interface kits for all major operating systems that support UPS monitoring are available from your dealer.

APC SmartSlot for APC Silcon Series UPS's has been designed for reliable and maintenance-free service in combination with your American Power Conversion (APC) Silcon UPS Series uninterruptible power supply (UPS).

4.6.1 SmartSlot Accessories

SmartSlot at the front of the frame accomodate up to 3 accessory cards. Before installing any SmartSlot accessory, ensure it is a compatible "APC Silcon DUPSK" model.

1. Share-UPS TM, provides automatic shutdown of up to two additional servers.
2. Measure-UPS TM II, provides environmental information such as ambient temperature and humidity.
3. Call-UPS TM, works with an external modem to provide out-of-band UPS manegement
4. WEB/SNMP Management card, provides web based UPS management.

4.6.2 Multiple SmartSlot Installation - introduction

If your UPS configuration uses more than one SmartSlot device, you must install them in the correct order for them to work together properly.

Priority of SmartSlot devices:

A SmartSlot device with higher priority is to be placed in the SmartSlort accessory slot with the higher number. Refer to the following table.

Priority of APC accessories:

Install SmartSlot accessories as dictated by the following table. An accessory with higher priority is to be placed in the accessory slot with the higher number.

Accessory	P/N	Priority	Position
Web/SNMP Management Card	AP9606S	Higesst	↑ ↓ Low-numbered
Call-UPS® //	AP9608	Second-highest	
Interface expander	AP9607	Second-lowest	
Measure-UPS® //	AP9612T AP9612TH	Lowest	

Installing accessories – procedure

To install accessories, perform the following steps:

- 1) Make sure that the APC Silcon UPS is powered off.
- 2) Install the SmartSlot accessories into the housings on the front of the chassis.
See the instructions supplied with the accessories and "Priority of APC accessories."

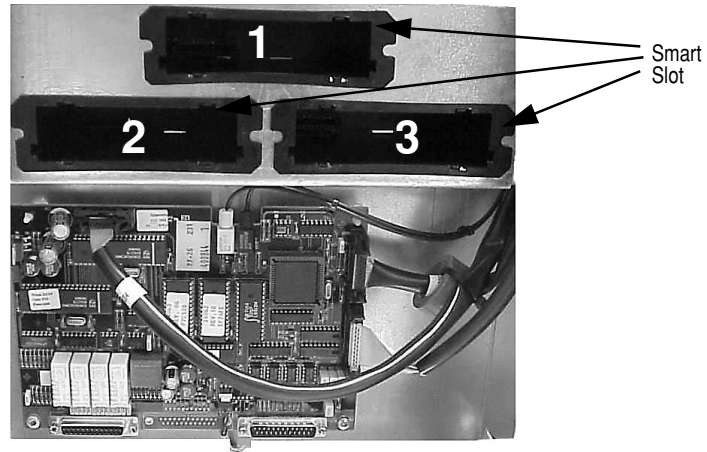
If your UPS has one SmartSlot accessory slot

If your UPS has exactly one SmartSlot accessory slot, use this accessory slot for the SmartSlot device with the lowest priority.

External Connection

Installation in APC Silcon 240kW and 320kW

For installation of multiple SmartSlot devices in 240kW and 320kW, refer to the numbering shown in the figure that follows:



External Connection

4.6.3 APC Silcon Battery Cabinets

IMPORTANT SAFETY INSTRUCTIONS

- a) The servicing of batteries requires battery knowledge and should only be carried out or 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. See "How to Contact APC" in this guide.

Find more information on the APC World Wide Web site at <http://www.apc.com>.



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. Failing that, the installer takes over full responsibility!

NEVER lift or transport connected/installed batteries

External Connection

4.6.3.7 Installation of Batteries

See Installation Guide for Battery Cabinet for:

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



WARNING!

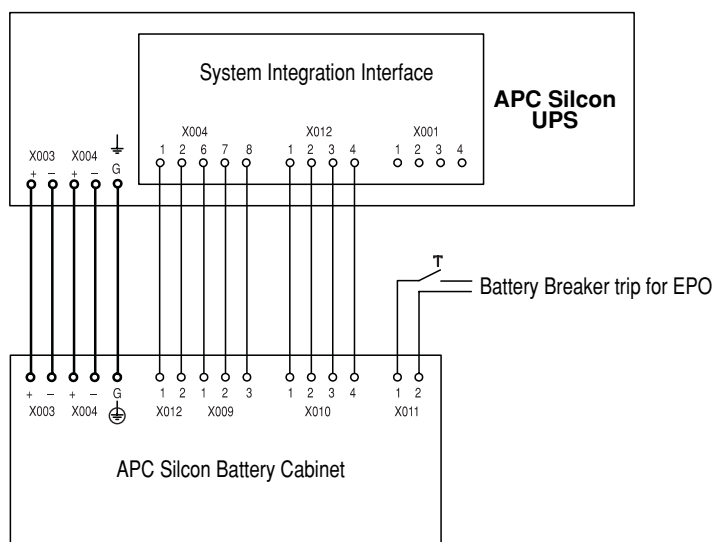
Before proceeding, ensure that power supplies have been disconnected from UPS for a minimum of 5 minutes.



CAUTION!

Follow "Start-up Procedure" in the APC Silcon User Guide.

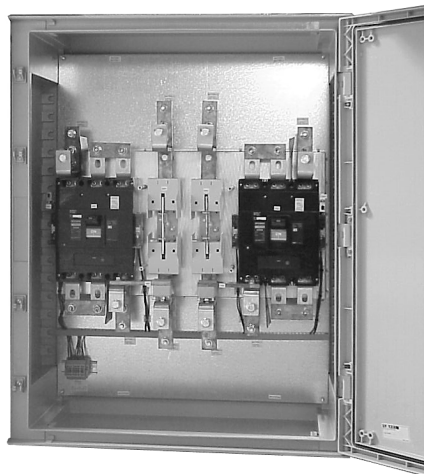
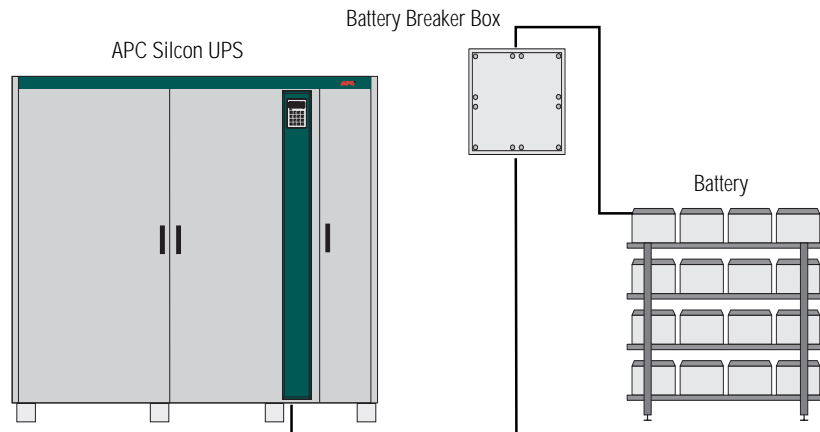
Diagram - UPS with Battery Cabinet



External Connection

4.7 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.

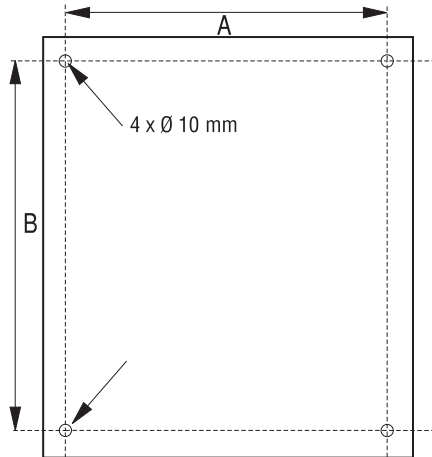


External Connection

4.7.1 Interconnection

NOTICE!

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



Fixing centres in rear of enclosure
See measurements in below table

SKU No.	Type	UPS	Dimensions HxWxD* [in/mm]	Fixing centres AxB [in/mm]	Weight [lbs/kg]
SL0901712	Battery Breaker Box 240kW 480V	240kW 480V	36.22/920 x 33.46/850 x 7.09/180	24.41/620 x 25.59/650	198 / 90
SL0901713	Battery Breaker Box 320kW 480V	320kW 480V	36.22/920 x 33.46/850 x 7.09/180	24.41/620 x 25.59/650	198 / 90

CAUTION!

Check correct polarity when connecting DC cables.

NOTICE!

Terminal for Equipment Grounding Conductor is marked 

NOTICE!

For grounding, refer to local legal regulations.

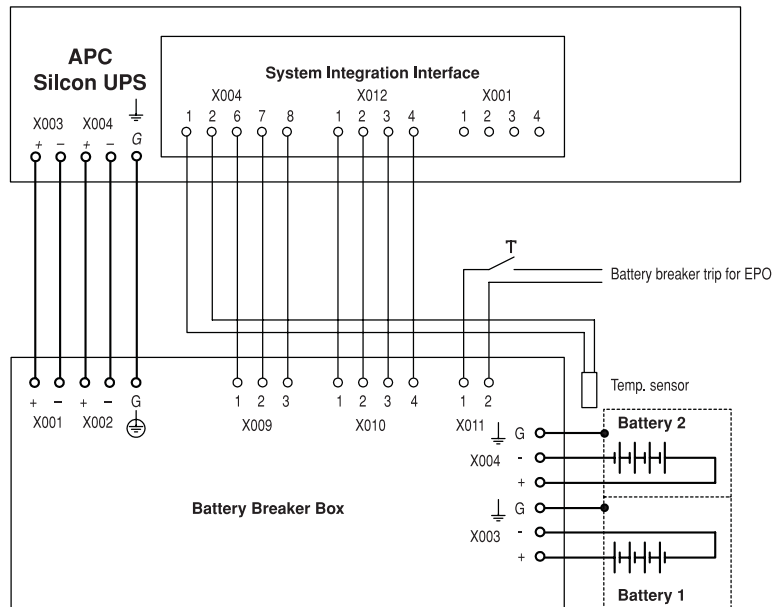
4.7.2 Mounting and Connection of Battery Breaker Box

All AC cables rated 600V.

DC cables must be rated 1000V, unless otherwise stated.

External Connection

4.7.3 UPS with External Battery via Battery Breaker Box



4.8 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 principle 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.

External Connection

4.8.1 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 the 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.

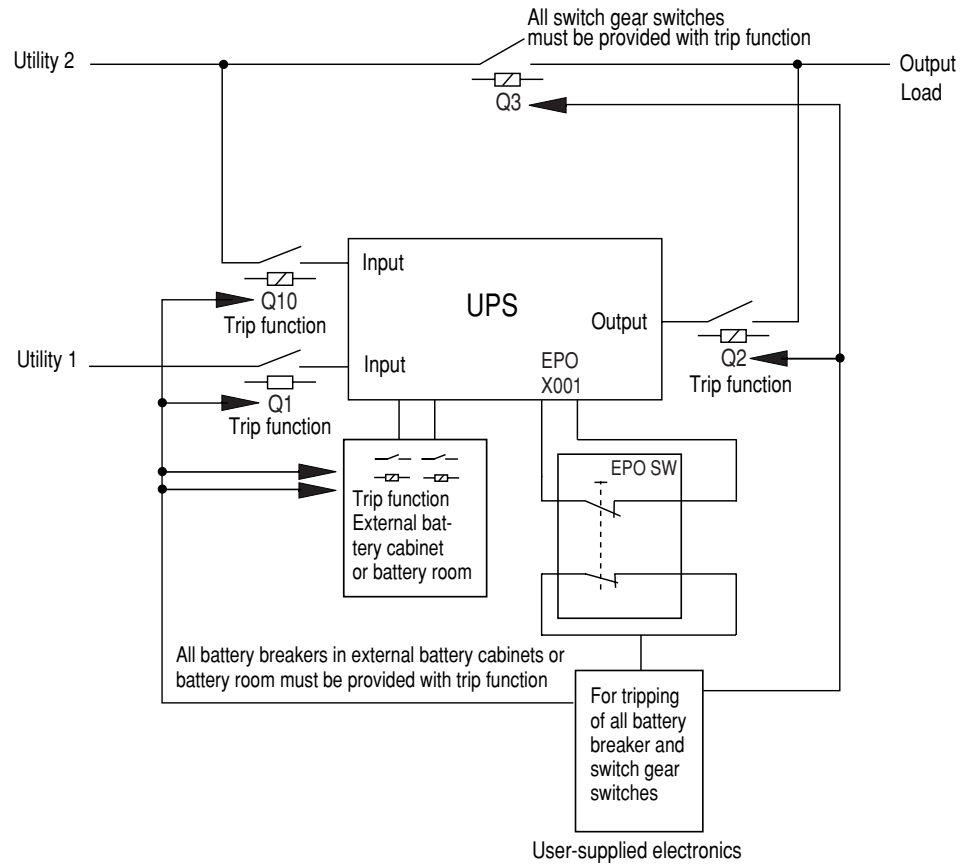
The EPO switch is interconnected to an electronic control system (not available from APC) supplying the Battery Breaker Box and switch gear tripping function with an external 480/277Vac 50/60Hz supply from Utility 2 (if available) or Utility 1 and UPS output before Q002.

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.

<p>NOTICE! Emergency Power Off function requires a special Service Bypass Panel with tripp function breakers.</p>
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External Connection

Principle diagram

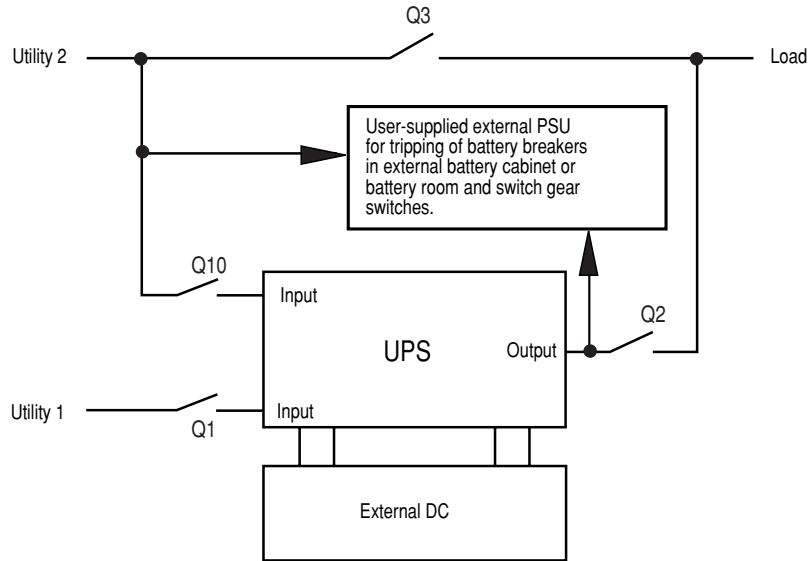


External Connection

4.8.2 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 Dual Utility

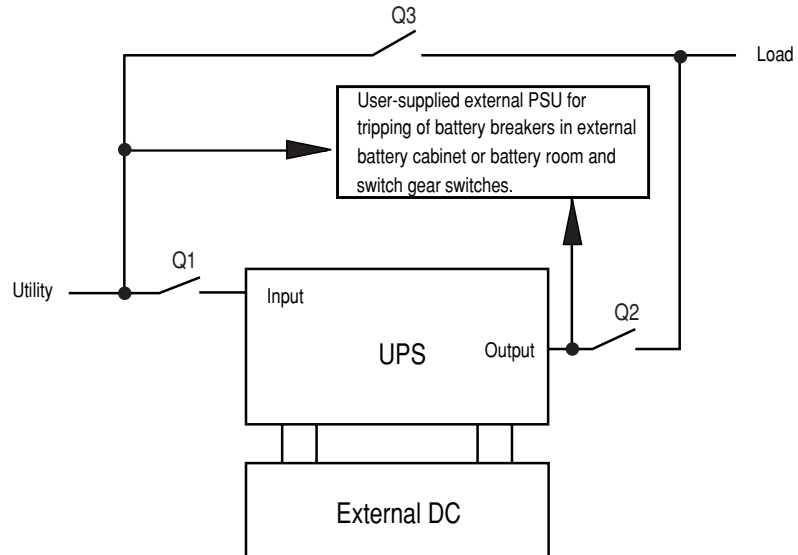


Dual Utility Matrix

DC	Utility 2	Utility 1	Possible UPS operation modes	Tripping Supply	Note
0	0	0	Off	0	Nothing to trip
0	0	1	X		Under installation only
0	1	0	Bypass operation only	1	
0	1	1	Bypass operation only	1	
1	0	0	Battery operation only	1	
1	0	1	Normal/battery operation	1	
1	1	0	Bypass/battery operation	1	
1	1	1	Normal/bypass/battery operation	1	

External Connection

Single 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	1	
1	0	Battery operation only	1	
1	1	Normal/bypass/battery operaiton	1	

Programming

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 6.0).
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)

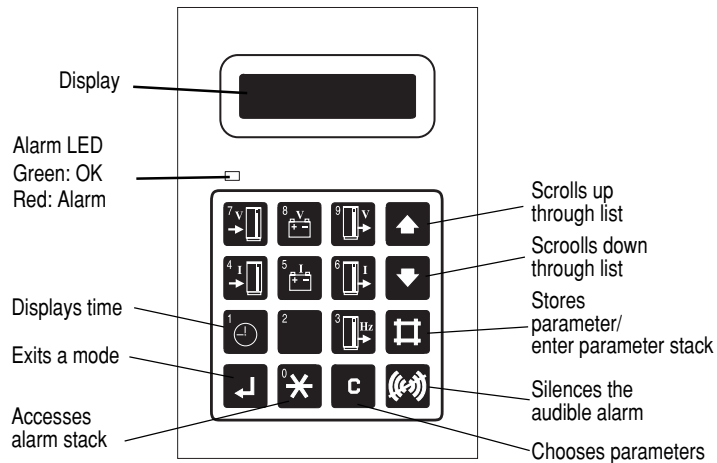
* Factory settings in bold

** For systems with active 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.

Programming




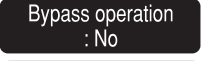

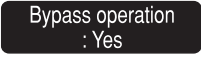

5.1.1 Programming Keys



NOTICE!
Display accuracy is $\pm 1\%$, ± 1 digit.




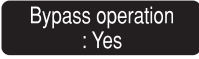




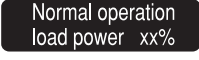
5.1.2 Programming Example - Switch to Bypass Operation

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

Action	Display shows
1. Press  to enter parameter stack	
2. Press  or  until	
3. Press  until	
4. Press  to store	

Programming

Return to normal operation

Action	Display shows
5. Press  to enter parameter stack	
6. Press  or  until	
7. Press  until	
8. Press  to store	
9. Press  to exit	

Follow same procedure to program other parameters.

Programming

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 available	YES, NO	YES for systems with external static bypass switch
Normal Charge Voltage	410-460V 438V	Setting of float charge voltage at 20°C/68°F (Automatic compensation for temperature deviations)
Boost Charge Voltage	438-460V 438V	Setting of boost charge voltage at 20°C/68°F (Automatic compensation for temperature deviations)
Low Battery warning	336-384V 346V	Discharged Battery warning
Low Battery shut-down	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

* Bold text refers to standard factory setting

** Advanced Battery Monitor

Programming



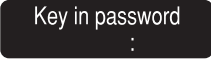









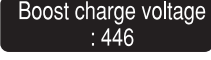

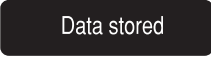
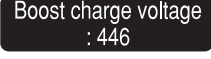

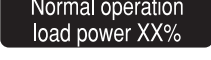
Parameter	Setting*	Comments
APM*** Mode Active	Disabled Redundant +1 Parallel +1	Use only in parallel systems. Disabled: APM*** off. Redundant +1: Redundant operation with one unit being inactive in parallel system Parallel +1: Redundant operation with all units in operation.
APM Test Mode Active	YES, 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

**Advanced Battery Monitor

***Advanced Power Management

5.2.1 Programming Example - Change Boost Charge Voltage to 446V



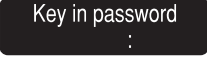
















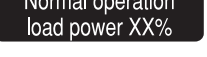
Action	Display shows
1. Press  and  simultaneously to prepare for password entry	
2. Enter password xx xx xx by pressing: 	
3. Press  or  until message appears	
4. Press    	
5. Press  to store	
6. Wait about 1 second	
7. Press  to exit	

NOTICE!


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

Programming

5.2.2 Programming Example - Change to Output Isolation Transformer Available

Action	Display shows
1. Press  and  simultaneously to prepare for password entry	
2. Enter password xx xx xx by pressing      	
3. Press  or  until message appears	
4. Press  to change	
5. Press  to store	
6. Wait about 1 second	
7. Press  to exit	

NOTICE!

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

Programming

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 paralleled 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.

Programming

- If APM should not 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 numbers must be left in this sequence. Furthermore, “Highest station address” must be changed to number of active UPS’s in parallel.

5.4 Battery Monitor

Action	Display shows
1. Press  and  simultaneously to prepare for password entry	Key in password :
2. Enter password xx xx xx by pressing      	Last selected parameter
3. Press  or  until message appears:	Expected back-up time [min.]: XXX.X
4. Enter the expected back-up time in minutes at 100% ohmic (pf = 1) load, when the inverter has a mean efficiency of approximately 96% Press   	Expected back-up time [min.]: 14.0
5. Press  to store data	Data stored
6. Press  or  until message appears	Battery capacity in [Ah]: XX.X
7. Press   to set Ah for battery	Battery capacity in [Ah]: 7.0
8. Press  to store data	Data stored
9. Press  to exit	Normal operation load power XX%

Installation of new batteries:

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

NOTICE!

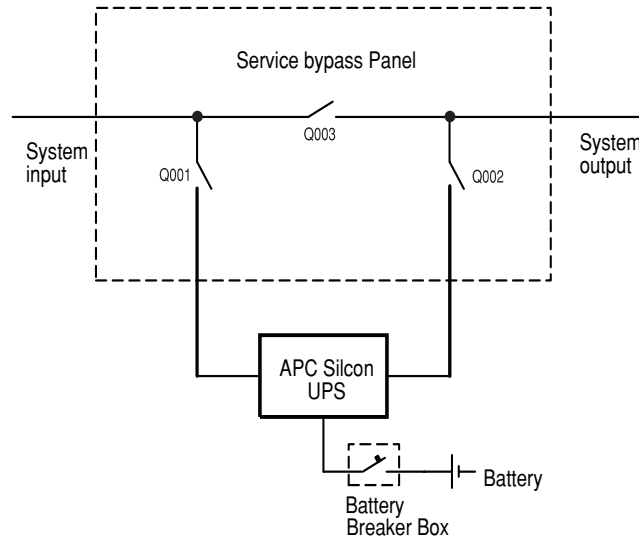
Contact your local dealer if you have any questions regarding changing parameters.

Options/Accessories

6.0 Options/Accessories

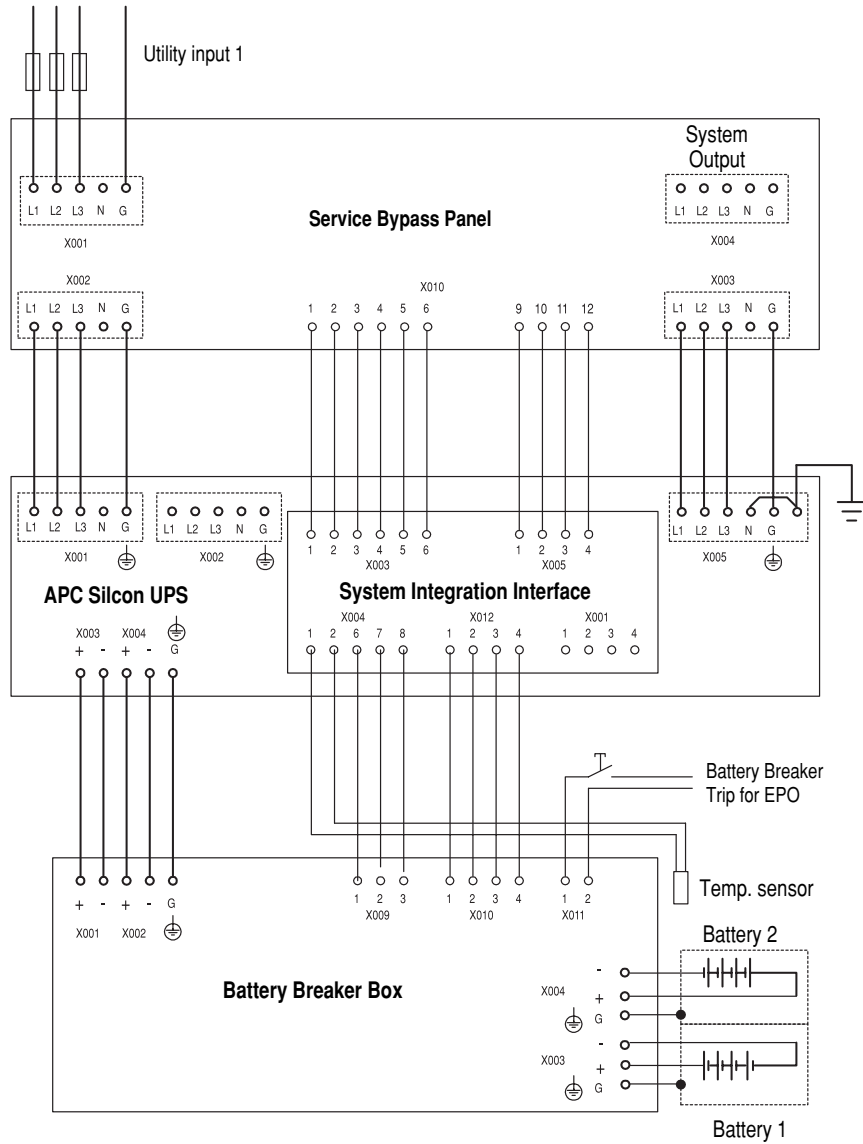
6.1 Diagrams for Service Bypass Panel for Single Operation, Single and Dual Utility

Principle diagram: Service Bypass Panel for single operation



Options/Accessories

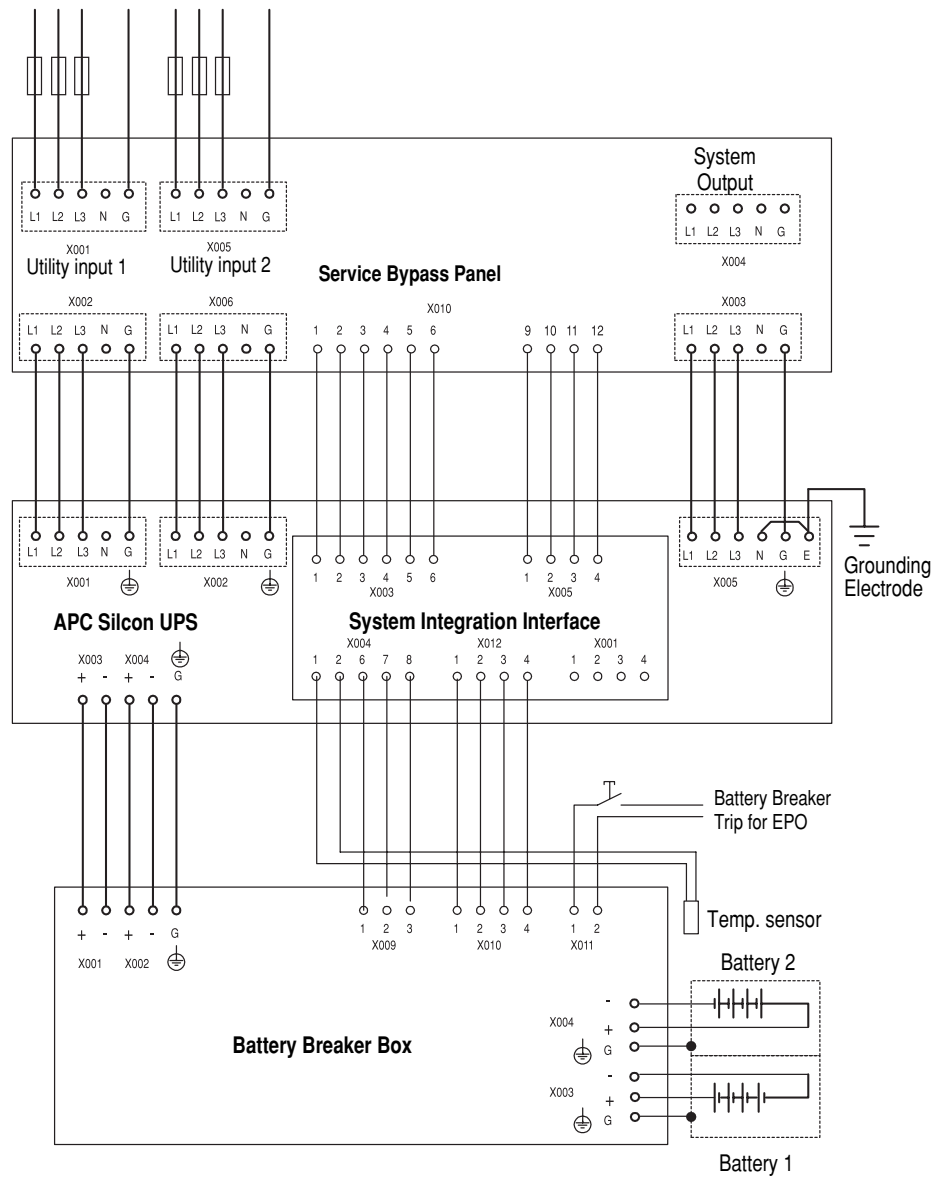
6.1.0.1 APC Silcon UPS with Service Bypass Panel and External Battery via Battery Breaker Box (Single Utility) 3-wire grounded WYE service



990-4049

Options/Accessories

6.1.0.2 APC Silcon UPS with Service Bypass Panel and External Battery via Battery Breaker Box (Dual Utility) 3-wire grounded WYE service



6.1.0.3 Mounting and Connecting

NOTICE!

"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

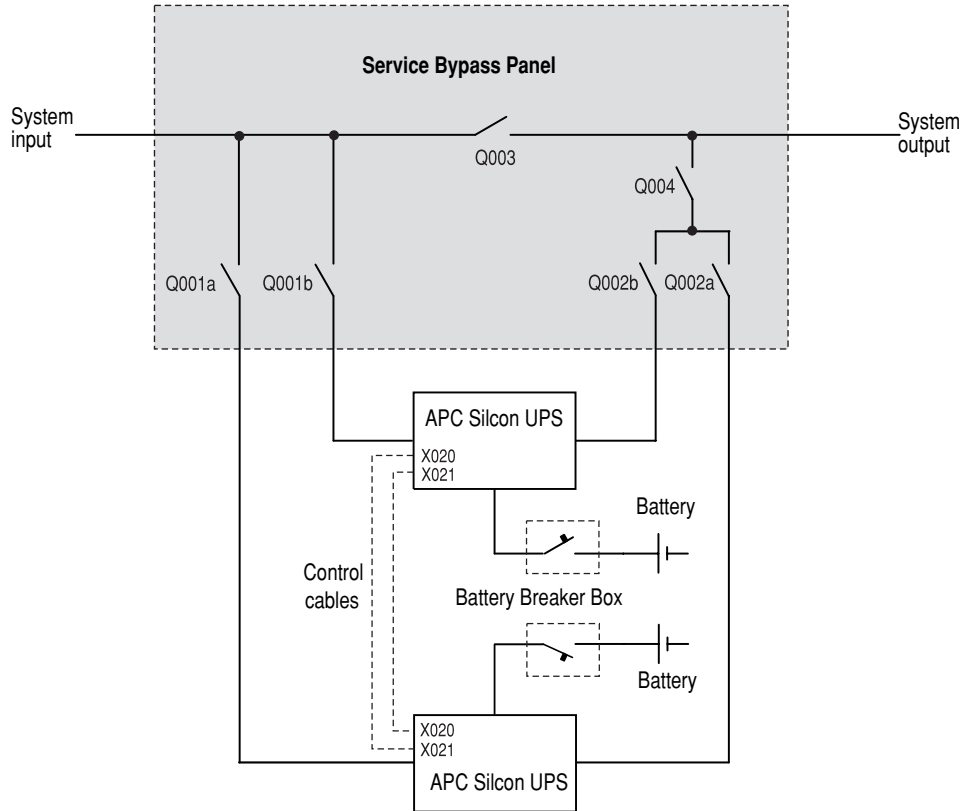
Select wire size based on the data in Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

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 manufacturer.

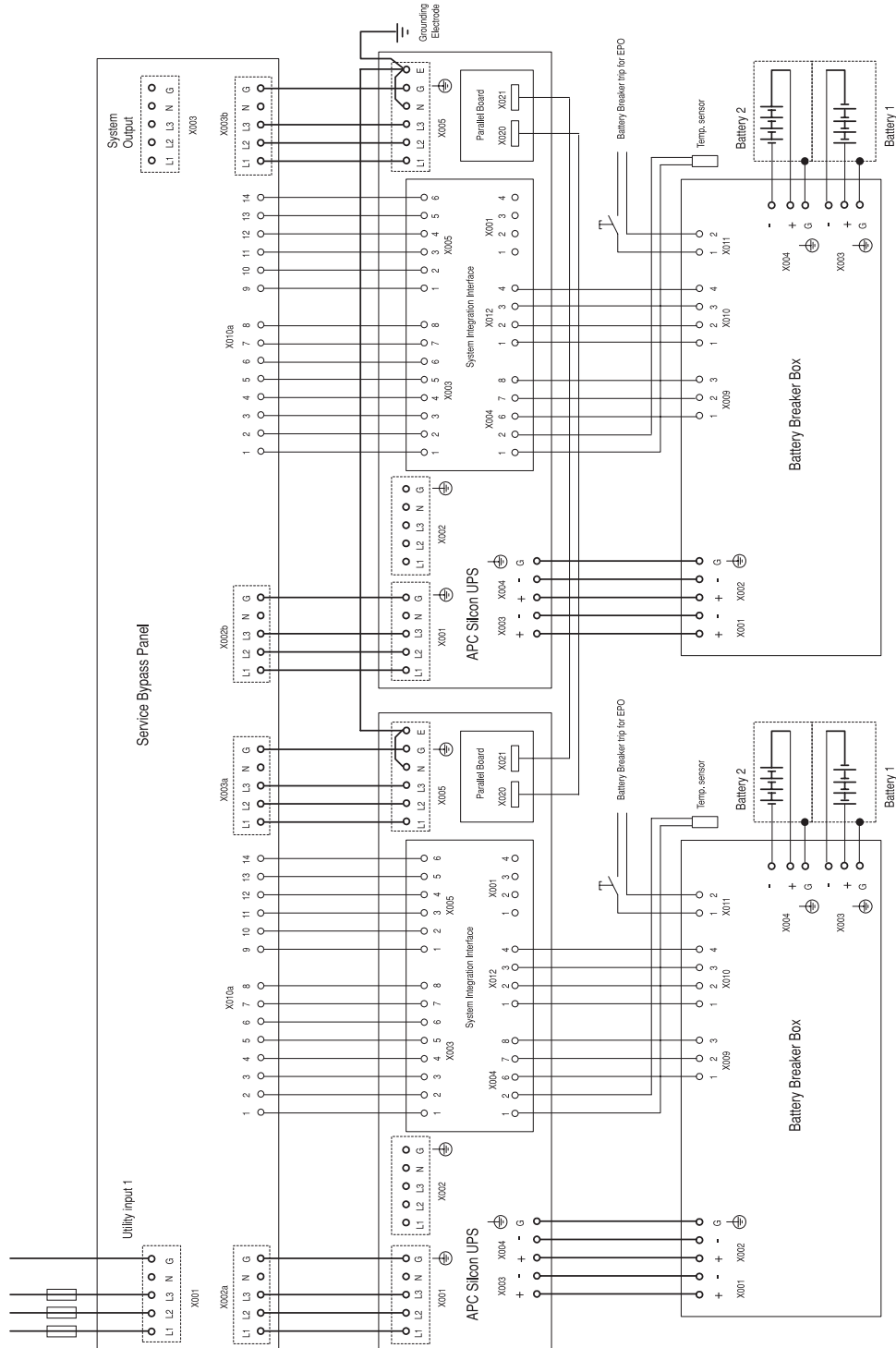
Options/Accessories

6.1.0.4 Service Bypass Panel for parallel redundant operation, single Utility

Principle Diagram: Service Bypass Panel for redundant operation.



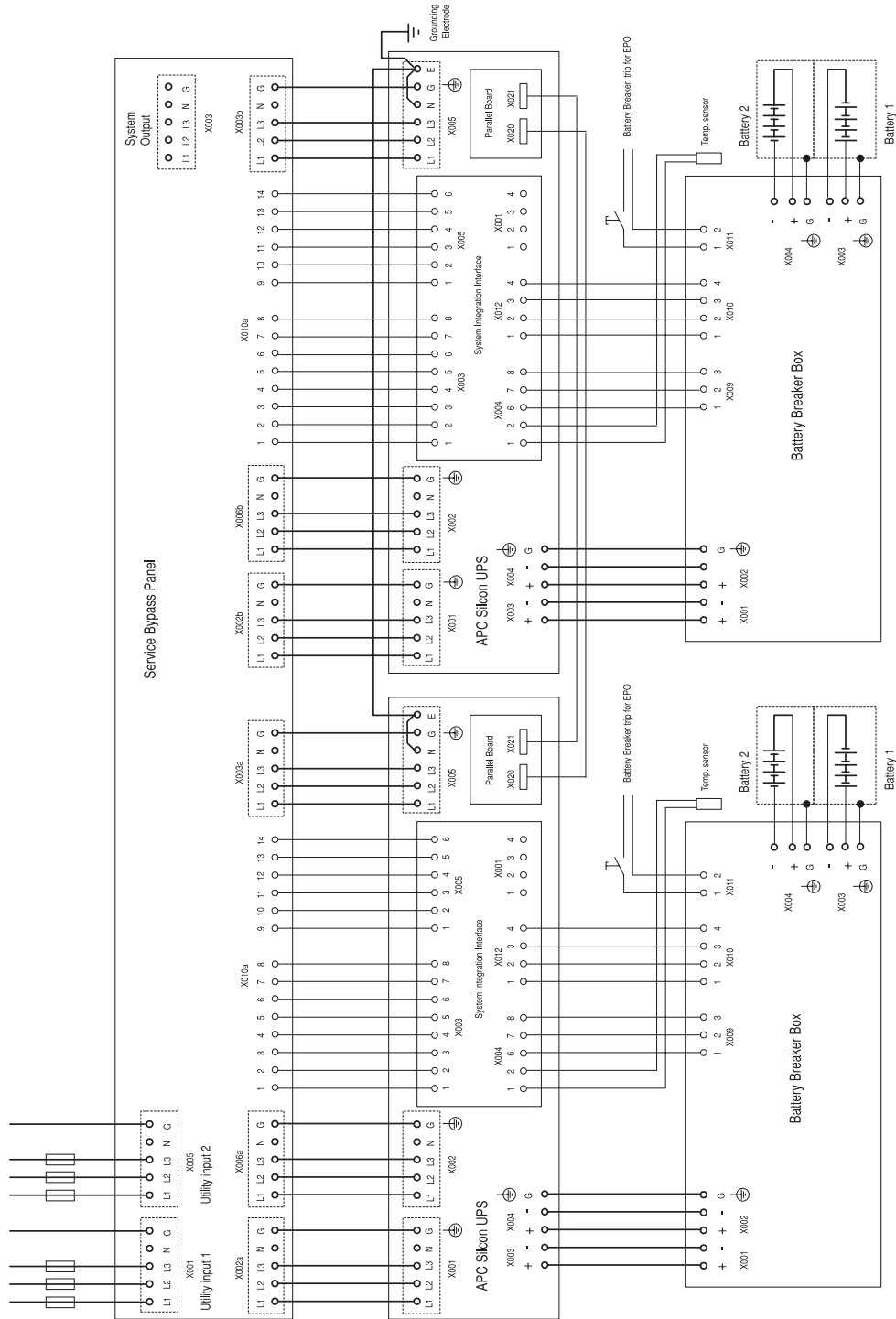
6.1.0.5 Parallel/Redundant UPS with Service Bypass Panel and External Battery via Battery Breaker Box (Single Utility) 3-wire grounded WYE service



990-4049

Options/Accessories

6.1.0.6 Parallel/Redundant UPS with Service Bypass Panel and External Battery via Battery Breaker Box (Dual Utility) 4-wire grounded WYE service



990-4049

6.1.0.7 Mounting and Connecting

NOTICE!

“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.

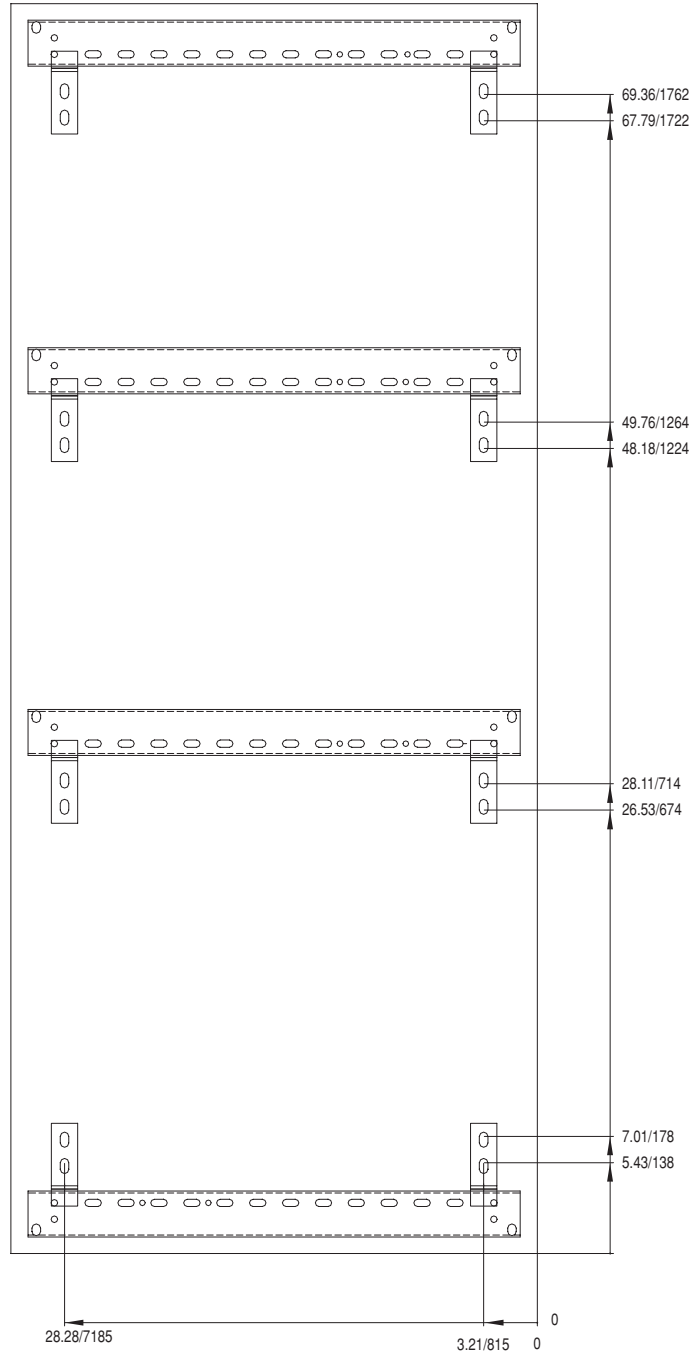
Wiring

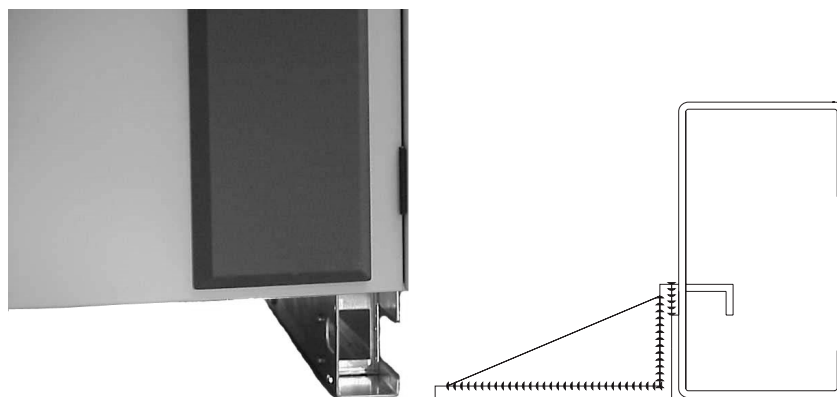
Select wire size based on the data in Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

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 manufacturer.

Options/Accessories

6.2 Seismic Anchoring





8 seismic angles

6.2.1 Mounting Seismic Anchoring

Drill 16 holes for Ø10mm bolts at installation site according to dimensioned sketch.

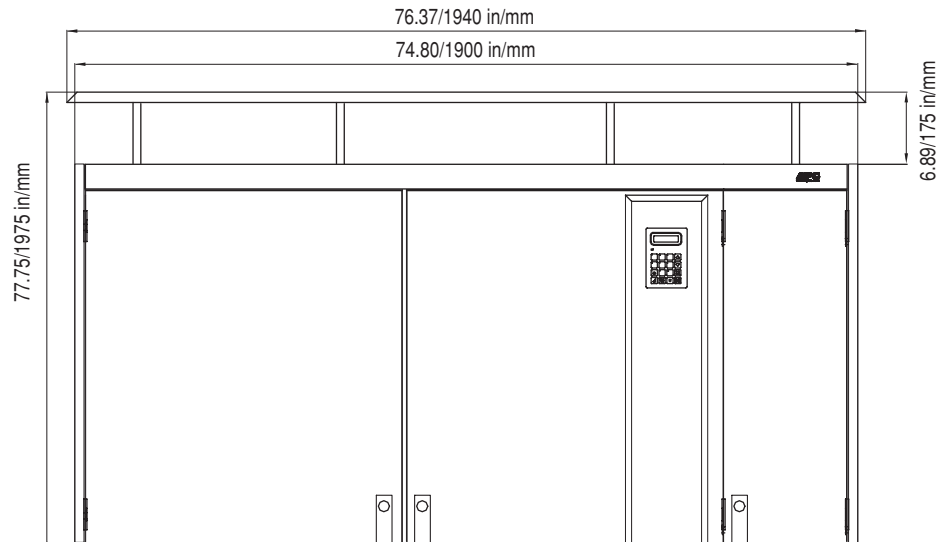
With the holes drilled in the UPS, position the system correctly and slide the 8 seismic anchoring angles into the bars (see illustration above). Tighten the angles in the holes, using bolts and plain washers.

NOTICE!

Tighten all bolts in all 8 angles to the floor. Floor bolts not supplied

Options/Accessories

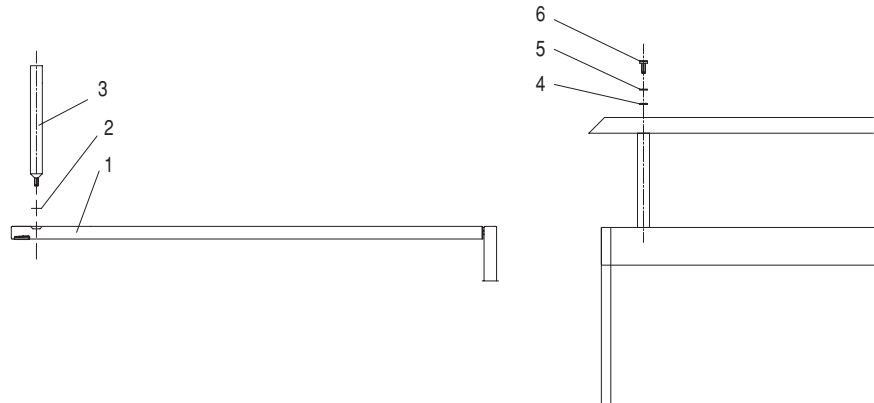
6.3 NEMA 12 Cover (IP31)



NOTICE!
NEMA 12 cannot be used with top cable entry.

6.3.1 Mounting NEMA 12 Cover

- Replace all screws on the top cover (1) with distance stays (3) and plastic locking (2)
- Mount NEMA 12 cover with plain washer (4), spring washer (5), and screw (6) on the 4 distance stays



6.4 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.

6.4.1 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.

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

Options/Accessories

Remote Display. The converter provides optical signal isolation. Both converter boxes must be supplied by an uninterruptible power source.

6.4.1.1 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 the 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

6.4.1.2 Connections With Converter

Connections to be made according to converter manual.

Pin connection example only:

Pin Connections for cable from host to ME800A-R2.

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

Pin connection for cable from ME800A-R2 to Remote Display

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.

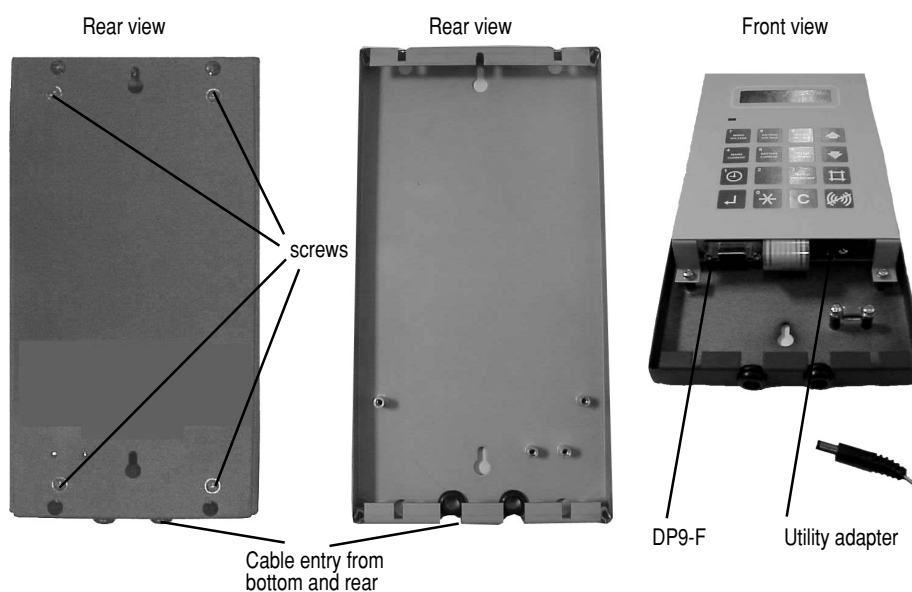
The interconnection cable between the two ME800A-R2 boxes is a 4-wire twisted pair telephone cable with or without shield. The shield improves noise immunity but reduces maximum communication distance.

6.4.2 Remote Display Installation

6.4.2.1 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

6.4.2.2 Remote Display Power Supply

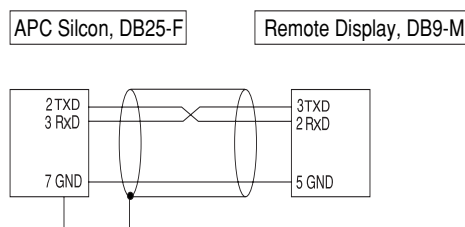
The remote display is supplied by normal AC power with no battery back-up. For UPS data transmission to remote display to remain unaffected during power failure, the remote display must be supplied from an uninterruptible power source.

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

Options/Accessories

6.4.2.3 Remote Display Cables

RS232C to RS232C cable:



NOTICE!
Connect shield at one end only

Rating: Refer to Local/National electrical codes.
Communication voltage $\pm 15V_{DC}$

6.4.3 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).

6.4.3.1 Initiating the Remote Display

After having connected the supply the display will show:

Remote Display: "APC Silcon UPS"

6.4.3.2 Communication Fault

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

"Data transmission interrupted"

6.4.3.3 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

6.4.3.4 Operation

See Operation section in the APC Silcon User Guide.

6.4.3.5 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.

6.4.3.6 Alarms

See Alarms section in the APC Silcon User Guide.

6.5 Isolation Transformer Module



CAUTION!

Use only one type of isolation transformers for dual utility input.

Isolation transformer modules can be used in the following configurations:

1. Between utility supply and UPS input, in a 3-phase Delta-service-phase or midpoint of 2 phases (grounded)
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 for voltage stepping from 480V - 208V/Y 120V 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

Configuration of isolation transformers is as Delta-WYE with accessible neutral (Dyn11)

NOTICE!

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 recommended sizes only. Refer to local regulations.

6.5.1 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.

990-4049

Options/Accessories

NOTICE!

For grounding, refer to local legal regulations.

NOTICE!



“phase”



“risk of electric shock”





Terminal for Equipment Grounding Conductor



“E” Terminal for Grounding Electrode Conductor

NOTICE!

The terminals marked  and  are electrically connected to terminals “E”.

6.5.2 Cabinets and Dimensions

See the Installation Guide for Isolation Transformer.

6.5.3 Footprints

See the Installation Guide for Isolation Transformer

6.5.4 Connecting Isolation Transformer

See the Installation Guide for Isolation Transformer

6.5.4.1 External Temperature Alarm Cable*

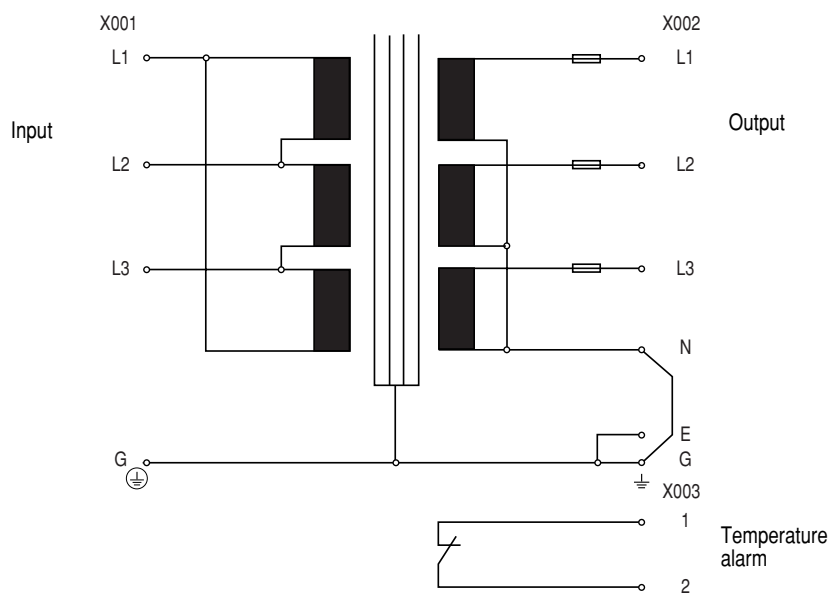
Voltage rating must be 600V. Cable size can be 18 or 14 AWG.

6.5.5 Recommended Cable Lugs and Crimping Tools

See section 4.1.6

Options/Accessories

6.5.6 Isolation Transformer - Diagram Delta WYE configuration (Dyn11)




6.5.7 Isolation Transformer Grounding

6.5.7.1 System Grounding

See the installation guide for Isolation Transformer.

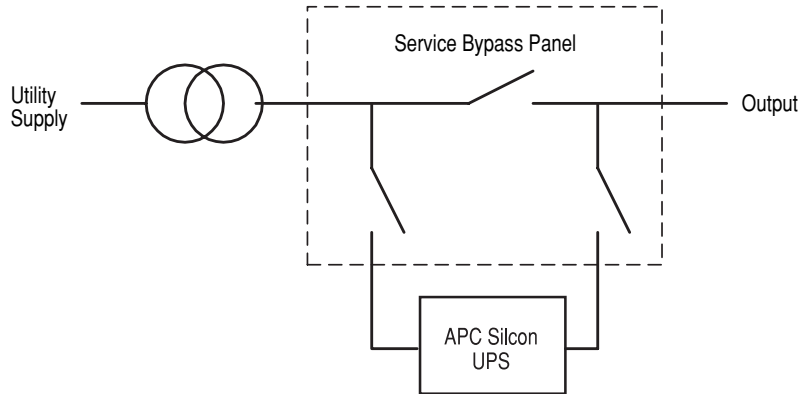
6.5.7.2 Equipment Grounding

Terminal marked  is intended for equipment grounding.

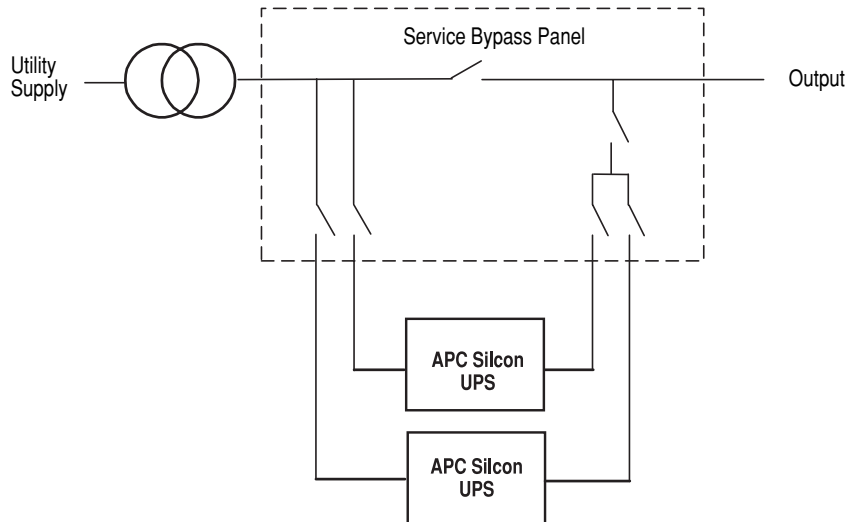
Options/Accessories

6.5.8 Principle Diagrams for Isolation Transformer

6.5.8.1 Single Utility and Single System Diagram

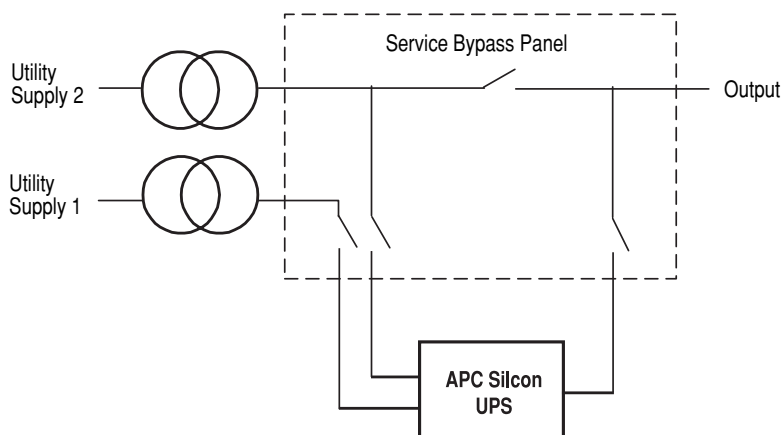


6.5.8.2 Single Utility and Redundant System

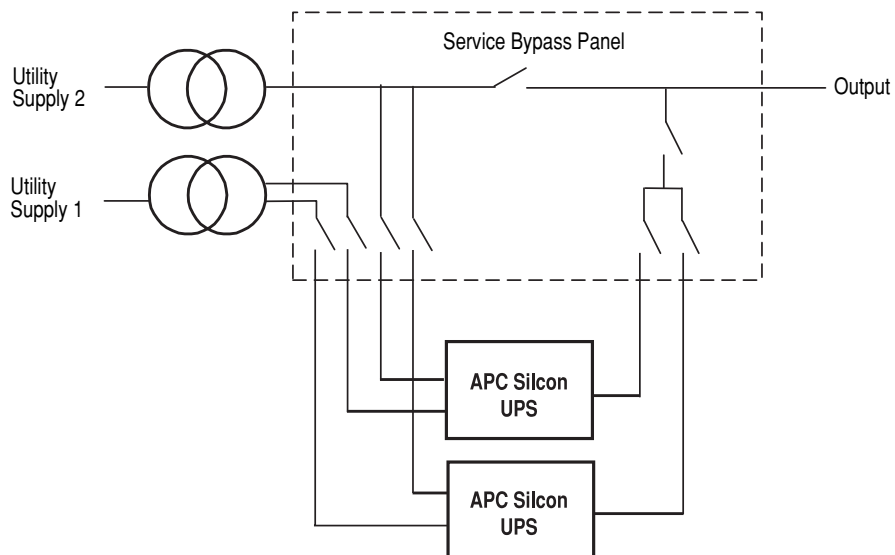


Options/Accessories

6.5.8.3 Dual Utility and Single System



6.5.8.4 Dual Utility and Redundant System



990-4049

Options/Accessories

6.6 Intersystem Synchronization Unit

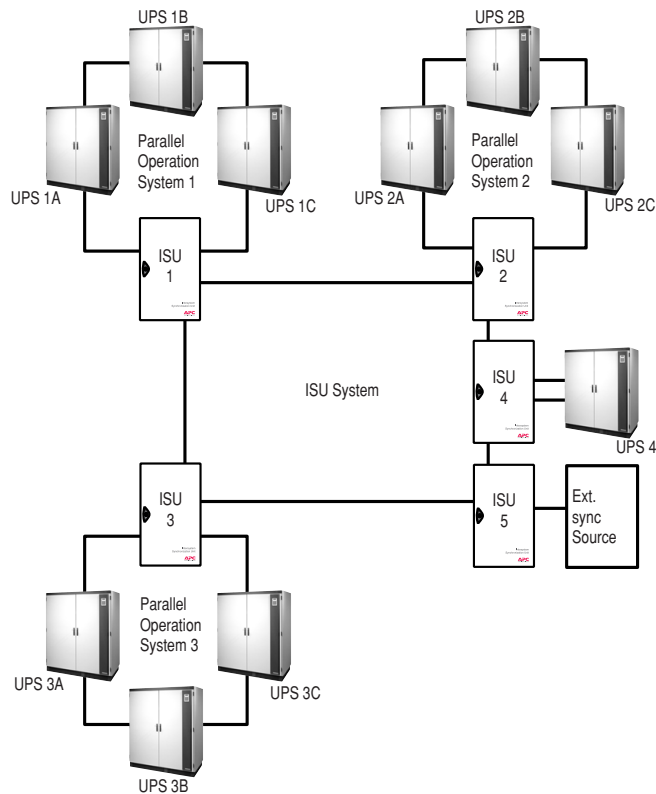
Intersystem Synchronization Unit System (ISU System)

The ISU system consists of inter-connected ISUs. One ISU system may consist of up to 5 ISUs, regardless 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.)

System Specifications

7.0 System Specifications

7.1 Technical Data

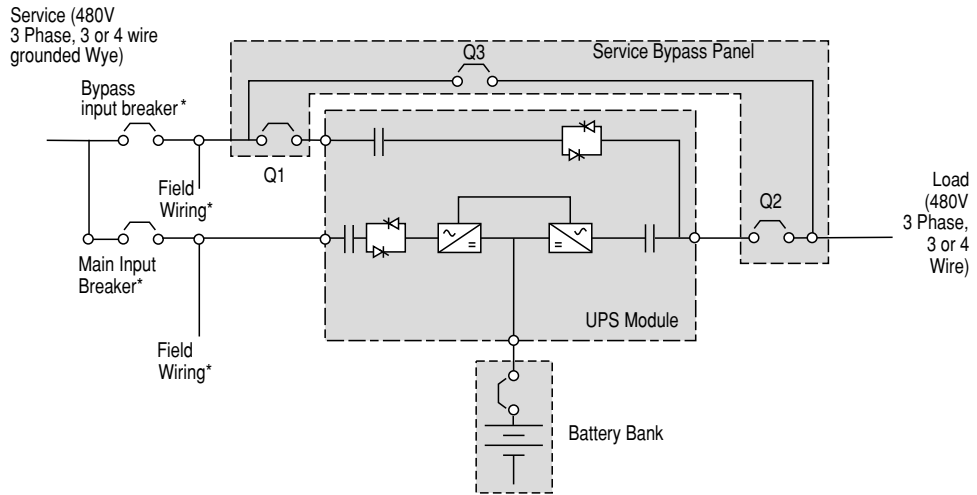
	Voltage	3x480V
Input	Voltage tolerance Normal operation Normal operation	±15% ±10% standard ±4, 6 8% (programmable)
	Frequency	60Hz ±6 standard ±0.5-8% (programmable)
	Input power factor	load 25% minimum 0.97 load 100% minimum 0.99
	Current distortion	Max. 5%
Output	Voltage	3x480V
	Voltage tolerance	±1% static, symmetrical load ±3% static, symmetrical 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 seconds 125% - 10 minutes 150% - 30 seconds 125% - continuous
General	Ambient temperature	0-40°C/32-104°F (Temperatures above 25°C/77°F will reduce battery life time)
	Humidity Protection class Safety Emission and Immunity Static bypass switch Auto restart Economy mode	Max. 95% non-condensing NEMA1 UL 1778 FCC ClassA Built-in Programmable Programmable

990-4049

Appendix

8.0 Appendix

8.1 Table 1. Installation Planning Data



* Supplied by others
Input must be limited to less than 50 kAIC

Installation Planning Data
APC Silcon Series

Power rating			AC Input (480V)								Battery System DC				AC Output (480V)		Heat Rejection kBTU/hr
			Source		P (kW)		I (A)		Min. Input Cable (per phase)	Service Over-current Protection*	V _n (Vdc)	Full load P(kW)	I _{Nom} Disch (A)	I _{Max} Disch (A)	I _n (A)	Load side Over-current Protection*	
kW	kVA	Pf	V	Hz	Nom.	Max.	Nom.	Max.									
120	120	1	480	60	126.8	140.0	152.5	168.0	1 x 4/0	225AT	2x384	127.0	166	194.8	144.0	200AT	23.2
160	160	1	480	60	167.5	186.0	201.5	224.0	1 x 350mcm	300AT	2x384	168.8	220	258.9	192.0	250AT	25.6
240	240	1	480	60	252.9	280.0	304.2	336.0	1 x 700mcm / 2 x 4/0	450AT	2x384	252.1	328	386.7	289.0	400AT	44.0
320	320	1	480	60	334.4	373.0	402.2	448.0	2 x 350mcm	600AT	2x384	335.4	437	514.4	385.0	500AT	49.1
400	400	1	480	60	415.8	460.0	500.1	560.0	2 x 350mcm	700AT	2x384	421.9	549	647.1	482.0	600AT	35.9
500	500	1	480	60	519.2	574.0	624.5	700.0	2 x 700 / 3 x 350mcm	900AT	2x384	525.8	685	806.4	602.0	800AT	65.5
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

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

Appendix

- 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.

8.2 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 AWG or kcmil	Temperature Rating of Conductor (See Table 310-13)						Size AWG or kcmil
	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)	
	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	
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

990-4049

Appendix

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							
Ambi-ent 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
<small>¹⁾Reprinted with permission 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.</small>							

9.0 Warranty

9.1 APC Silcon Series® Limited Factory Warranty

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How to Contact APC

10.0 How to Contact APC



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