

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.

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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 _____ | | | | | | | | | | |

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.

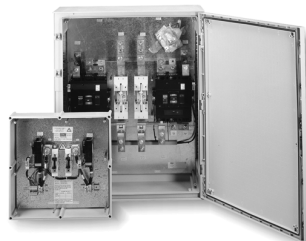


Service Bypass Panel

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.



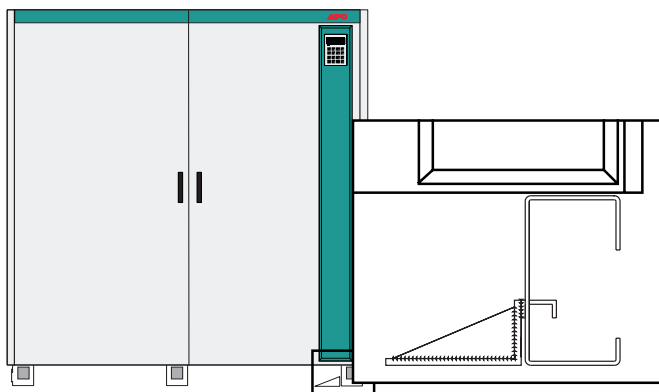
Unpacking/Identification of Equipment

Isolation Transformer

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

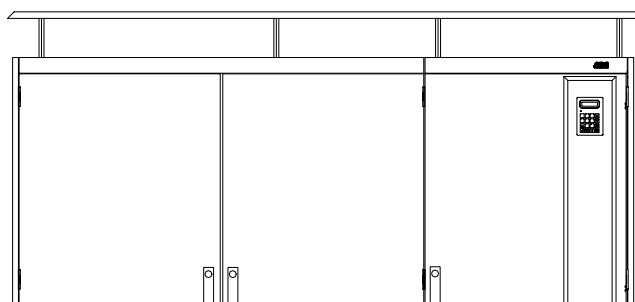
Seismic Anchoring

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!

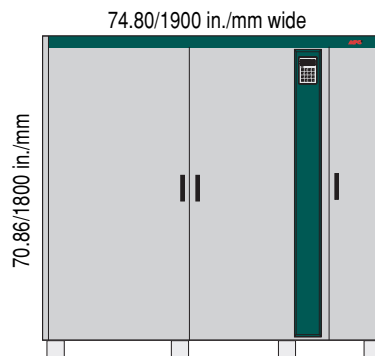
For safety reasons do not stand on UPS. Keep UPS cabinet surface free of any objects

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



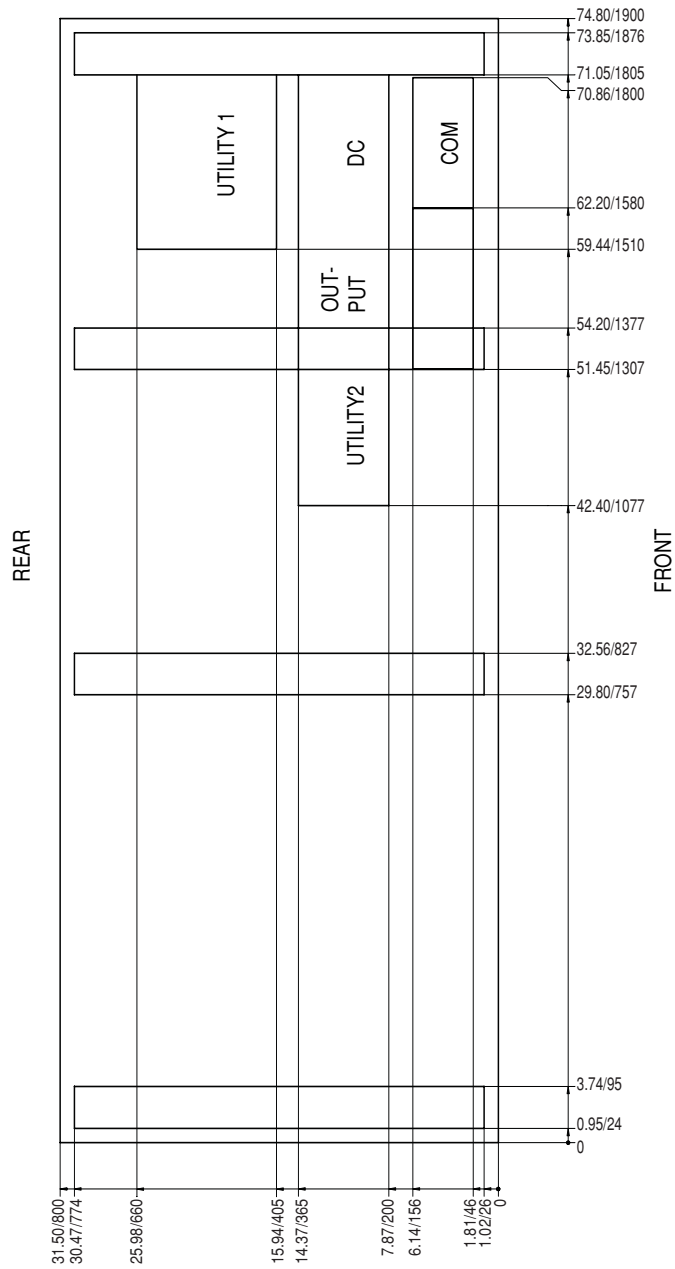
Installation

3.3 Footprints

3.3.1 UPS Cabinet Footprints

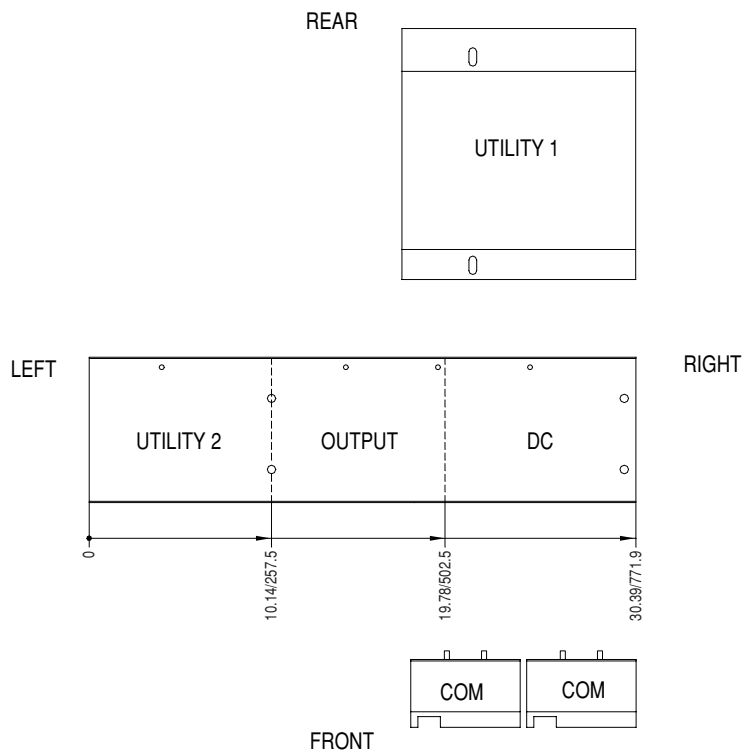
NOTICE!

Dimensions indicated in inches / millimeters and lbs. / kgs



Installation

3.3.2 Conduit Entrance Plate in bottom of the system

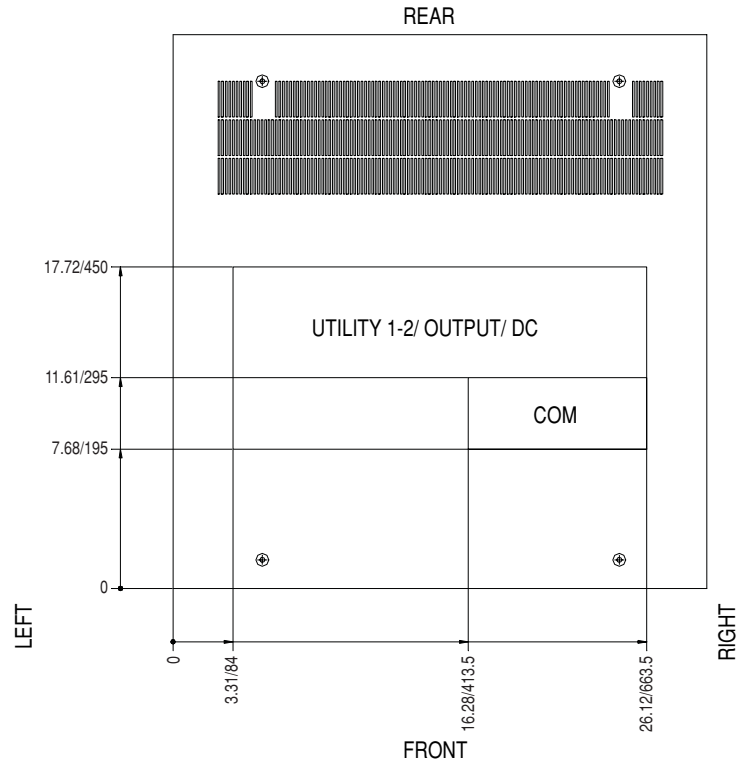


Cable entries need to be punched in the UPS cabinet. Follow diagram for correct orientation of power and control cables to be led into the UPS.

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!

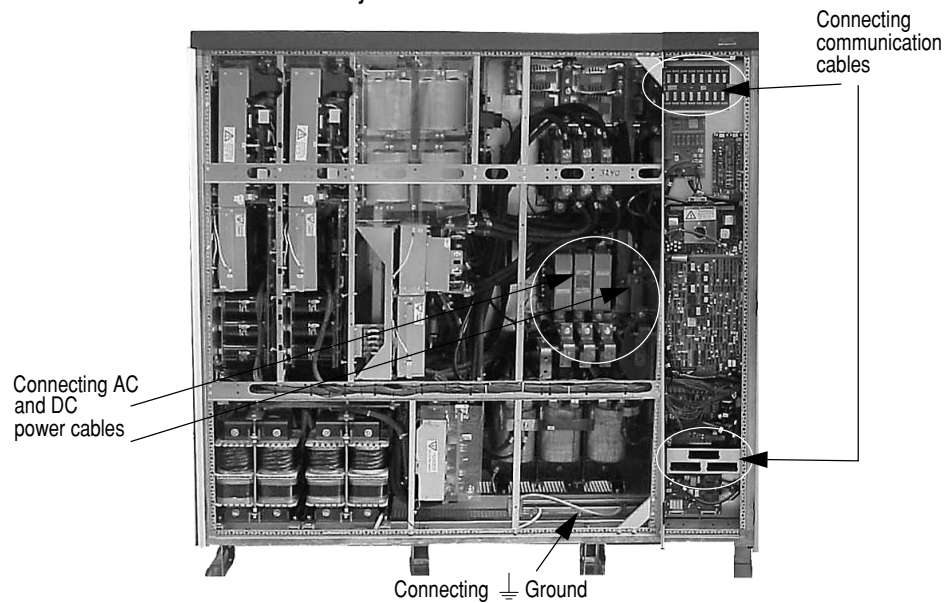
Read warnings on page 2 of this manual before continuing.

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

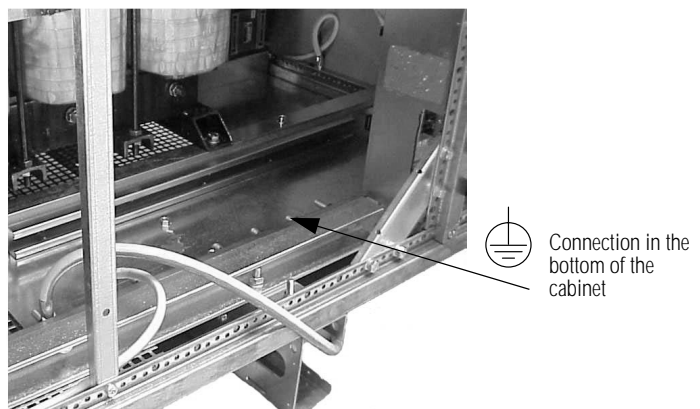
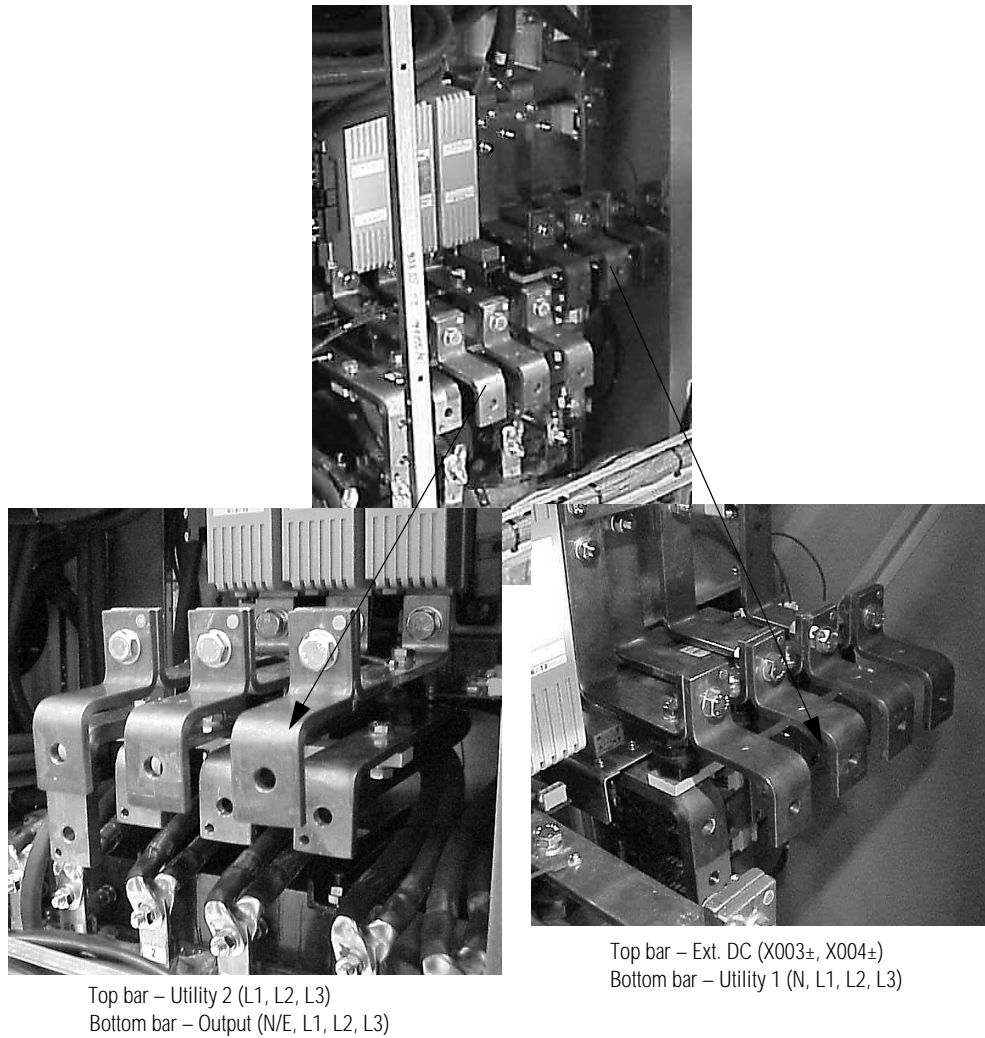


NOTICE!

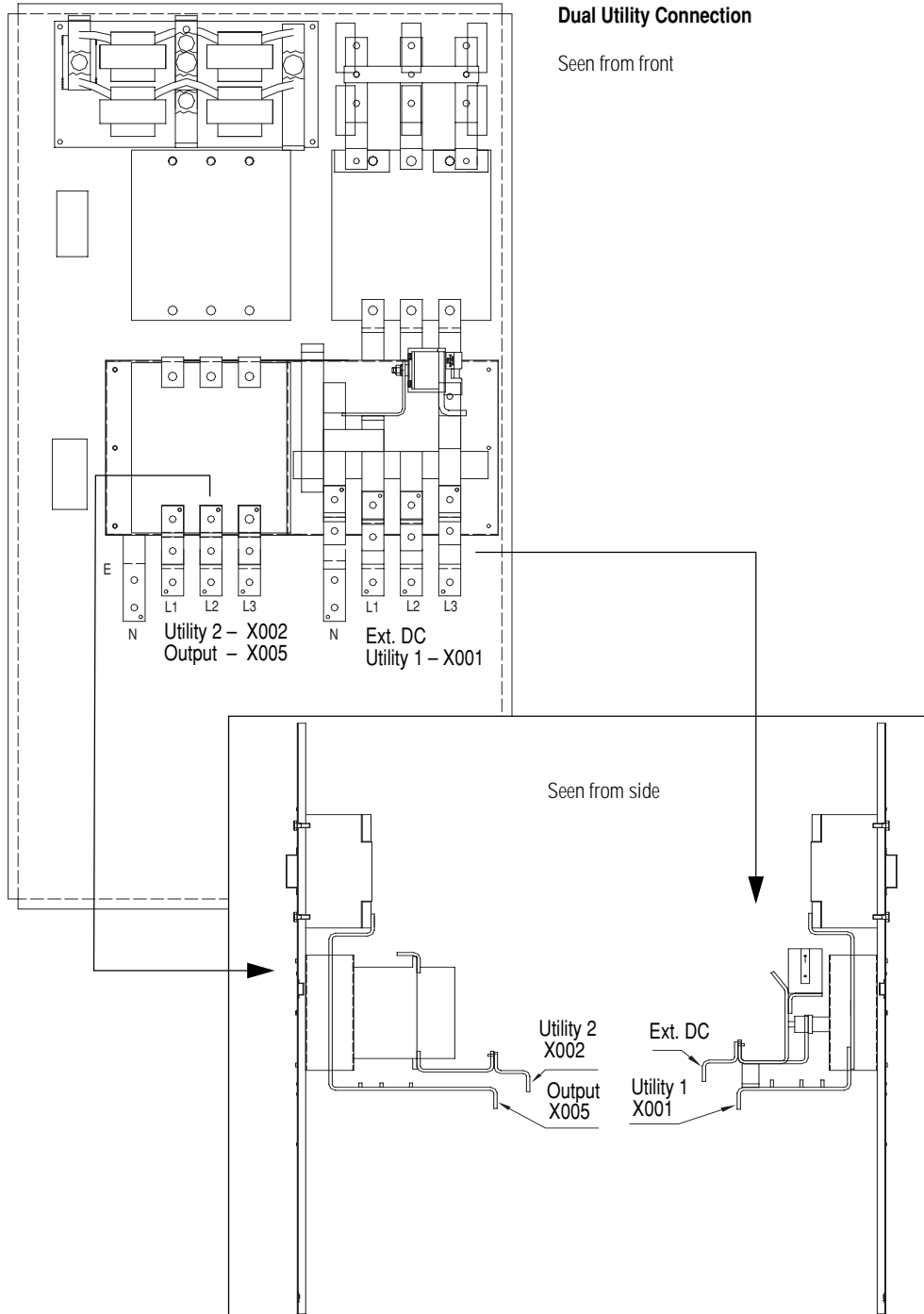
Always keep AC, DC and communication cables separate.

External Connection

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



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.

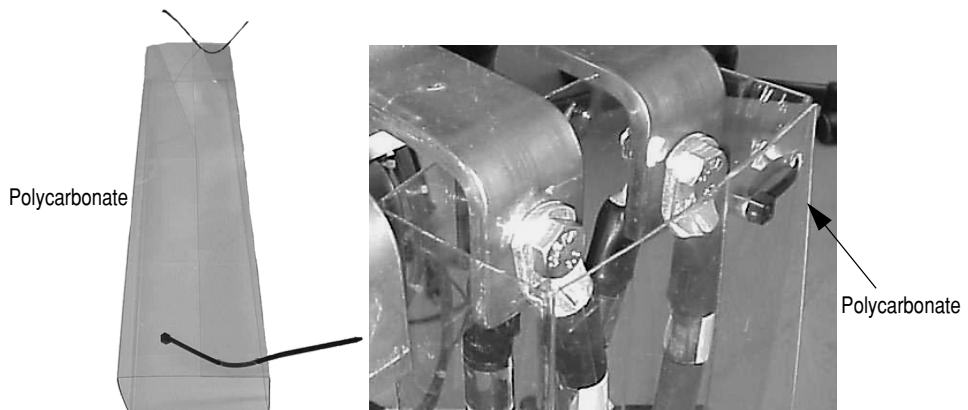


WARNING!

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

4.1.2 Separation of AC from DC1 and DC2

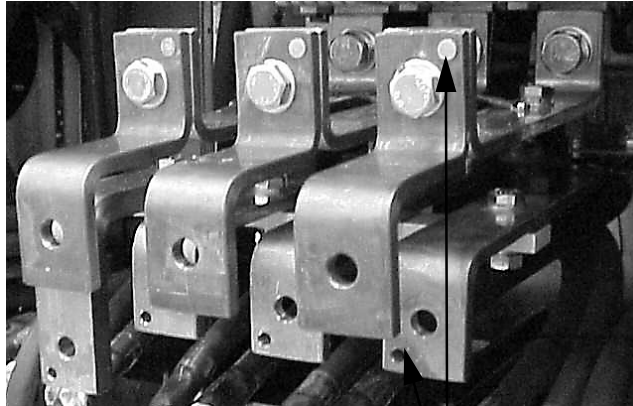
Use the 2 pieces of polycarbonate (supplied with the UPS) to separate AC from DC1 and DC2. Standard length of polycarbonate adjusted for top cable entry. Adjust length of polycarbonate to fit bottom entry where applicable.



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.



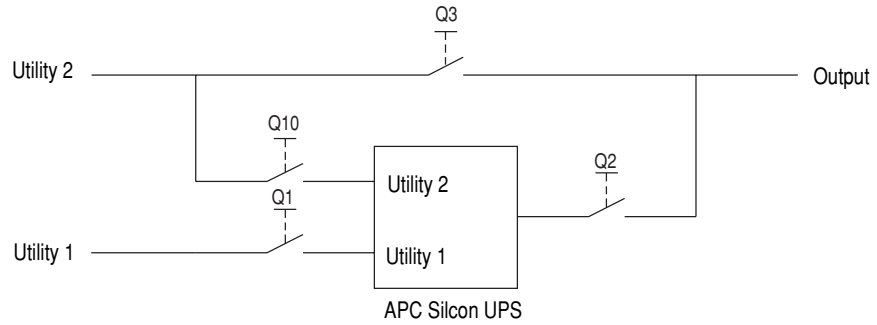
CAUTION!

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

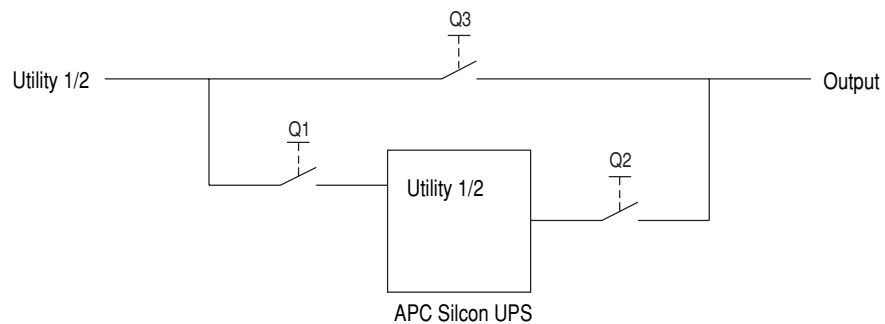
Working Principle of Dual Utility (2 utility supplies)



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)



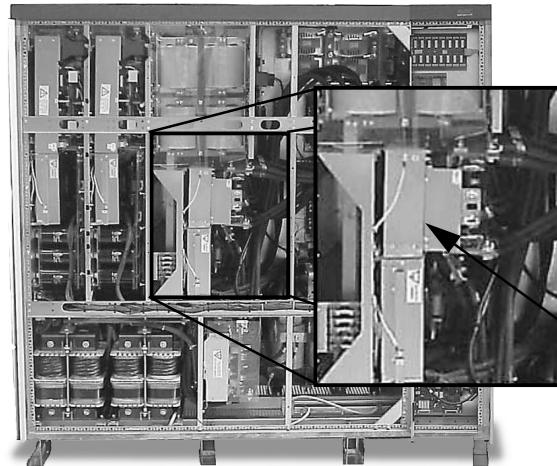
NOTICE!

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.

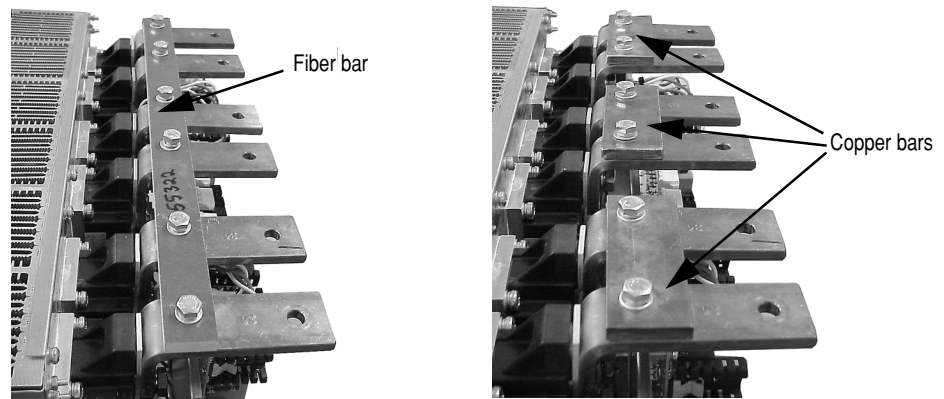
External Connection

4.1.5 Switching from Dual to Single Utility Input

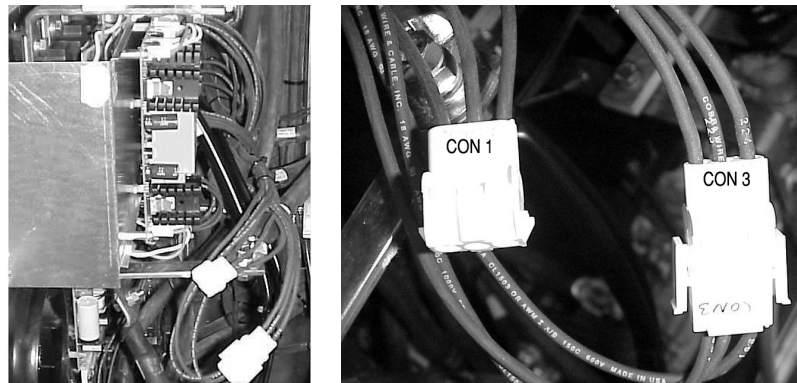
Follow steps 1 and 2 to switch from dual to single input.



- 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

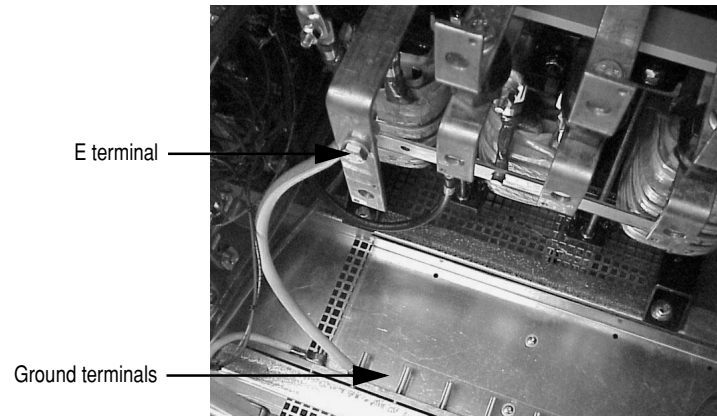
4.1.8.2 Equipment Grounding

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

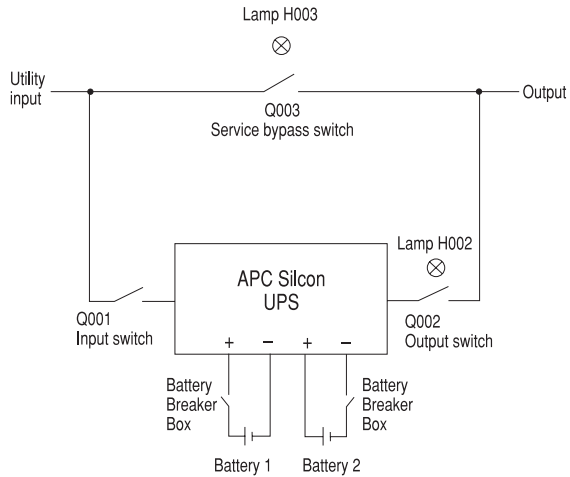


External Connection

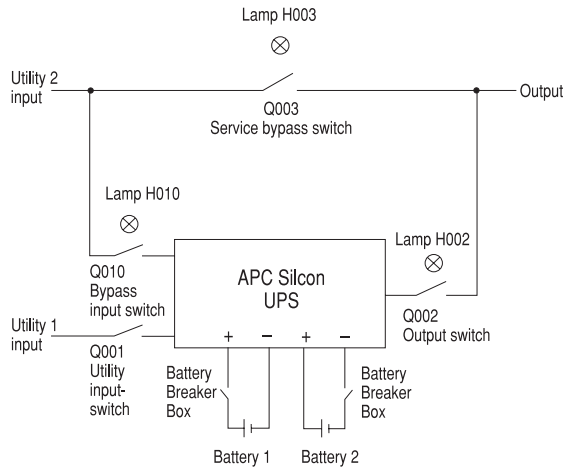
4.2 System Integration Interface

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.

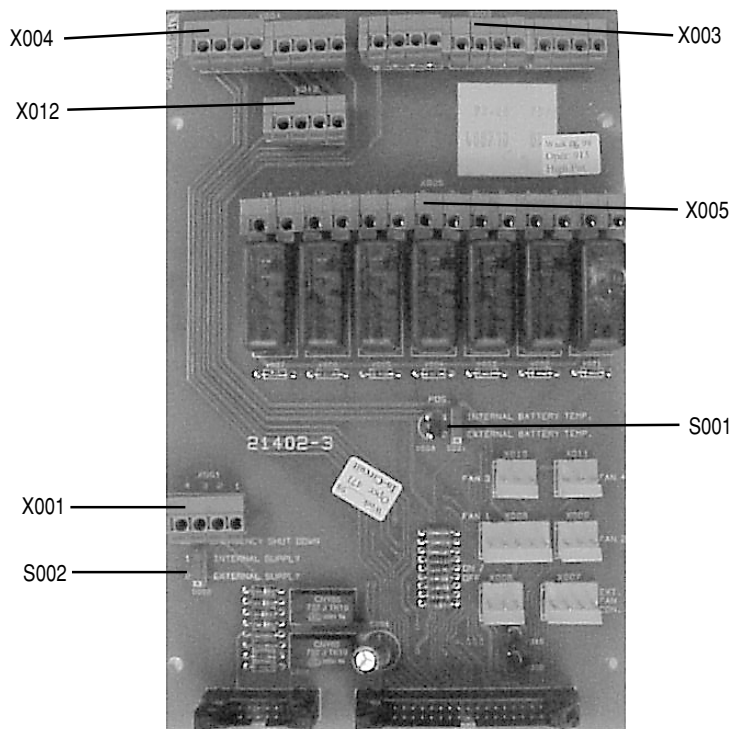
External Connection

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)

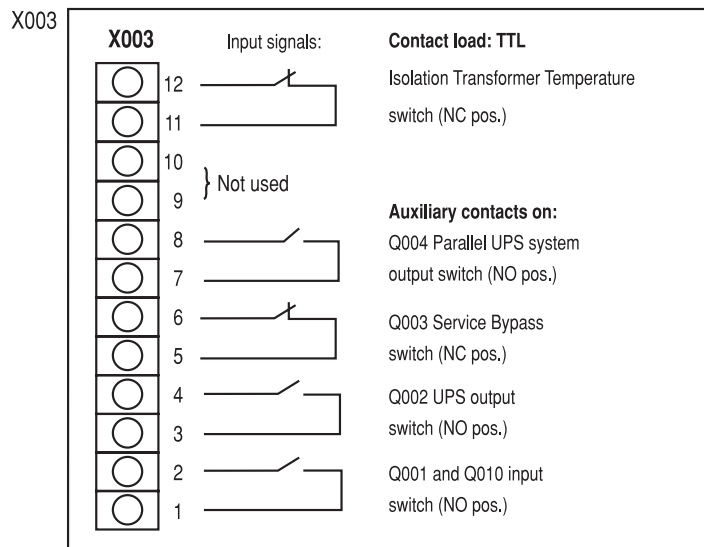
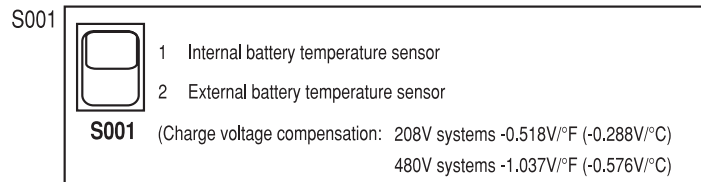
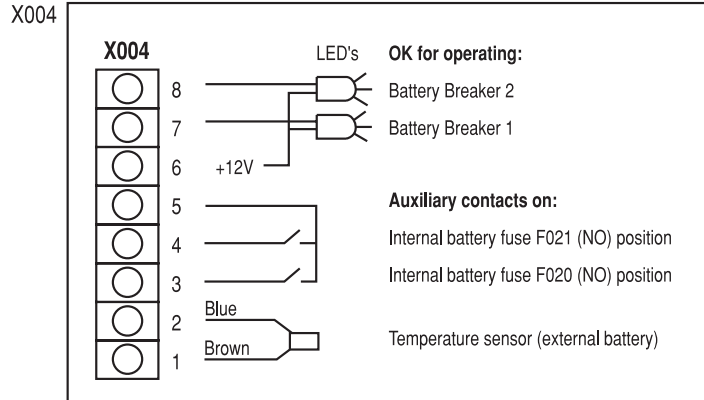
The battery operation signal is received with a 30-second delay. This function is inactive during battery tests. Common fault relay facility is programmable (standard factory setting: 10 sec.) See APC Silcon User Guide for details.

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”.

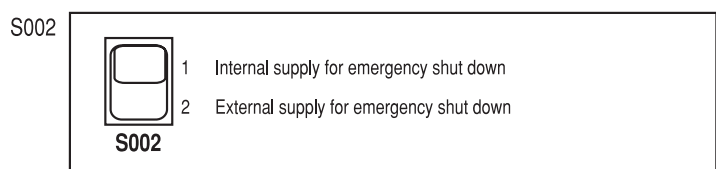
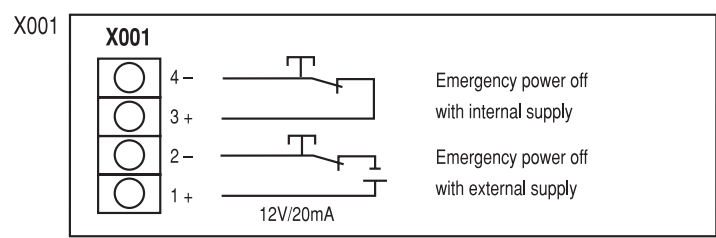
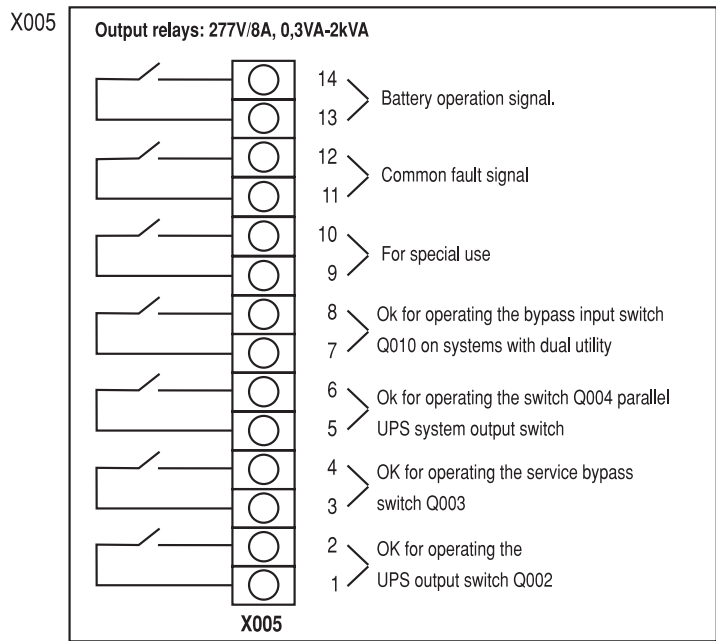
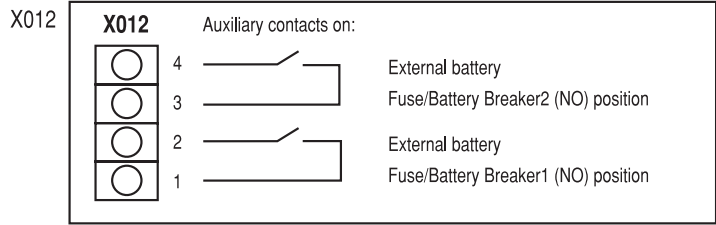
Terminals X001, X003, X005, X004, X012:

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

External Connection



External Connection

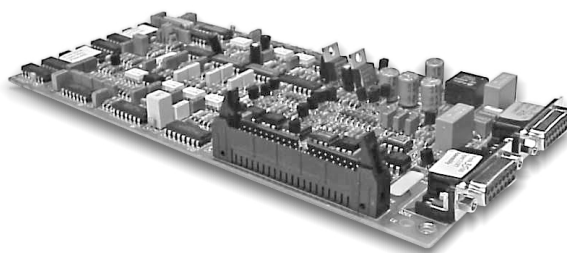


External Connection

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.

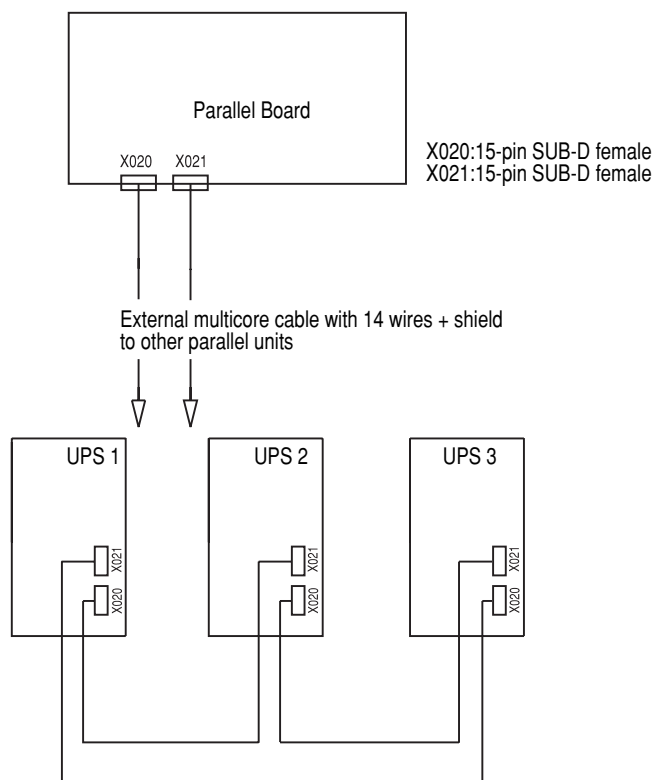
To prepare the UPS for parallel/redundant mode, disconnect all sources of AC and DC power supply to the UPS and connect the ribbon cable from the parallel board to the main controller board. (The ribbon cable is delivered with the UPS).

**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.

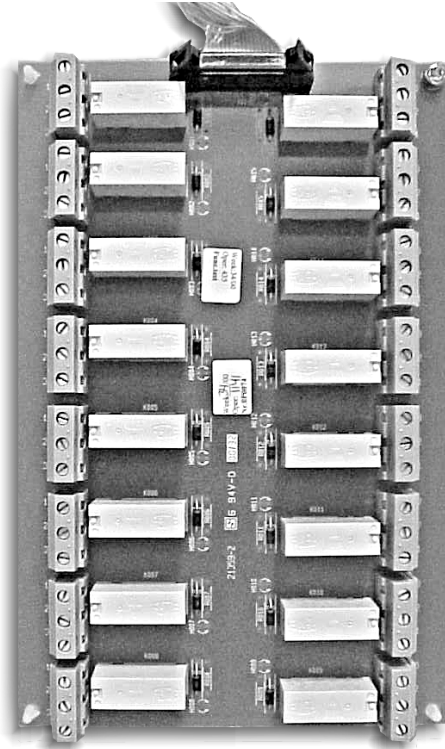
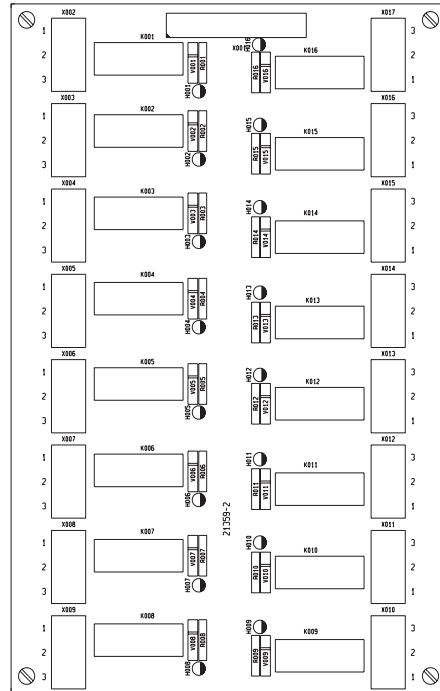
(Cable is delivered with the UPS).

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

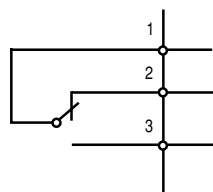
4.4 Relay Board



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 |

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

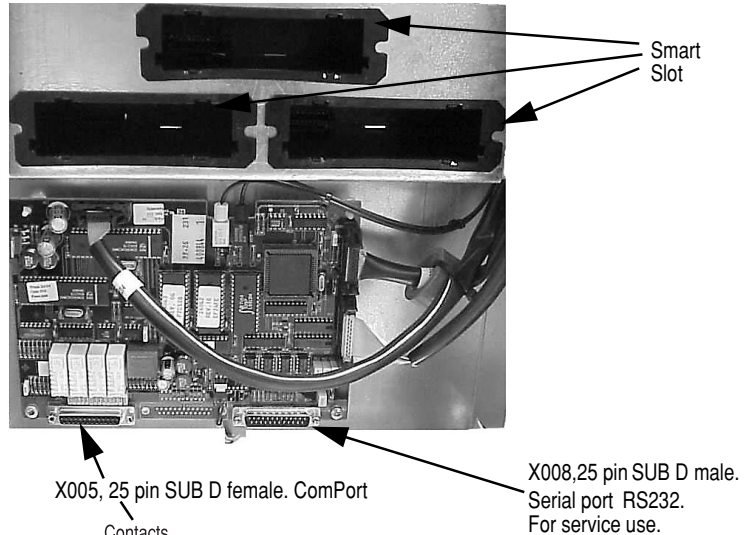
Cable sizes 24 AWG - 12 AWG are suitable. Use copper conductors only. Cable sizes depend on current demand and ambient temperature.

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: |
|------------------------|-------------------|--|
| | 2-14 2-15 | The UPS is OFF, no output voltage The UPS is ON, output voltage present |
| | 4-16 4-17 | The UPS is not in bypass operation The UPS is in bypass operation |
| | 6-18 6-19 | The UPS is not in battery operation The UPS is in battery operation |
| | 8-20 8-21 | The UPS battery voltage is above the warning level The UPS battery has been discharged to the warning level |
| | 13 + 25 - | Input for remote shutting down of the UPS Signal required: 3.5-25V pulse for min. 1 sec. |
| 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™, provides automatic shutdown of up to two additional servers.
2. Measure-UPS™ II, provides environmental information such as ambient temperature and humidity.
3. Call-UPS™, 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 | High-numbered slot |
| 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.”

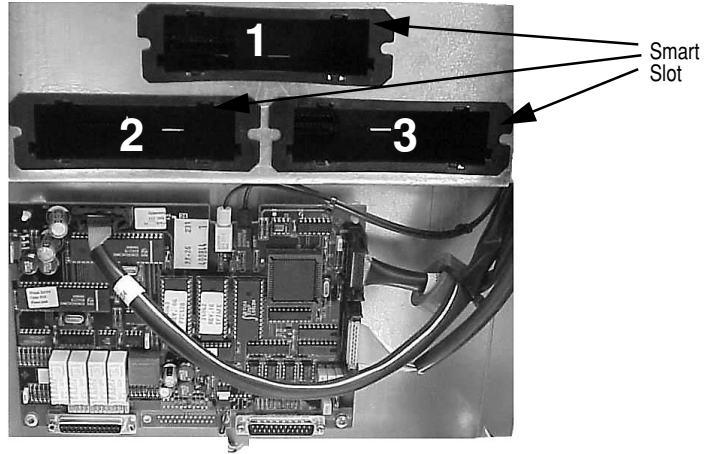
If your UPS has one SmartSlot accessory slot

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!

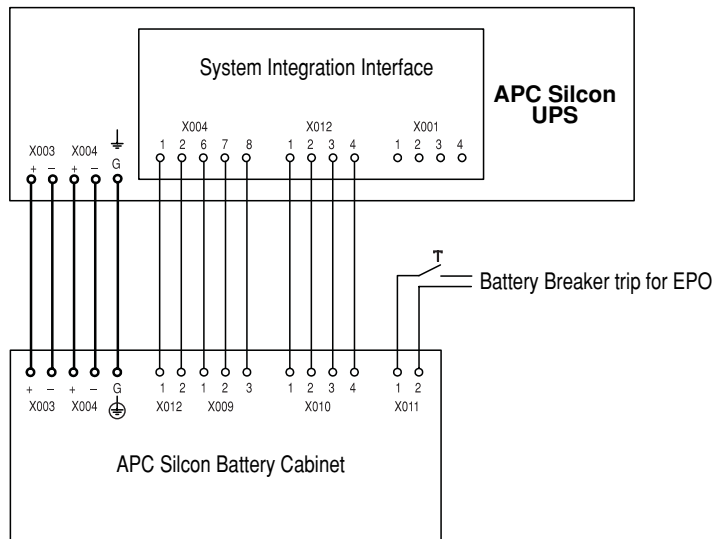
Before proceeding, ensure that power supplies have been disconnected from UPS for a minimum of 5 minutes.



CAUTION!

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

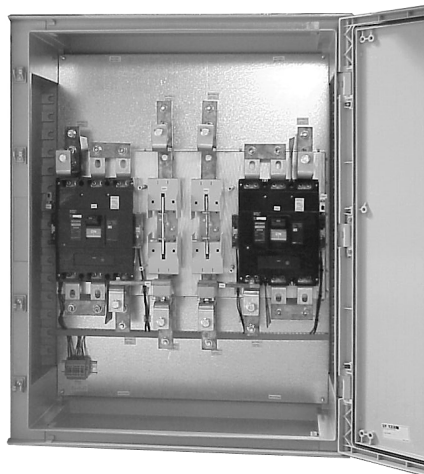
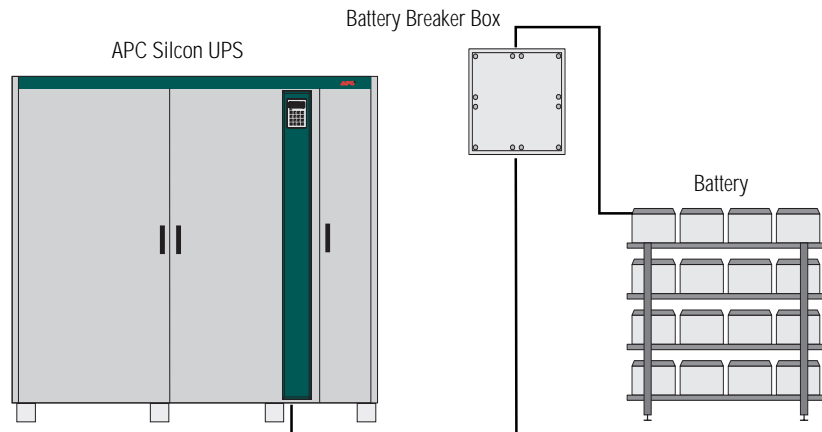
Diagram - UPS with Battery Cabinet



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.

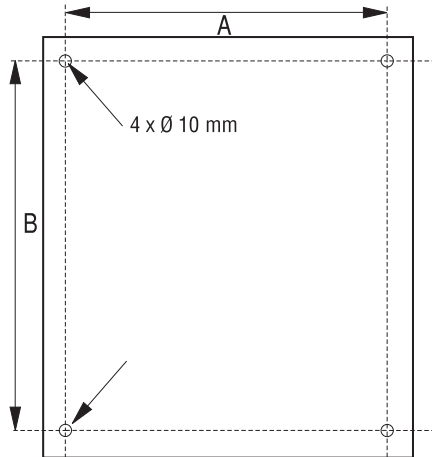


External Connection

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.

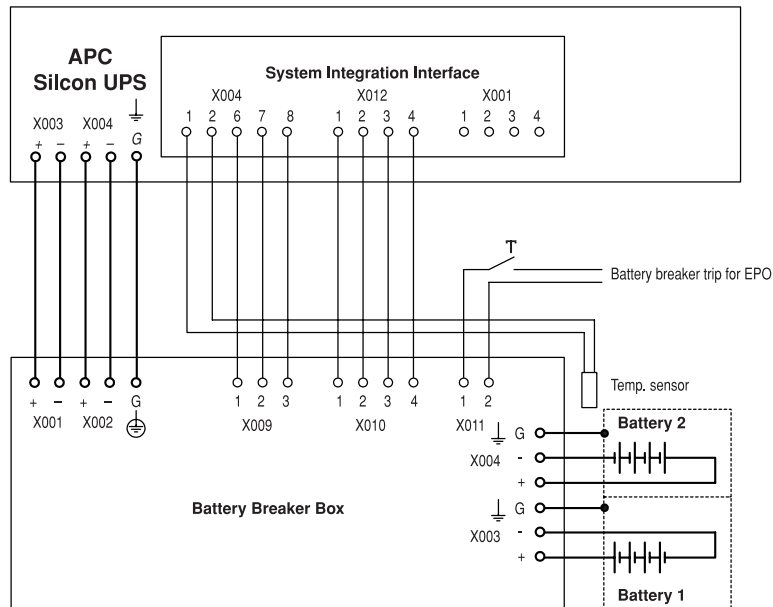
4.7.2 Mounting and Connection of Battery Breaker Box

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.

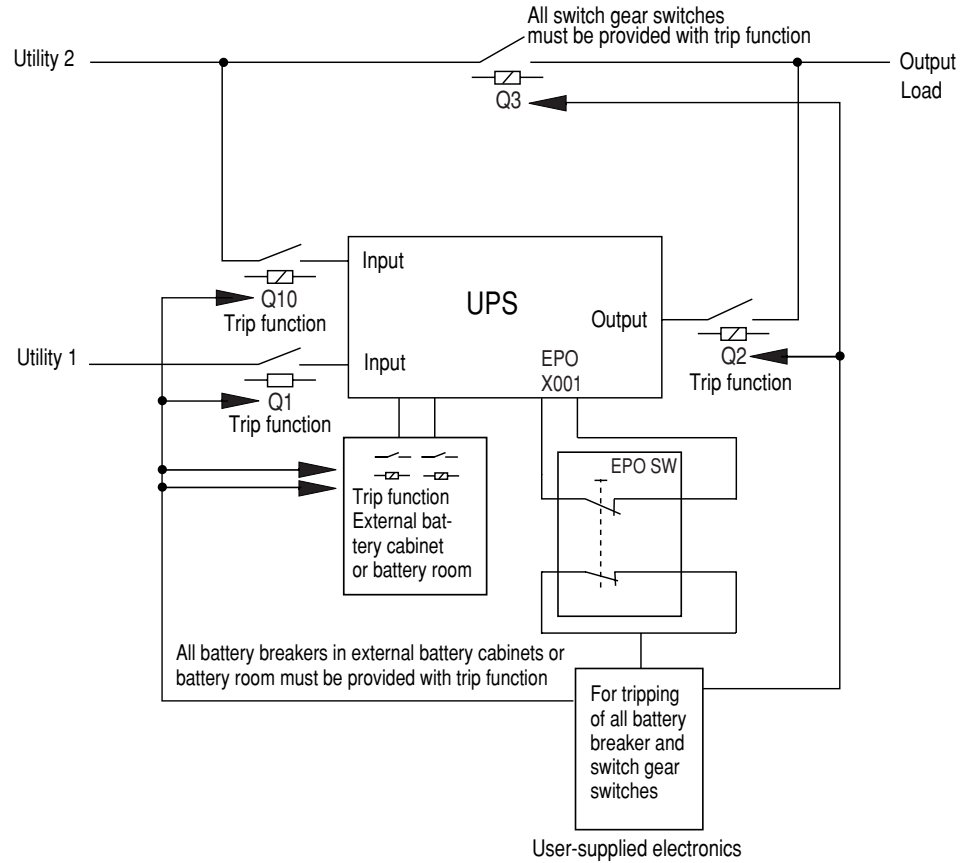
The EPO switch is interconnected to an electronic control system (not available from APC) supplying the Battery Breaker Box and switch gear tripping function with an external 480/277Vac 50/60Hz supply from Utility 2 (if available) or Utility 1 and UPS output before Q002.

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> |
|--|

External Connection

Principle diagram

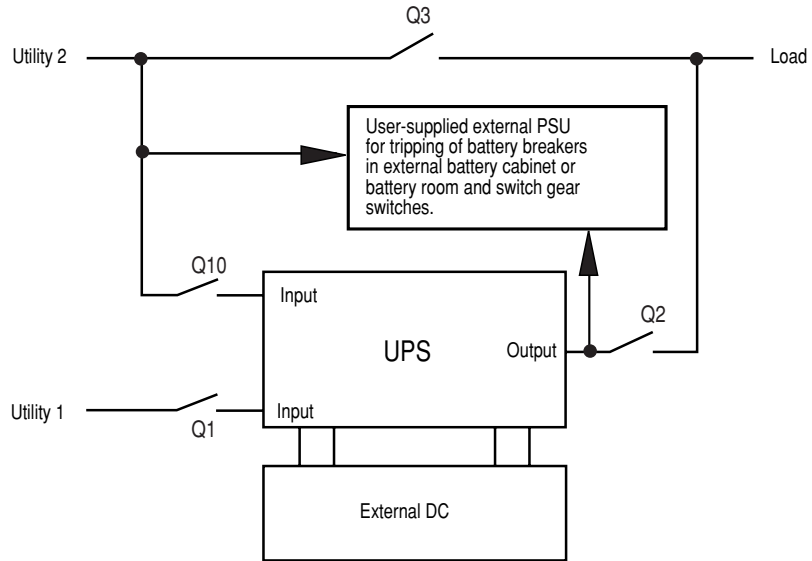


External Connection

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

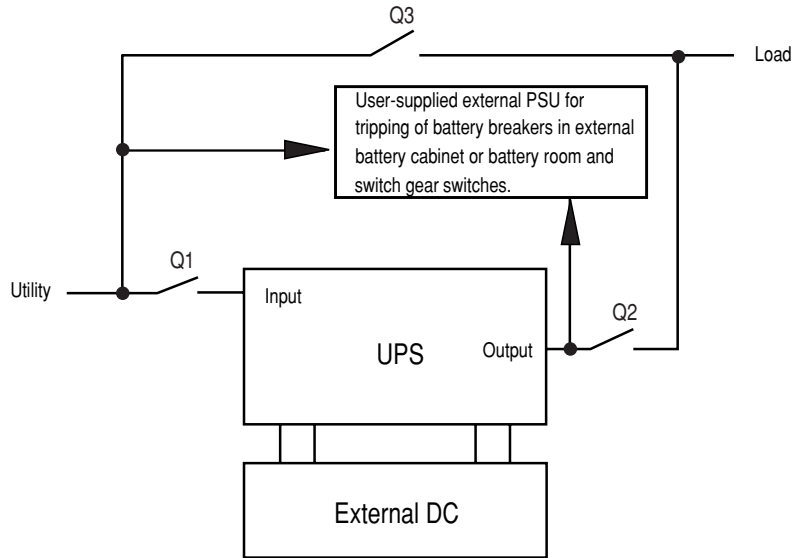


Dual Utility Matrix

| 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) |

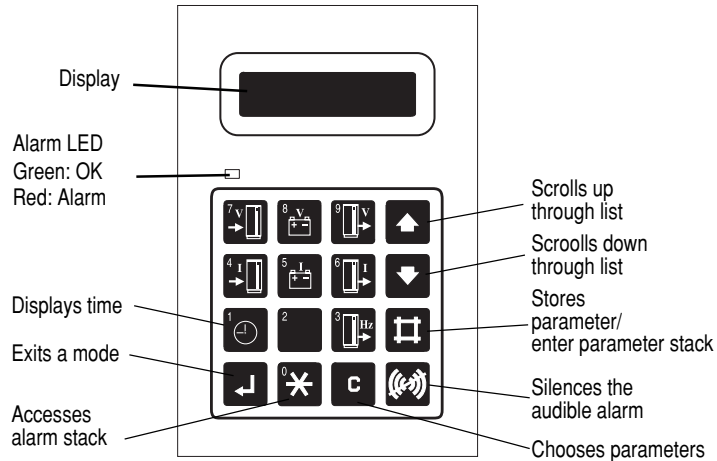
* Factory settings in bold

** 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




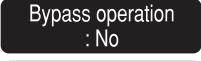

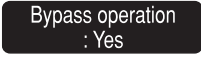

5.1.1 Programming Keys



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




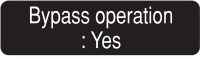





5.1.2 Programming Example - Switch to Bypass Operation

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



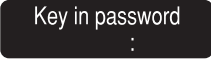









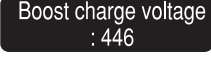

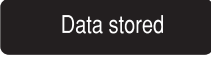
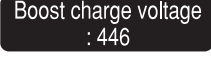

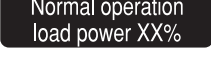
| Parameter | Setting* | Comments |
|----------------------|---|--|
| APM*** Mode Active | Disabled Redundant +1 Parallel +1 | Use only in parallel systems. Disabled: APM*** off. Redundant +1: Redundant operation with one unit being inactive in parallel system Parallel +1: Redundant operation with all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



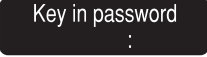













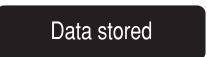



| Action | Display shows |
|--|---|
| 1. Press  and  simultaneously to prepare for password entry |  |
| 2. Enter password xx xx xx by pressing:  |  |
| 3. Press  or  until message appears |  |
| 4. Press     |  |
| 5. Press  to store |  |
| 6. Wait about 1 second |  |
| 7. Press  to exit |  |

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!

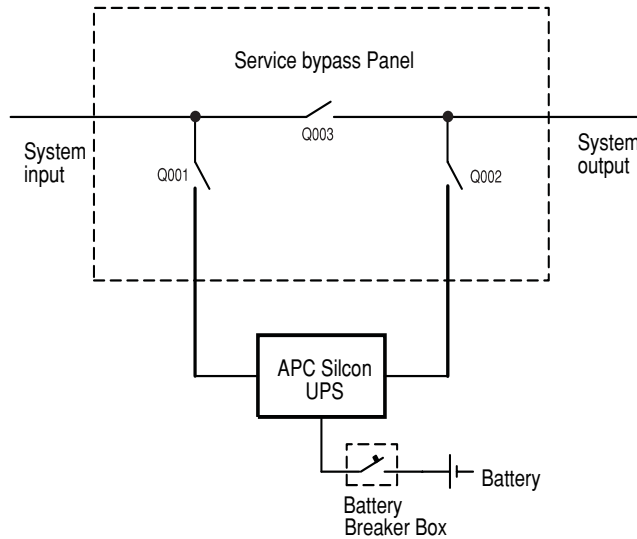
Contact your local dealer if you have any questions regarding changing parameters.

Options/Accessories

6.0 Options/Accessories

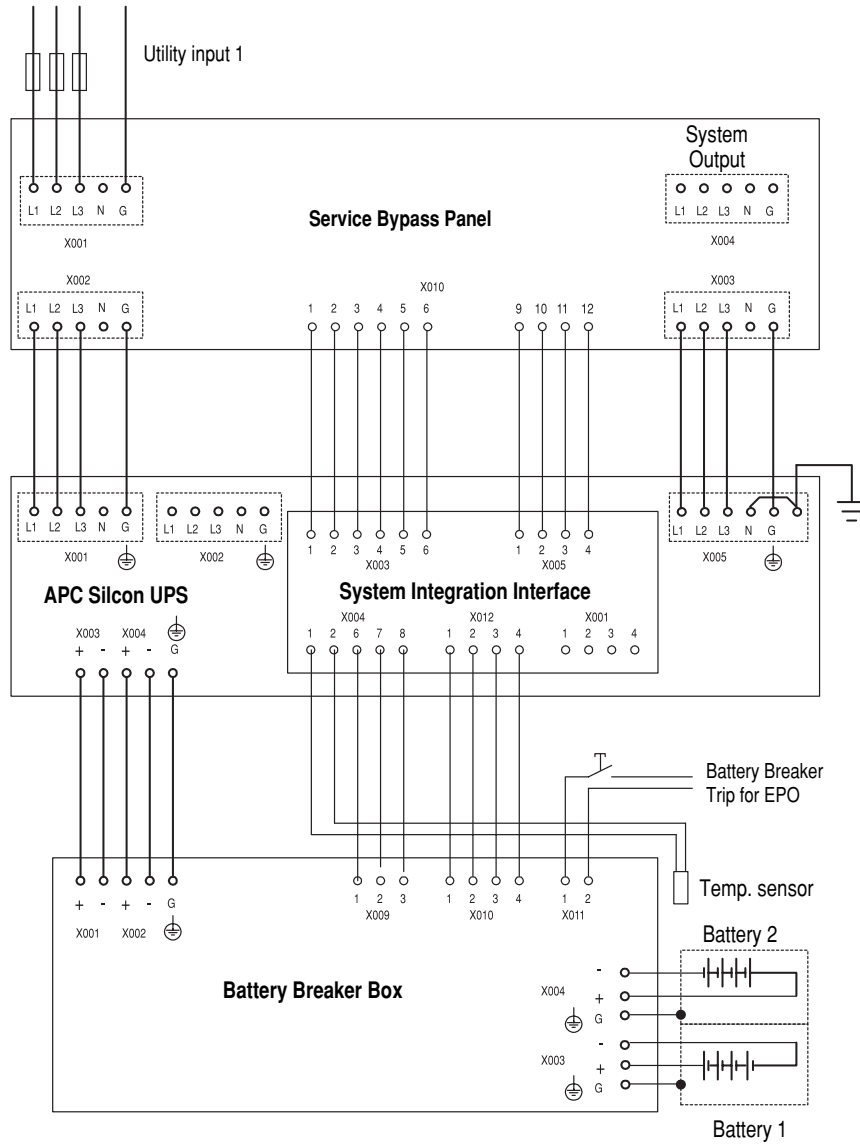
6.1 Diagrams for Service Bypass Panel for Single Operation, Single and Dual Utility

Principle diagram: Service Bypass Panel for single operation



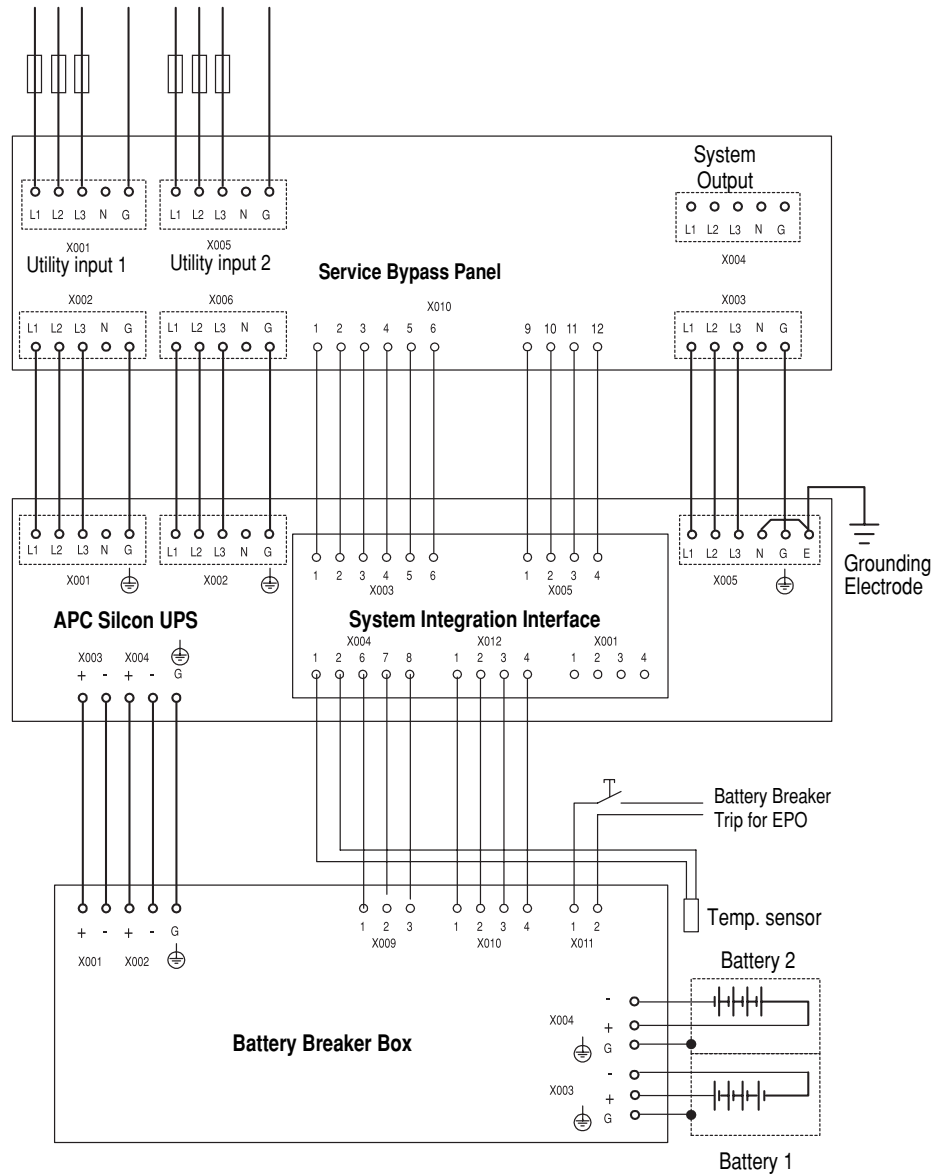
Options/Accessories

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



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



Terminal for Grounding Electrode Conductor

NOTICE!

For grounding, refer to local legal regulations.

NOTICE!

Check correct phase connection of inputs and outputs.

Wiring

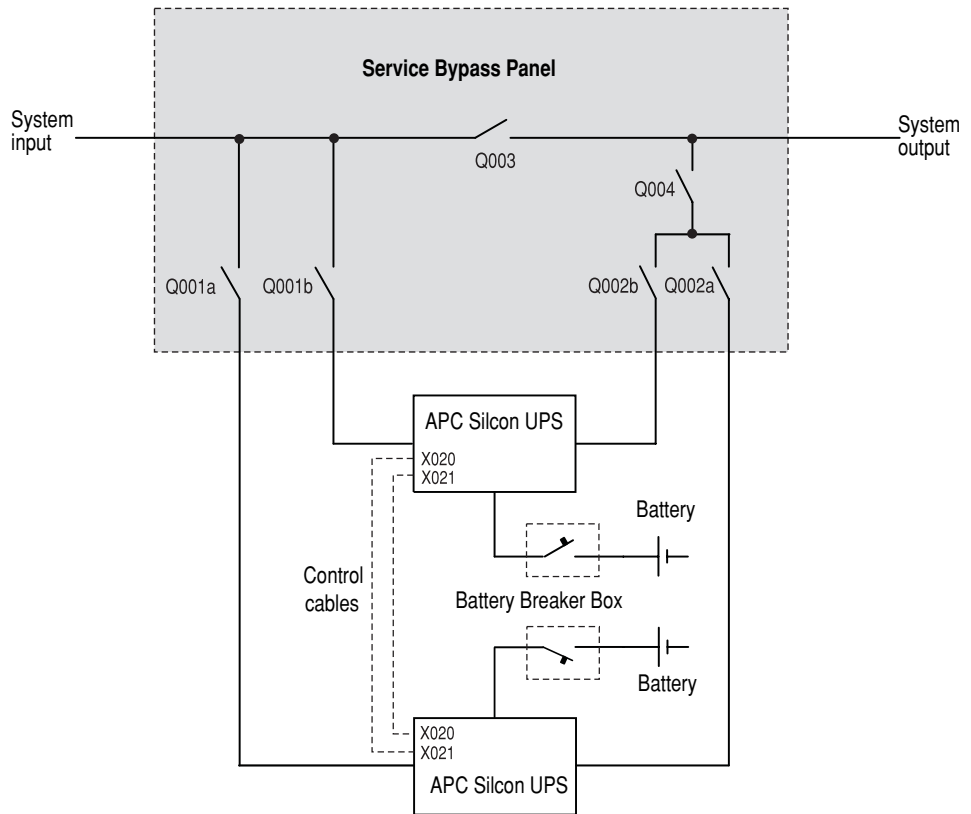
Select wire size based on the data in Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

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.

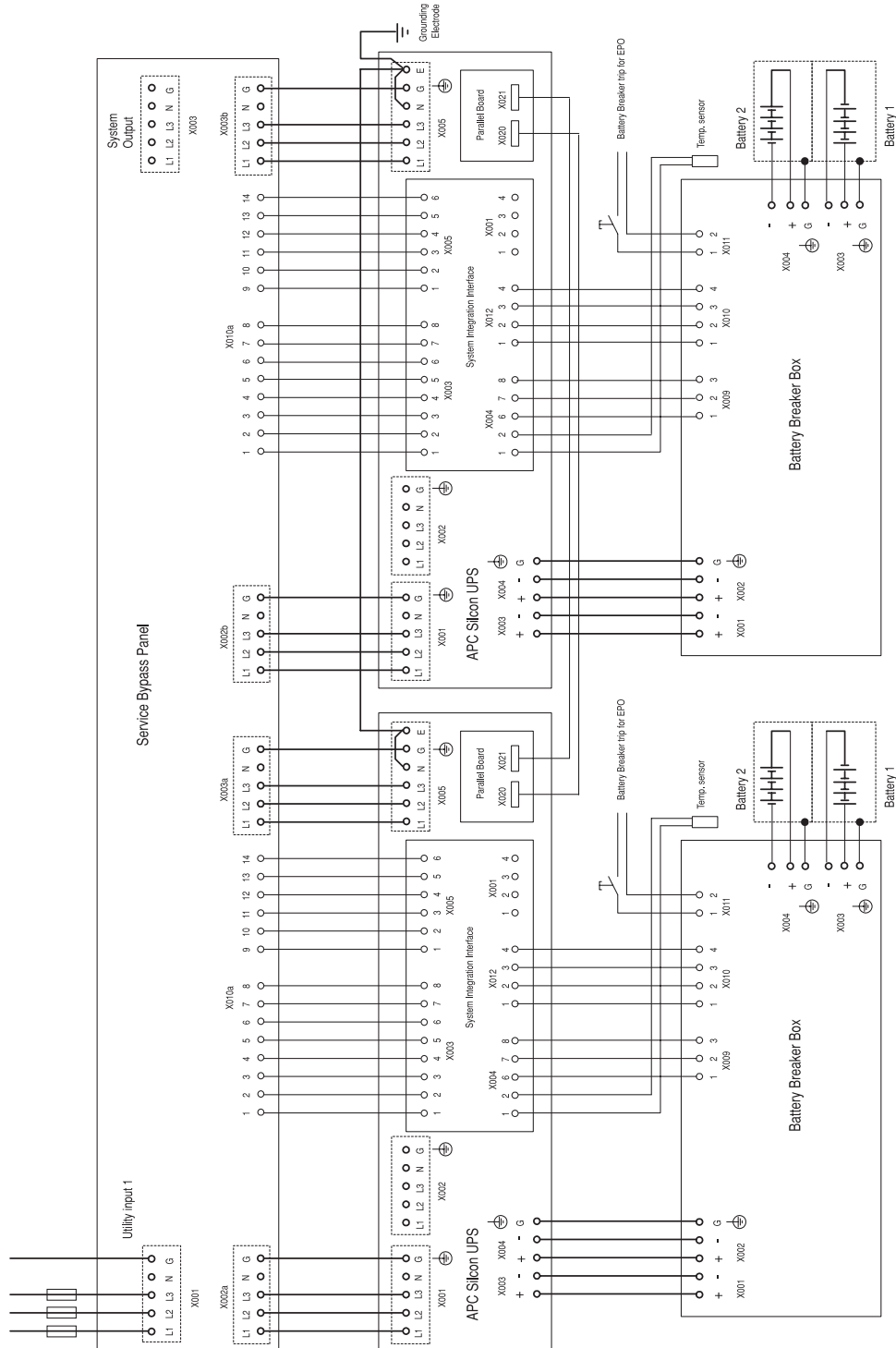
Options/Accessories

6.1.0.4 Service Bypass Panel for parallel redundant operation, single Utility

Principle Diagram: Service Bypass Panel for redundant operation.



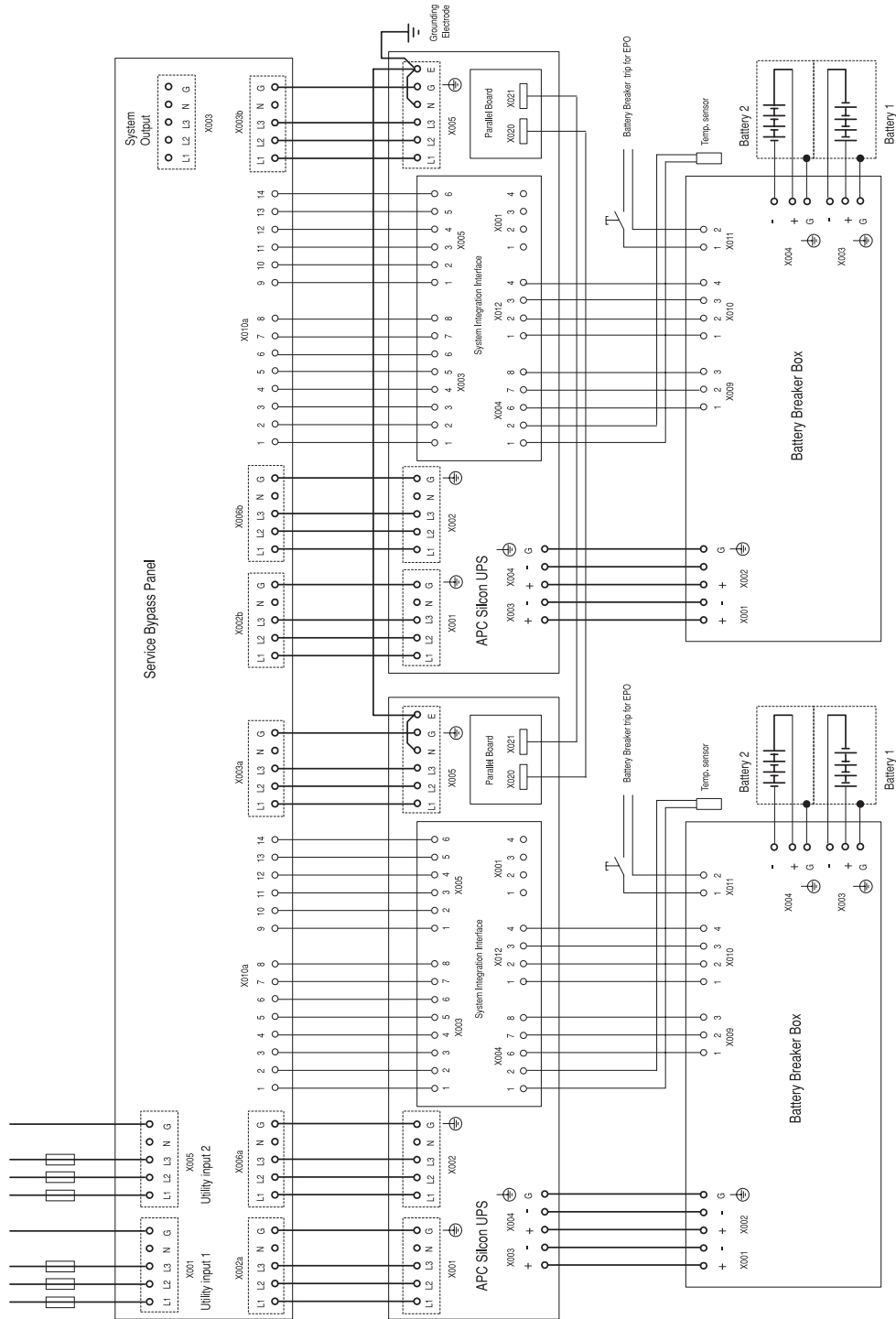
6.1.0.5 Parallel/Redundant UPS with Service Bypass Panel and External Battery via Battery Breaker Box (Single Utility) 3-wire grounded WYE service



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



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.

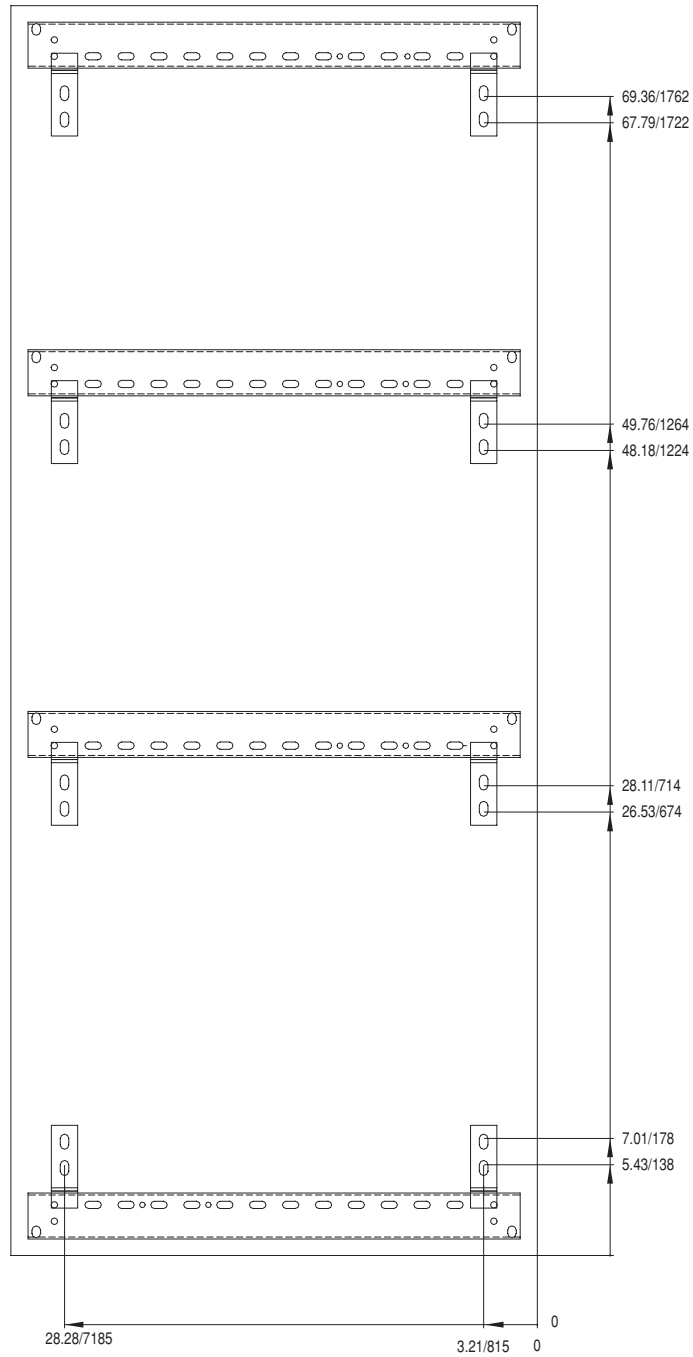
Wiring

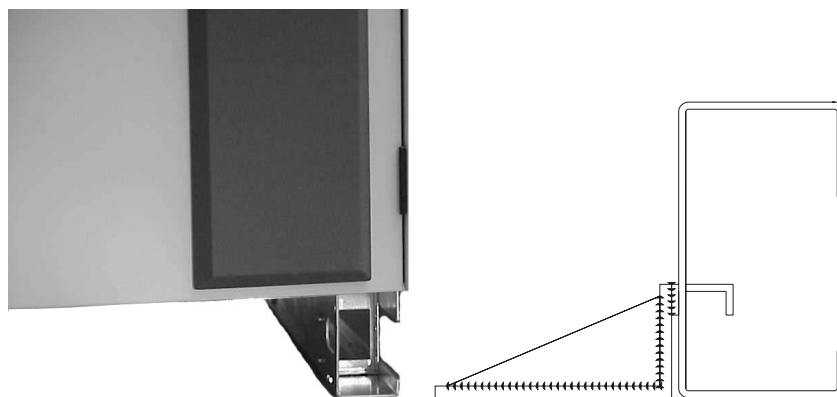
Select wire size based on the data in Table 1, and the ampacities in Table 2 of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NFPA 70).

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.

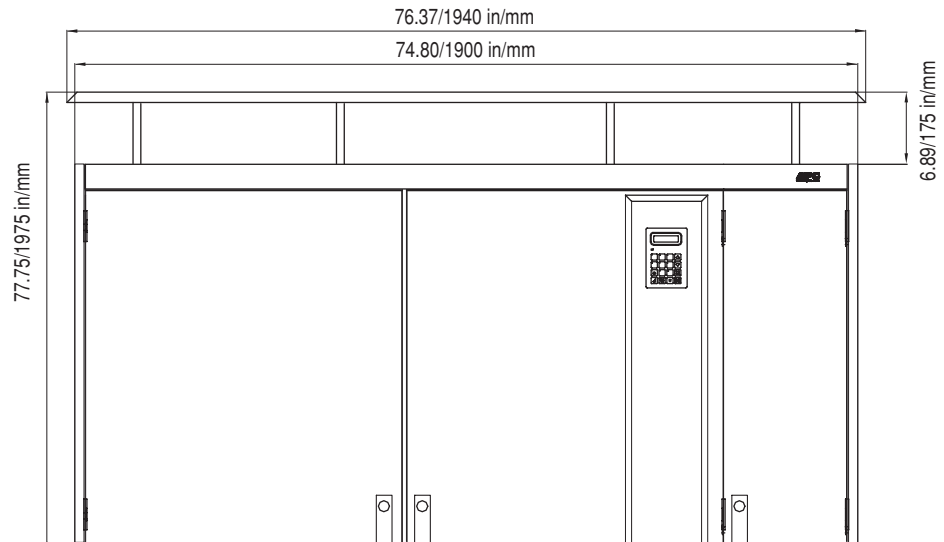
With the holes drilled in the UPS, position the system correctly and slide the 8 seismic anchoring angles into the bars (see illustration above). Tighten the angles in the holes, using bolts and plain washers.

NOTICE!

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

Options/Accessories

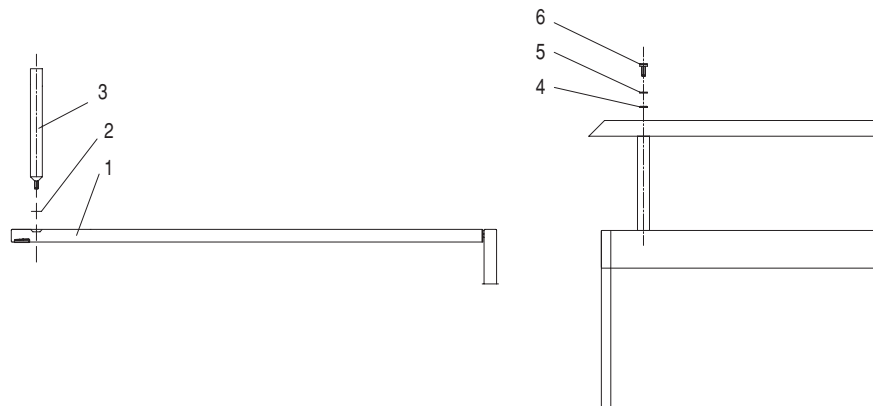
6.3 NEMA 12 Cover (IP31)



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.

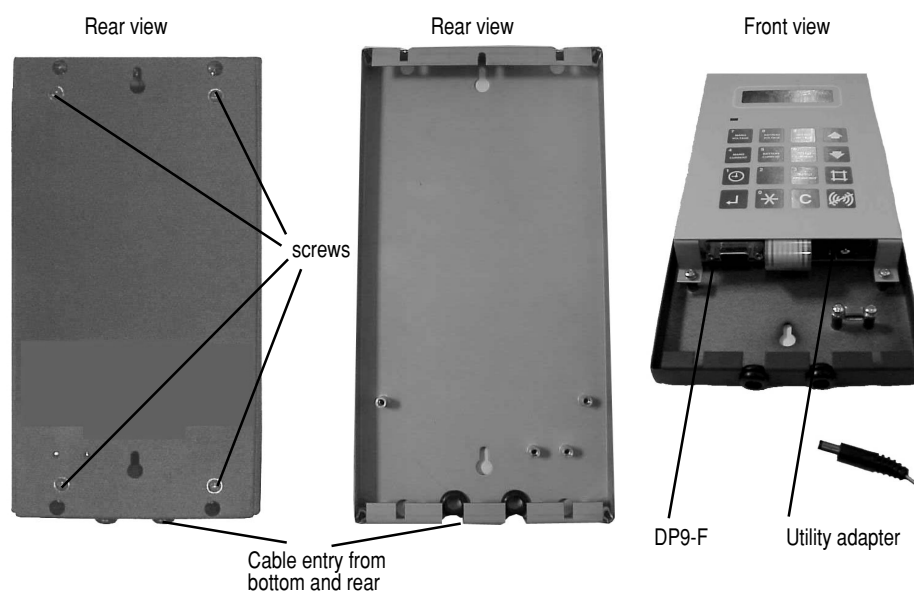
The interconnection cable between the two ME800A-R2 boxes is a 4-wire twisted pair telephone cable with or without shield. The shield improves noise immunity but reduces maximum communication distance.

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

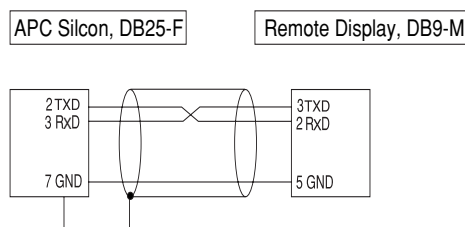
The remote display is supplied by normal AC power with no battery back-up. For UPS data transmission to remote display to remain unaffected during power failure, the remote display must be supplied from an uninterruptible power source.

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.


Options/Accessories

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!

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*

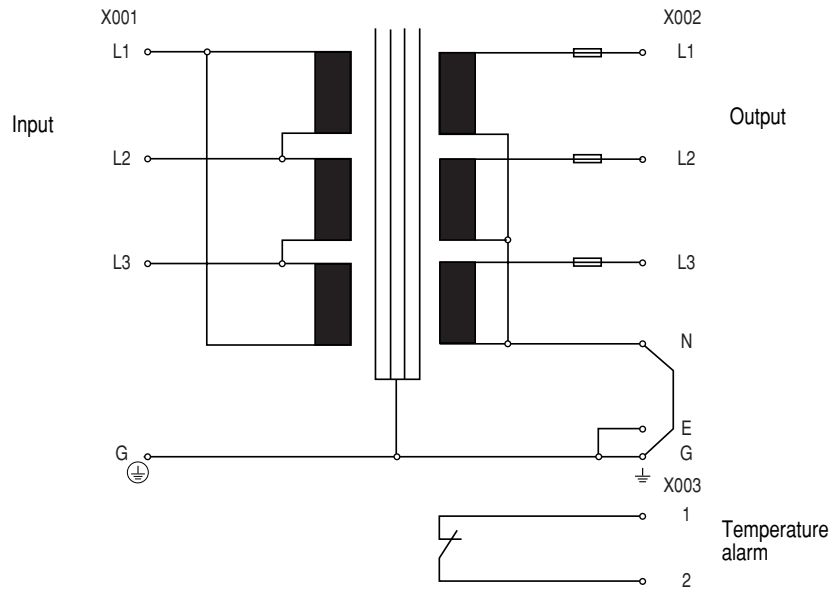
Voltage rating must be 600V. Cable size can be 18 or 14 AWG.

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.

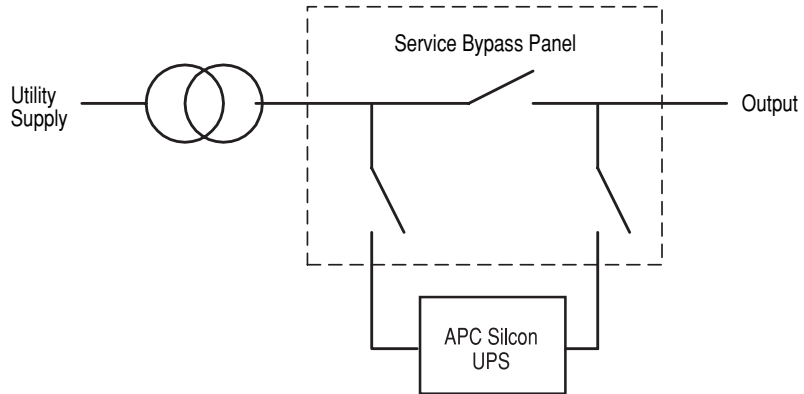
6.5.7.2 Equipment Grounding

Terminal marked  is intended for equipment grounding.

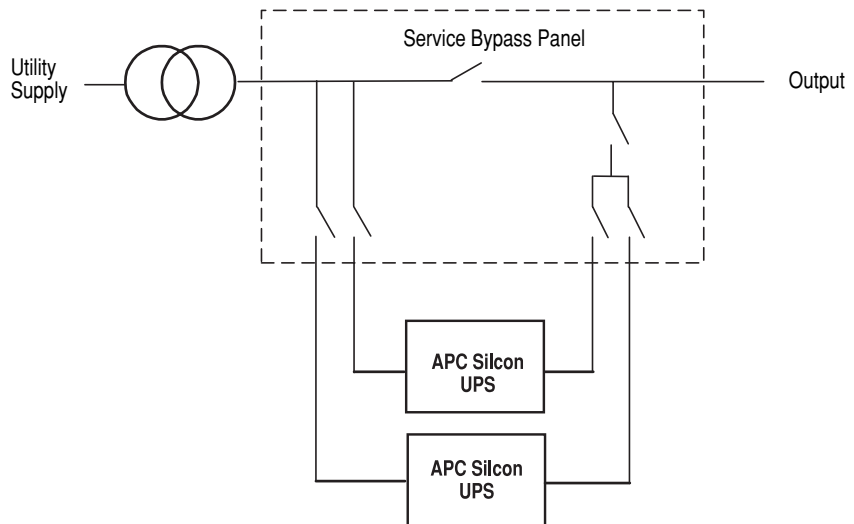
Options/Accessories

6.5.8 Principle Diagrams for Isolation Transformer

6.5.8.1 Single Utility and Single System Diagram

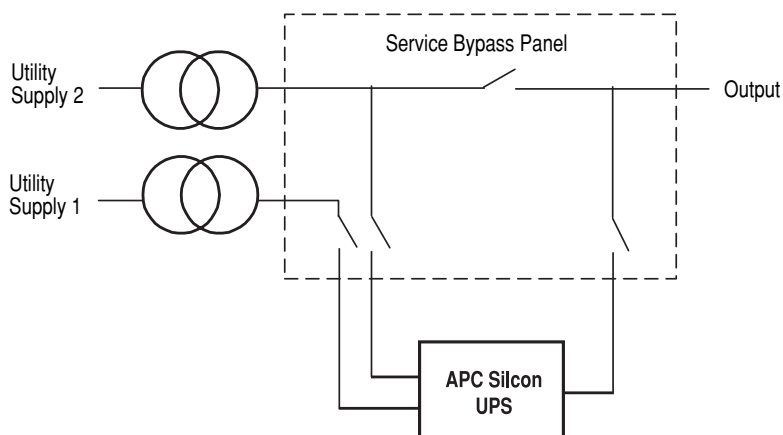


6.5.8.2 Single Utility and Redundant System

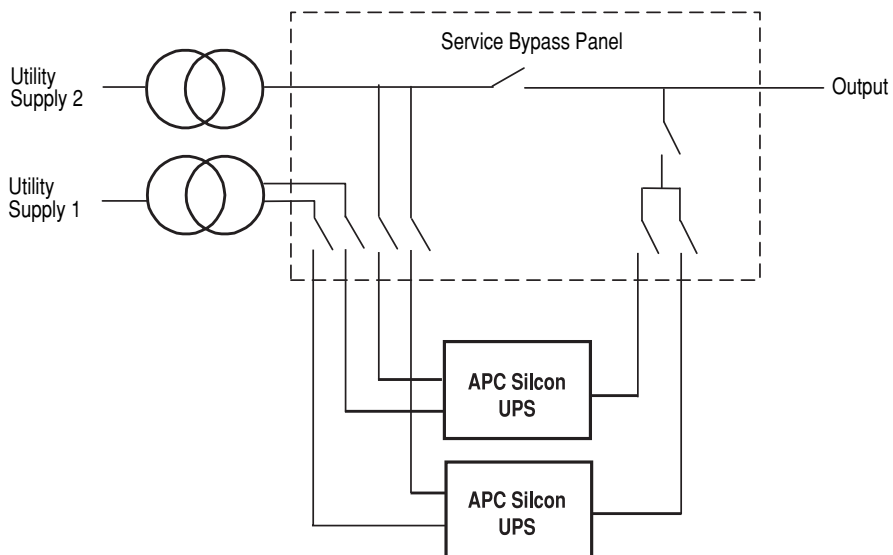


Options/Accessories

6.5.8.3 Dual Utility and Single System



6.5.8.4 Dual Utility and Redundant System



Options/Accessories

6.6 Intersystem Synchronization Unit

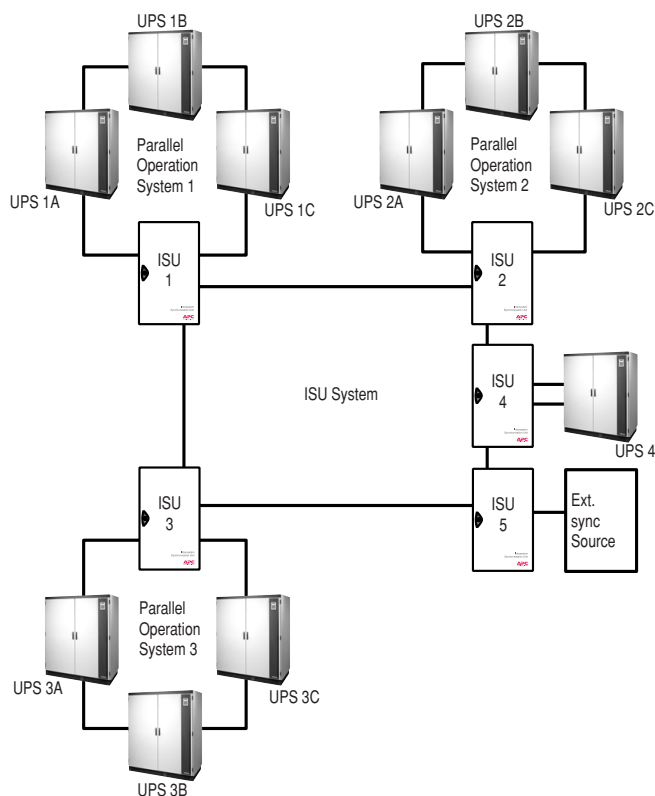
Intersystem Synchronization Unit System (ISU System)

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

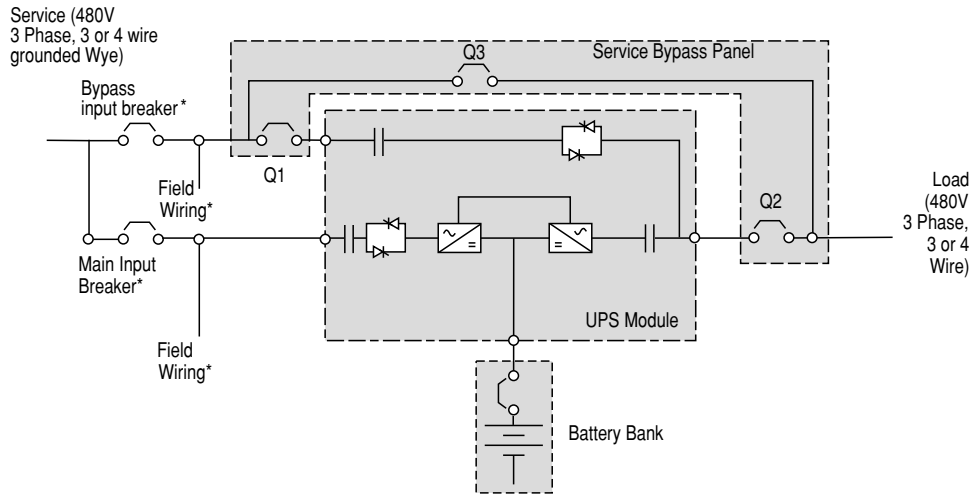
7.1 Technical Data

| | | |
|----------------|---|---|
| | 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 |

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 |
| 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. | | | | | | | |

9.0 Warranty

9.1 APC Silcon Series[®] Limited Factory Warranty

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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.

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How to Contact APC

10.0 How to Contact APC



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