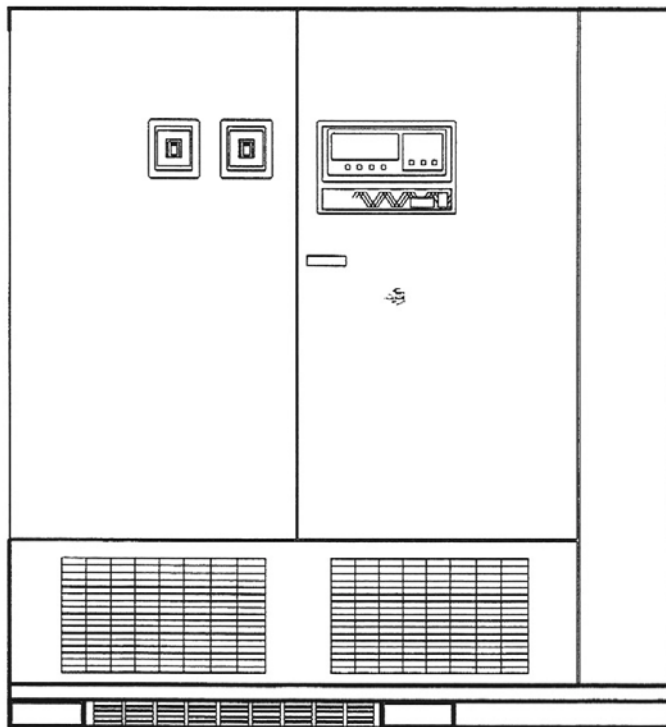
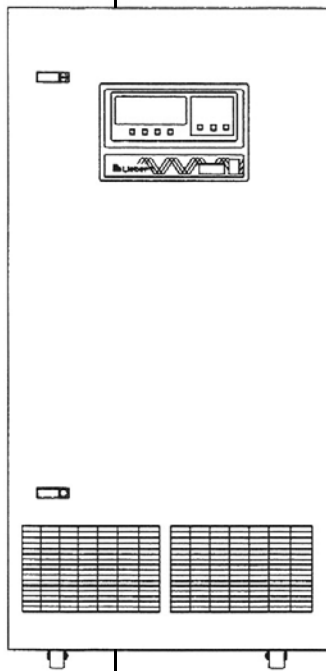


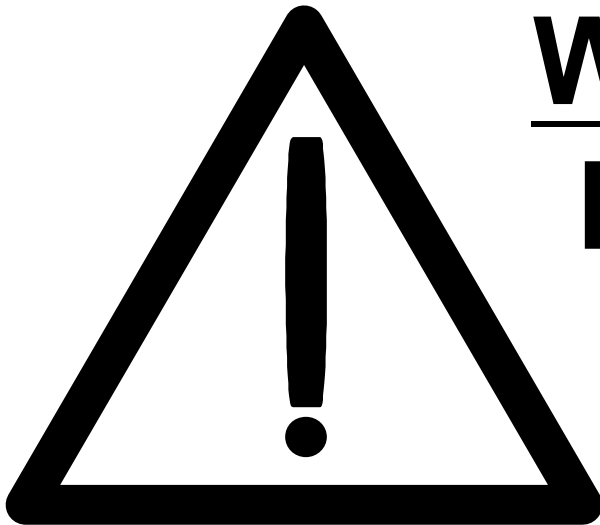
Series 600T™ UPS

INSTALLATION MANUAL



*Multi-Module
Three-Phase
65-225 kVA
60 Hz*

The following **WARNING** applies to all battery cabinets supplied with UPS systems:



WARNING **HAZARD**

INTERNAL BATTERY STRAPPING MUST BE VERIFIED BY MANUFACTURER PRIOR TO MOVING A BATTERY CABINET.

Battery cabinets contain non-spillable batteries.

Keep units upright.

Do not stack.

Do not tilt.

Failure to heed this warning could result in smoke, fire or electric hazard. Call 1-800-LIEBERT prior to moving battery cabinets.

Table of Contents

| | | |
|------|--|----|
| 1.0 | Safety Precautions | 3 |
| 2.0 | Installation Considerations | 4 |
| 2.1 | Types of System Control Cabinets. | 6 |
| 3.0 | Unloading and Handling | 7 |
| 4.0 | Inspections | |
| 4.1 | External Inspections. | 8 |
| 4.2 | Internal Inspections | 8 |
| 5.0 | Equipment Location | 9 |
| 6.0 | Battery Installation | 10 |
| 6.1 | Battery Safety Precautions | 10 |
| 6.2 | Matching Battery Cabinets | 13 |
| 6.3 | Non-Standard Batteries | 13 |
| 7.0 | Configuring Your Neutral and Ground Connections | 14 |
| 7.1 | Preferred Grounding Configuration, Isolated PDUs, Wye-Connected Service . . | 15 |
| 7.2 | Grounding Configuration, 480 or 600 VAC Input and Output, Delta Source . . . | 16 |
| 7.3 | Preferred Grounding Configuration with Power-Tie Switchgear | 17 |
| 7.4 | Grounding Configurations, Battery Systems | 18 |
| 8.0 | Wiring Considerations | 19 |
| 8.1 | Power Wiring | 20 |
| 8.2 | Control Wiring | 21 |
| 8.3 | Battery Wiring | 22 |
| 9.0 | Wiring Connections | 24 |
| 10.0 | Wiring Inspection | 26 |
| 11.0 | Installation Drawings | 28 |
| 12.0 | Appendix A - Site Planning Data | 76 |
| 13.0 | Appendix B - Field Supplied Lugs | 80 |

List of Figures

| | | |
|-----------|---|----|
| Figure 1 | Multi-Module UPS, 65 & 80 kVA (left) and bottom-entry 100-225 kVA (right) | 5 |
| Figure 2 | UPS Multi-Module Unit Block Diagram | 6 |
| Figure 3 | Preferred Grounding Configuration, 480 or 600 VAC Input and Output | 15 |
| Figure 4 | Grounding Configuration with Ungrounded Delta Source Input | 16 |
| Figure 5 | Preferred Grounding Configuration, Power-Tie Systems | 17 |
| Figure 6 | Battery Cabinet Grounding Configuration | 18 |
| Figure 7 | Typical Multi-Module Configurations | 23 |
| Figure 8 | Outline Drawing, Single & Multi-Module 65 & 80 kVA | 28 |
| Figure 9 | Outline Drawing, Multi-Module System, 100 - 225 kVA, Space Saver | 29 |
| Figure 10 | Outline Drawing, Multi-Module System, 100 - 225 kVA | 30 |
| Figure 11 | Outline Drawing, System Control Cabinet (SCCT), 200-1200 Amps | 31 |
| Figure 12 | Outline Drawing, System Control Cabinet (SCCT), 1600-2500 Amps | 32 |
| Figure 13 | Outline Drawing, System Control Cabinet (SCCP), 200-480 Amps | 33 |
| Figure 14 | Outline Drawing, System Control Cabinet (SCCP) 560-960 Amps | 34 |
| Figure 15 | Outline Drawing, System Control Cabinet (SCCP) 1120 to 2000 Amp | 35 |
| Figure 16 | Outline Drawing, System Control Cabinet (SCCB) 640 to 800 Amps | 36 |
| Figure 17 | Outline Drawing, System Control Cabinet (SCCB) 1280 to 1600 Amps | 37 |
| Figure 18 | Outline Drawing, Battery Power Pack, 65 & 80 kVA | 38 |
| Figure 19 | Battery Power Pack, Size A | 39 |
| Figure 20 | Line-Up Detail, Single or Multi-Module System, 65 & 80 kVA with Battery Cabinets | 40 |
| Figure 21 | Line-Up Detail, Single or MM System, 100-225 kVA, Space Saver with Battery Cabinets . | 41 |
| Figure 22 | Line-Up Detail, Single or Multi-Module System, 100-225 kVA, with Battery Cabinets | 42 |
| Figure 23 | Base Mounting Patterns, System Control Cabinets (SCCT), 200 & 1200 Amps | 43 |
| Figure 24 | Base Mounting Patterns, System Control Cabinets (SCCT), 1600-2500 Amps | 44 |
| Figure 25 | Base Mounting Patterns, System Control Cabinets (SCCP), 200-480 Amps | 45 |
| Figure 26 | Base Mounting Patterns, System Control Cabinets (SCCP), 560-960 Amps | 46 |
| Figure 27 | Base Mounting Patterns, System Control Cabinet (SCCB), 640-3000 Amps | 47 |
| Figure 28 | Terminal Details, 65 & 80 kVA Module | 48 |
| Figure 29 | Terminal Details, Multi-Module System, 100 & 125 kVA Space Saver | 49 |
| Figure 30 | Terminal Details, Multi-Module System, 150 & 225 kVA, Space Saver | 50 |
| Figure 31 | Terminal Details, Multi-Module System, 100 & 125 kVA | 51 |
| Figure 32 | Terminal Details, Multi-Module System, 150 & 225 kVA | 52 |
| Figure 33 | Control Connection Location Diagram, 65-80 kVA | 53 |
| Figure 34 | Control Connection Location Diagram, 100-225 kVA | 54 |
| Figure 35 | Control Connection Location Diagram, SCCC & SCCI | 55 |
| Figure 36 | Control Connection - Location Diagram, System Control Cabinet - SCCT | 56 |
| Figure 37 | Control Wiring, External Interconnect Diagram | 57 |
| Figure 38 | Control Wire List, External Interconnections, UPS Module | 58 |
| Figure 39 | Control Wire List, External Interconnections, Standard Wiring, SCCT, Part 1 of 3 | 59 |
| Figure 40 | Control Wire List, External Interconnections, Standard Wiring, SCCT, Part 2 of 3 | 60 |
| Figure 41 | Control Wire List, External Interconnections, Standard Wiring, SCCT, Part 3 of 3 | 61 |
| Figure 42 | Control Wire List, External Interconnections, Alarm Status Contacts Option | 62 |
| Figure 43 | Control Wire List, External Interconnections, Maintenance Bypass Interlock Option | 63 |
| Figure 44 | Control Wire List, External Interconnections, Remote Status Panel Option | 64 |
| Figure 45 | Control Wire List, External Interconnections, Internal Modem Option | 65 |
| Figure 46 | Control Wire List, External Interconnections, Customer Alarm Interface Option | 66 |
| Figure 47 | Control Wire List, External Interconnections, Battery Temperature Sensor Option | 67 |
| Figure 48 | Control Wire List, External Interconnections, SNMP Interface Option | 68 |
| Figure 49 | Outline Drawing, Module Battery Disconnect, 175-250 Amps | 69 |

| | | |
|-----------|---|----|
| Figure 50 | Outline Drawing, Module Battery Disconnect, 300-1200 Amps (modules w/input iso. xfmr) | 70 |
| Figure 51 | Remote Status Panel, Surface Mount | 71 |
| Figure 52 | Circuit Breaker Schedule, Multi-Module UPS, 65-225 kVA | 72 |
| Figure 53 | Circuit Breaker Schedule, Battery Cabinet, 65-500 kVA | 73 |
| Figure 54 | Circuit Breaker Schedule, Merlin Gerin, System Control Cabinet (SCCT), 200-4000 Amps | 74 |
| Figure 55 | Circuit Breaker Schedule, G.E., System Control Cabinet (SCCT), 1600-4000 Amps | 75 |

IMPORTANT SAFETY INSTRUCTIONS

Save These Instructions.

This manual contains important instructions that should be followed during installation of your Series 600T UPS and batteries.



WARNING

EXERCISE EXTREME CARE WHEN HANDLING UPS CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. THE UPS MODULE WEIGHT RANGES FROM 2735 POUNDS (1245 KG) TO 5705 POUNDS (2600 KG), INCLUDING INPUT TRANSFORMER. THE BATTERY CABINETS WEIGH BETWEEN 3000 POUNDS (1364 KG) AND 4900 POUNDS (2227 KG).

LOCATE CENTER OF GRAVITY SYMBOLS BEFORE HANDLING EACH CABINET. TEST LIFT AND BALANCE THE CABINETS BEFORE TRANSPORTING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES.

SLOTS AT THE BASE OF THE MODULES AND BATTERY CABINETS ARE INTENDED FOR FORKLIFT USE. BASE SLOTS WILL SUPPORT THE UNIT ONLY IF THE FORKS ARE COMPLETELY BENEATH THE UNIT.

SYSTEM CONTROL CABINETS (SCC'S) HAVE HOLES INTENDED FOR RIGGING BARS OR CHAINS. PREVENT CHAINS OR CABLES FROM CONTACTING CABINET BY USING SPREADER BAR AND ADEQUATE PADDING.

FOLLOW ALL BATTERY SAFETY PRECAUTIONS WHEN INSTALLING, CHARGING, OR SERVICING BATTERIES. IN ADDITION TO THE HAZARD OF ELECTRIC SHOCK, GAS PRODUCED BY BATTERIES CAN BE EXPLOSIVE AND SULFURIC ACID CAN CAUSE SEVERE BURNS.

IN CASE OF FIRE INVOLVING ELECTRICAL EQUIPMENT, ONLY CARBON DIOXIDE FIRE EXTINGUISHERS, OR THOSE APPROVED FOR USE IN ELECTRICAL FIRE FIGHTING, SHOULD BE USED.

EXTREME CAUTION IS REQUIRED WHEN PERFORMING MAINTENANCE.

BE CONSTANTLY AWARE THAT THE UPS SYSTEM CONTAINS HIGH DC AS WELL AS AC VOLTAGES.

CHECK FOR VOLTAGE WITH BOTH AC AND DC VOLTMETERS PRIOR TO MAKING CONTACT.



WARNING

LOCATE CENTER OF GRAVITY SYMBOLS AND DETERMINE UNIT WEIGHT BEFORE HANDLING CABINET.



If you require assistance for any reason, call the toll-free Liebert Global Services number; 1-800-543-2378. For LGS to assist you expediently, please have the following information available:

Part Numbers: _____

Serial Numbers: _____

kVA Rating: _____

Date Purchased: _____

Date Installed: _____

Location: _____

Input Voltage: _____

Output Voltage: _____

Battery Reserve Time: _____

1.0 SAFETY PRECAUTIONS

Read this manual thoroughly, paying special attention to the sections that apply to you, before working with the UPS. **Retain this manual for use by installing personnel.**

Under typical operation and with all UPS doors closed, only normal safety precautions are necessary. The area around the UPS system should be kept free from puddles of water, excess moisture, or debris.

Special safety precautions are required for procedures involving handling, installation, and maintenance of the UPS system or the battery. Observe all safety precautions in this manual before handling or installing the UPS system. Observe all precautions in the **Operation and Maintenance Manual**, before as well as during performance of all maintenance procedures. Observe all battery safety precautions before working on or near the battery.

This equipment contains several circuits that are energized with high voltage. Only test equipment designated for troubleshooting should be used. This is particularly true for oscilloscopes. Always check with an AC and DC voltmeter to ensure safety before making contact or using tools. Even when the power is turned Off, dangerously high potentials may exist at the capacitor banks and at the batteries.

ONLY qualified service personnel should perform maintenance on the UPS system. When performing maintenance with any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. The service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground).

Unless all power is removed from the equipment, one person should never work alone. A second person should be standing by to assist and summon help in case an accident should occur.

Four types of messages are used throughout the manual to stress important text. Carefully read the text below each Danger, Warning, Caution, and Note and use professional skills and prudent care when performing the actions described by that text.

A **Danger** signals immediate hazards resulting in severe personal injury or death. For example:



DANGER

A DANGER SIGNALS IMMEDIATE HAZARDS WHICH WILL RESULT IN SEVERE PERSONAL INJURY OR DEATH.

A **Warning** signals the presence of a possible serious, life-threatening condition. For example:



WARNING

LETHAL VOLTAGES MAY BE PRESENT WITHIN THIS UNIT EVEN WHEN IT IS APPARENTLY NOT OPERATING. OBSERVE ALL CAUTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH. DO NOT WORK ON OR OPERATE THIS EQUIPMENT UNLESS YOU ARE FULLY QUALIFIED TO DO SO!! NEVER WORK ALONE.

A **Caution** indicates a condition that could seriously damage equipment and possibly injure personnel. For example:



CAUTION

Extreme care is necessary when removing shoring braces. Do not strike the cabinet with hammers or other tools.

A **Note** emphasizes important text. If the note is not followed, equipment could be damaged or may not operate properly. For example:



NOTE

If the UPS system has a blown fuse, the cause should be determined before you replace the fuse. Contact Liebert Global Services.

2.0 INSTALLATION CONSIDERATIONS

Install your Series 600T UPS in accordance with the submittal drawing package and the following procedures.

A Liebert authorized representative must perform the initial system check-out and start-up to ensure proper system operation. Equipment warranties will be voided unless system start-up is performed by a Liebert authorized representative. Contact your local Liebert sales representative or Liebert Global Services at **1-800-543-2378** to arrange for system start-up.



CAUTION

Read this manual thoroughly before attempting to wire or operate the unit. Improper installation is the most significant cause of UPS start-up problems.

Do not install this equipment near gas or electric heaters. It is preferable to install the UPS in a restricted location to prevent access by unauthorized personnel.

1. Proper planning will speed unloading, location, and connection of the UPS. **Refer to Figure 8 through Figure 55 and Appendix A - Site Planning Data.**
2. Refer to information later in this manual regarding the optional Battery Cabinets and Transformer Cabinets. **Observe all battery safety precautions when working on or near the battery.**
3. Use the shortest output distribution cable runs possible, consistent with logical equipment arrangements and with allowances for future additions if planned.
4. Recommended ambient operating temperature is 25°C (77°F). Relative humidity must be less than 95%, non-condensing. Note that room ventilation is necessary, but air conditioning may not be required. Maximum ambient operating temperature is 40°C (104°F) without derating. The batteries should not exceed 25°C (77°F). At elevations above 4,000 feet (1219 meters) derating may be required (consult your Liebert sales representative).
5. Even though your Liebert UPS unit is at least 93% efficient, the heat output is substantial. For more specific information, see **Appendix A - Site Planning Data**. Be sure environmental conditioning systems can accommodate this BTU load, even during utility outages.
6. The routing (inside the facility) to the installation site, as well as the floor at the final equipment location, must be capable of supporting the cabinet weight and the weight of any moving equipment. The modules weigh between 2775 and 5775 pounds. The battery cabinets weigh between 3000 and 4900 pounds. The System Control Cabinets weigh between 1000 and 2550 pounds. Refer to **Appendix A - Site Planning Data**.
7. Plan the routing to ensure that the unit can move through all aisleways, doorways, and around corners without risking damage. If the modules and batteries must be moved by elevator, check the size of the door openings and the weight-carrying capacity of the elevator.



WARNING

LOCATE CENTER OF GRAVITY SYMBOLS AND DETERMINE UNIT WEIGHT BEFORE HANDLING CABINET.



Figure 1 Multi-Module UPS, 65 & 80 kVA (left) and bottom-entry 100-225 kVA (right)

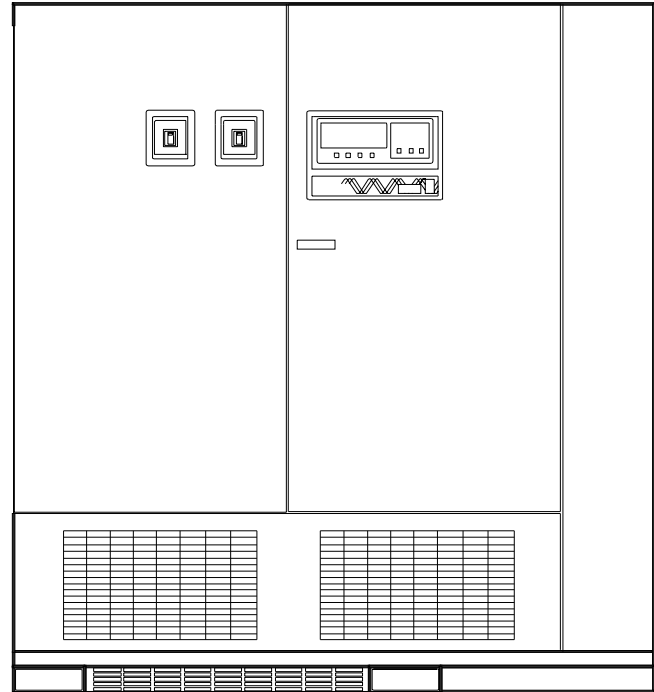
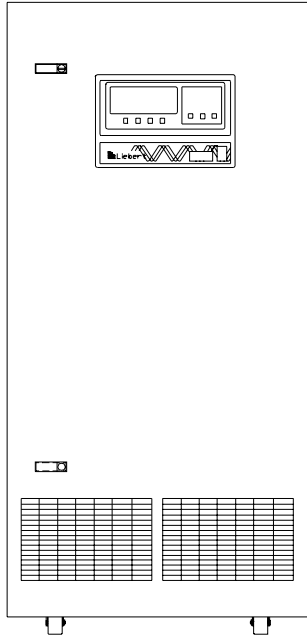
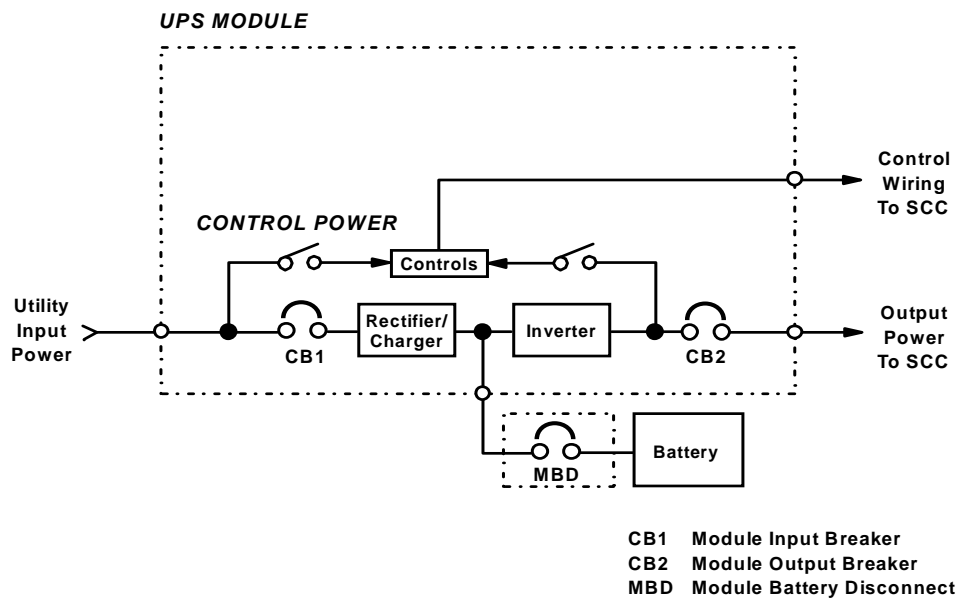


Figure 2 UPS Multi-Module Unit Block Diagram



2.1 Types of System Control Cabinets

1. **SCCT** is a stand-alone cabinet containing system control logic for up to six UPS modules, static bypass switch, manually operated disconnects for the static bypass switch, and two motor-operated system breakers. The SCCT is painted the same color as the Liebert UPS, but does not match the sheet metal style of the UPS.
2. **SCCI** has the system control logic, circuit breakers and static bypass switch integrated into a switchboard cabinet manufactured by others.
3. **SCCC** is an integrated configuration like the SCCI with the static bypass switch rated for continuous duty.

3.0 UNLOADING AND HANDLING

The UPS module is shipped in one cabinet to allow easy handling at the site. Because the weight distribution in the cabinet is uneven, use extreme care during handling and transport. Your installation may also include Battery Cabinets and a System Control Cabinet.



WARNING

EXERCISE EXTREME CARE WHEN HANDLING UPS CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. THE UPS MODULE WEIGHT RANGES FROM 2750 POUNDS TO 5300 POUNDS. BATTERY CABINETS WEIGH BETWEEN 3100 AND 4900 POUNDS.

LOCATE CENTER OF GRAVITY SYMBOLS BEFORE HANDLING CABINET. TEST LIFT AND BALANCE THE CABINET BEFORE TRANSPORTING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES.

SLOTS AT THE BASE OF THE MODULES AND BATTERY CABINETS ARE INTENDED FOR FORKLIFT USE. BASE SLOTS WILL SUPPORT THE UNIT ONLY IF THE FORKS ARE COMPLETELY BENEATH THE UNIT.

SYSTEM CONTROL CABINETS (SCC'S) HAVE HOLES INTENDED FOR RIGGING BARS OR CHAINS. PREVENT CHAINS OR CABLES FROM CONTACTING CABINET BY USING SPREADER BAR AND ADEQUATE PADDING.

To reduce the possibility of shipping damage, cabinets are shored with 2x4 bracing, secured with screw-type nails. This shoring must be carefully removed prior to unloading.



CAUTION

Extreme care is necessary when removing shoring braces. Do not strike cabinet with hammers or other tools.

4.0 INSPECTIONS

4.1 External Inspections

1. While the UPS system is still on the truck, inspect the equipment and shipping container(s) for any signs of damage or mishandling. Do not attempt to install the system if damage is apparent. If any damage is noted, file a damage claim with the shipping agency within 24 hours and contact Liebert Global Services at 1-800-543-2378 to inform them of the damage claim and the condition of the equipment.
2. Locate the bag containing the keys for the front access door. The bag is attached to the cabinet.
3. Compare the contents of the shipment with the bill of lading. Report any missing items to the carrier and to Liebert Global Services immediately.
4. Check the nameplate on the cabinets to verify that the model numbers correspond with the one specified. Record the model numbers and serial numbers in the front of this installation manual. A record of this information is necessary should servicing become required.

4.2 Internal Inspections

1. Verify that all items have been received.
2. If spare parts were ordered, verify arrival.
3. Open doors and remove cabinet panels to check for shipping damage to internal components.
4. Check for loose connections or unsecured components in the cabinet(s).
5. Check for installation of circuit breaker line safety shields. There should be no exposed circuit breaker terminals when the cabinet doors are opened.
6. Check for any unsafe condition that may be a potential safety hazard.
7. UPS modules are shipped with internally mounted shipping brackets. The shipping brackets (painted orange) must be removed from the rear (remove rear panels).

5.0 EQUIPMENT LOCATION

1. Handle cabinet(s) in accordance with the safety precautions in **Section 1.0**. Use a suitable material handling device to move cabinet to its final location. **Exercise extreme care because of the uneven weight distribution.** Carefully lower the cabinet to the floor.
2. Verify that the UPS system is installed in a clean, cool and dry location.
3. Installation and serviceability will be easier if adequate access is provided on all sides of the equipment, but only front access is required.
 - a. Verify that there is adequate clearance to open cabinet doors. See drawings and local codes (4 feet is recommended).
 - b. Verify that there is adequate area in front of circuit breakers to perform maintenance. Check installation drawings for location of breakers. Check with local codes.
 - c. Verify that there is adequate clearance above all cabinets to allow exhaust air to flow without restriction (2 feet minimum, unobstructed).

6.0 BATTERY INSTALLATION

6.1 Battery Safety Precautions

Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

When replacing batteries, use the same number and type of batteries.



CAUTION

Lead-acid batteries contain hazardous materials. Batteries must be handled, transported, and recycled or discarded in accordance with federal, state, and local regulations. Because lead is a toxic substance, lead-acid batteries should be recycled rather than discarded.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. Do not dispose of battery or batteries in a fire. The battery may explode.

A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

1. Remove watches, rings, or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not lay tools or metal parts on top of batteries.
5. Disconnect charging source prior to connecting or disconnecting battery terminals.
6. Determine if battery is inadvertently grounded. If inadvertently grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.

Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following procedures should be followed:

1. DO NOT SMOKE when near batteries.
2. DO NOT cause flame or spark in battery area.
3. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.

Battery Safety Precautions in French Per CSA Requirements

Instructions Importantes Concernant La Sécurité

Conserver Ces Instructions



ADVERTISSEMENT

DES PIÈCES SOUS ALIMENTATION SERONT LAISSÉES SANS PROTECTION DURANT CES PROCÉDURES D'ENTRETIEN. UN PERSONNEL QUALIFIÉ EST REQUIS POUR EFFECTUER CES TRAVAUX.

LES FUSIBLES A C.C. DE LA BATTERIE D'ACCUMULATEURS OPÈRENT EN TOUT TEMPS A LA TENSION NOMINALE. LA PRÉSENCE D'UN FUSIBLE A C.C. BRÛLE INDIQUE UN PROBLÈME SÉRIEUX. LE REMPLACEMENT DE CE FUSIBLE, SANS AVOIR DÉTERMINÉ LES RAISONS DE LA DÉFECTUOSITÉ, PEUT ENTRAÎNER DES BLESSURES OU DES DOMMAGES SÉRIEUX À L'ÉQUIPEMENT. POUR ASSISTANCE, APPELER LE DÉPARTEMENT DE SERVICE À LA CLIENTÈLE DE LIEBERT.



DANGER

Les accumulateurs plomb-acide contiennent de la matière comportant un certain risque. Les accumulateurs doivent être manipulés, transportés et recyclés ou éliminés en accord avec les lois fédérales, provinciales et locales. Parce que le plomb est une substance toxique, les accumulateurs plomb-acide devraient être recyclés plutôt qu'éliminés.

Il ne faut pas brûler le ou les accumulateurs. L'accumulateur pourrait alors exploser.

Il ne faut pas ouvrir ou endommager le ou les accumulateurs. L'électrolyte qui pourrait s'en échapper est dommageable pour la peau et les yeux.

Un accumulateur représente un risque de choc électrique et de haut courant de court-circuit. Lorsque des accumulateurs sont manipulés, les mesures préventives suivantes devraient être observées:

1. Retirer toutes montres, bagues ou autres objets métalliques.
2. Utiliser des outils avec manchon isolé.
3. Porter des gants et des bottes de caoutchouc.
4. Ne pas déposer les outils ou les pièces métalliques sur le dessus des accumulateurs.
5. Interrompre la source de charge avant de raccorder ou de débrancher les bornes de la batterie d'accumulateurs.
6. Déterminer si l'accumulateur est mis à la terre par erreur. Si oui, défaire cette mise à la terre. Tout contact avec un accumulateur mis à la terre peut se traduire en un choc électrique. La possibilité de tels chocs sera réduite si de telles mises à la terre sont débranchées pour la durée de l'installation ou de l'entretien.

Les accumulateurs plomb-acide présentent un risque d'incendie parce qu'ils génèrent des gaz à l'hydrogène. Les procédures suivantes devront être respectées.

1. NE PAS FUMER lorsque près des accumulateurs.
2. NE PAS produire de flammes ou d'étincelles près des accumulateurs.
3. Décharger toute électricité statique présente sur votre corps avant de toucher un accumulateur en touchant d'abord une surface métallique mise à la terre.



DANGER

L'électrolyte est un acide sulfurique dilué qui est dangereux au contact de la peau et des yeux. Ce produit est corrosif et aussi conducteur électrique. Les procédures suivantes devront être observées:

1. Porter toujours des vêtements protecteurs ainsi que des lunettes de protection pour les yeux.
2. Si l'électrolyte entre en contact avec la peau, nettoyer immédiatement en rinçant avec de l'eau.
3. Si l'électrolyte entre en contact avec les yeux, arroser immédiatement et généreusement avec de l'eau. Demander pour de l'aide médicale.
4. Lorsque l'électrolyte est renversée, la surface affectée devrait être nettoyée en utilisant un agent neutralisant adéquat. Une pratique courante est d'utiliser un mélange d'approximativement une livre (500 grammes) de bicarbonate de soude dans approximativement un gallon (4 litres) d'eau. Le mélange de bicarbonate de soude devra être ajouté jusqu'à ce qu'il n'y ait plus apparence de réaction (mousse). Le liquide résiduel devra être nettoyé à l'eau et la surface concernée devra être asséchée.

6.2 Matching Battery Cabinets

Two sizes of optional battery cabinets are available. Refer to **Figure 18** to **Figure 22**. The battery cabinet cells range from 90 to 150 Ampere-hours. The same model battery cabinet may be paralleled in multiple cabinet strings for additional capacity. Battery capacity (in minutes) at your installation will depend on cabinet model, number of cabinets, and amount of critical load on the UPS.

1. **Handling.** The Battery Cabinet weighs 3000 to 4900 pounds. Forklift slots are provided for easy handling.
2. **Cabinet Inspection.** Remove all panels and visually inspect the batteries, bus connections, and cabinet for any damage. **Exercise caution; voltage is present within the Battery Cabinet even before installation.** If there are signs of damage, do not proceed. Call Liebert Global Services at 1-800-542-2378.
3. **Battery Storage.** The batteries used in the Battery Cabinet have an excellent charge retaining characteristic. The batteries can be stored for up to six months without any appreciable deterioration. Self-discharge rate of the batteries is approximately 3% per month when the batteries are stored in temperatures of 15°C to 25°C (59°F to 77°F). If the Battery Cabinet is planned to be stored for longer than six months, contact Liebert Global Services for recommended action.
4. **Installation.** The Battery Cabinet(s) can be located conveniently next to each UPS module. The front-access-only-design eliminates side and rear service clearance requirements.
 - **Environment.** Locate the Battery Cabinet in a clean, dry environment. Recommended temperature range for optimum performance and lifetime is 20°C (68°F) to 25°C (77°F).
 - **Service Clearance.** Allow front access to the Battery Cabinet at all times for maintenance and servicing. Electrical codes require that the Battery Cabinet be installed with no less than 3 feet (1 meter) of clearance at the front of the cabinet when operating. Side and rear panels do not require service clearance.
 - **Side Panels.** Remove protective side panels to connect cabinets together. Panels are retained at the bottom with three screws.
 - **Shield Plate (100-225 kVA only).** The shield plate inside the Battery Cabinet should be on the side toward the UPS module for proper UPS airflow. Move the shield if required by your Battery Cabinet location.
 - **Cables.** Cables may be run between the cabinets through cutouts in the top of the cabinet, eliminating the need for external conduit runs. **Route cables before moving cabinets into final position for bolting together.** Remove top panels for access, if required. No top or bottom entry cables are required, except for remotely located cabinets which require conduits. Refer to **Figure 18** through **Figure 22**.
 - **Built-In Cabinets.** Matching Battery Cabinets are designed as a bolt-on section to the side of the UPS module cabinet. Use bolts (3/8"-16 x 1-1/4") to connect cabinet frames at posts, two places front and two places rear. Brackets are provided to make rear connections easier from inside the cabinet.

6.3 Non-Standard Batteries

When batteries other than a matching Battery Cabinet are used (not recommended), a remote battery disconnect switch with overcurrent protection is required per the National Electrical Code. Refer to **Figure 49** and **Figure 50**. Contact your Liebert sales representative regarding this option.

1. Install battery racks/cabinets and batteries per manufacturer's installation and maintenance instructions.
2. Verify battery area has adequate ventilation and battery operating temperature complies with manufacturer's specification.

If you have any questions concerning batteries, battery racks, or accessories, contact Liebert Global Services at 1-800-543-2378.

7.0 CONFIGURING YOUR NEUTRAL AND GROUND CONNECTIONS

Improper grounding is the largest single cause of UPS installation and start-up problems. This is not an easy subject, since grounding techniques vary significantly from site to site, depending on several factors. The questions you should ask are:

- What is the configuration of the input power source? Most of the recommended schemes for UPS grounding require grounded-wye service. The UPS system requires a bypass neutral for sensing and monitoring the quality of the bypass input. If the building service is straight delta or corner-grounded delta, contact your Liebert representative for details of the Artificial Neutral or Isolated Neutral kits for the System Control Cabinet.
- What are the UPS input and output voltages? Systems with 480 VAC input and output have significantly different needs than systems with 208/208 VAC.
- What is the connected load? Does the critical load consist of one or more Power Distribution Units (PDUs)? Do the PDUs have isolation transformers?

The following sections discuss recommended grounding procedures for various system configurations.

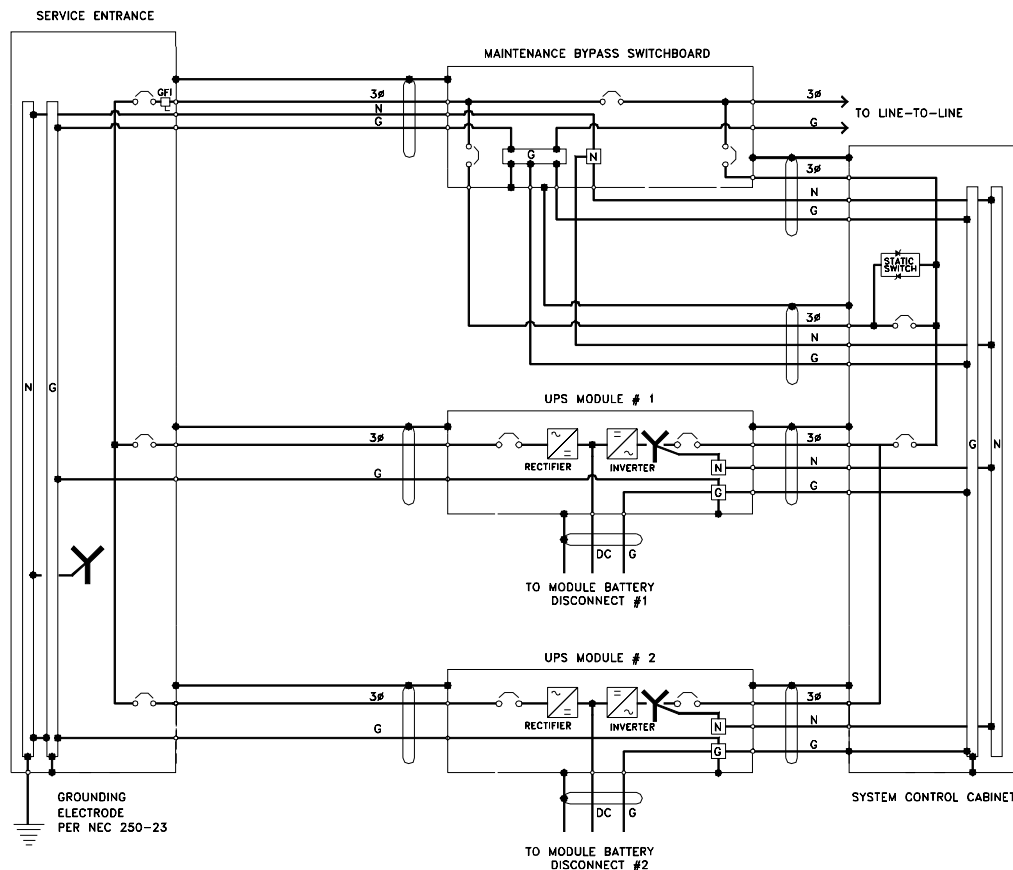


NOTE

Some UPS modules are equipped with input isolation transformers. However, these transformers have no effect upon any system grounding considerations. These modules will be grounded exactly as shown in the following examples.

7.1 Preferred Grounding Configuration, 480 or 600 VAC Input and Output, Isolated Power Distribution Units, Wye-Connected Service

Figure 3 Preferred Grounding Configuration, 480 or 600 VAC Input and Output



The most-common configuration of Series 600T UPS Multi-Module Systems is with 480 VAC input, 480 VAC output, and a connected load consisting of multiple Power Distribution Units (PDUs) with isolation transformers in the PDUs to produce 208 VAC. For Canadian customers, the UPS modules usually have 600 VAC input and output. The same principles apply if the connected load is an isolation transformer feeding various loads. Figure 4 above shows a typical installation. The Maintenance Bypass Switchgear is shown separately for clarity, but is usually contained within the System Control Cabinet (SCC).

Notice that the UPS module input and the system bypass input are connected to a grounded-wye service. In this configuration, the UPS module is not considered a separately derived source.

All of the UPS module output neutrals are solidly connected to the SCC neutral. The SCC neutral is solidly connected to the building service neutral, which is bonded to the grounding conductor at the service entrance equipment.

The isolation transformers in the PDUs can be considered separately derived sources. Therefore the PDU neutrals should be bonded to the PDU grounding conductor and connected to a local grounding electrode in compliance with NEC 250-26.

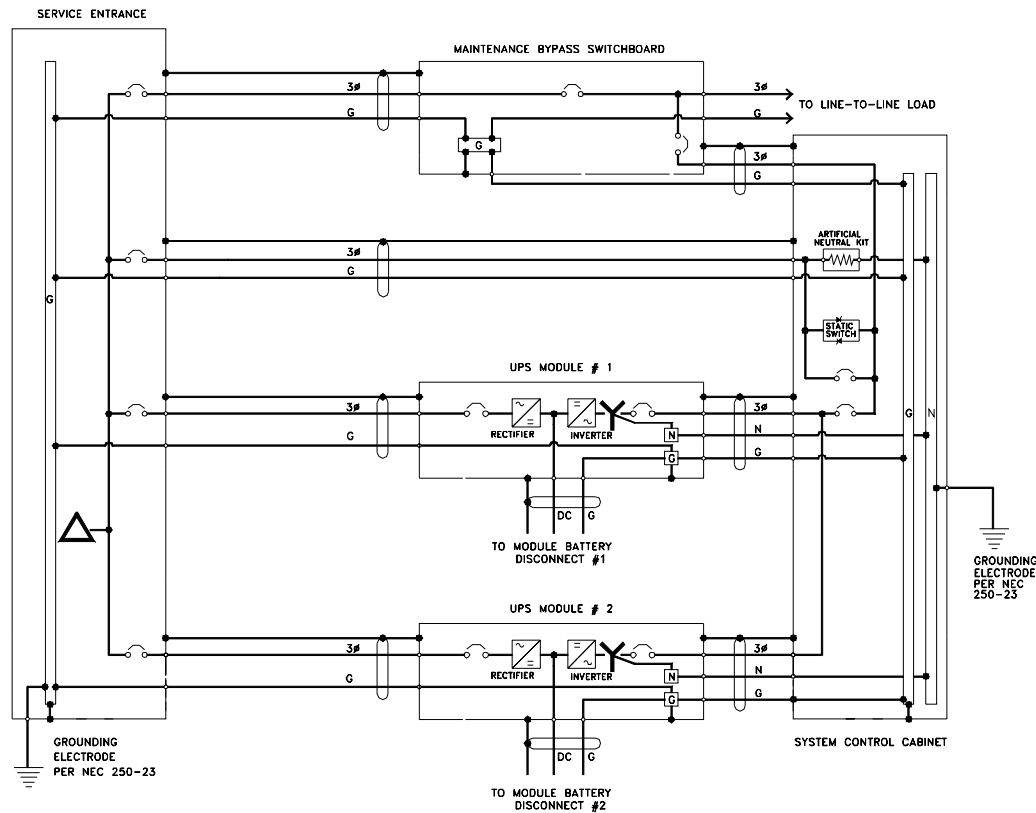


NOTE

Impedance-grounded wye sources require an Isolated Neutral Kit in addition to the grounding and neutral conductors shown above.

7.2 Grounding Configuration, 480 or 600 VAC Input and Output, Delta Source

Figure 4 Grounding Configuration with Ungrounded Delta Source Input



As previously mentioned, Series 600T UPS systems require a bypass input neutral for sensing and monitoring. With a wye-connected input source, the installer should always connect the building service neutral to the System Control Cabinet (SCC) output neutral to achieve this. When the building service is delta-connected, however, the installer must take special steps to ensure reliable UPS functioning.

If building service is *ungrounded delta* (and there is no intent to operate with one corner of the delta grounded, either on purpose or accidentally), the SCC requires the Series 600T Artificial Neutral Kit for proper operation. This kit uses a resistor network to create a reference point for the bypass input. In this case, the SCC output neutral *must* be bonded to the SCC ground.

If the building service is *corner-grounded delta* or an *Impedance-grounded wye*, the SCC requires the Isolated Neutral Kit, as do each of the UPS modules. This kit uses control isolation transformers to create a reference point. For this application, the SCC output neutral *must not* be bonded to the SCC ground.

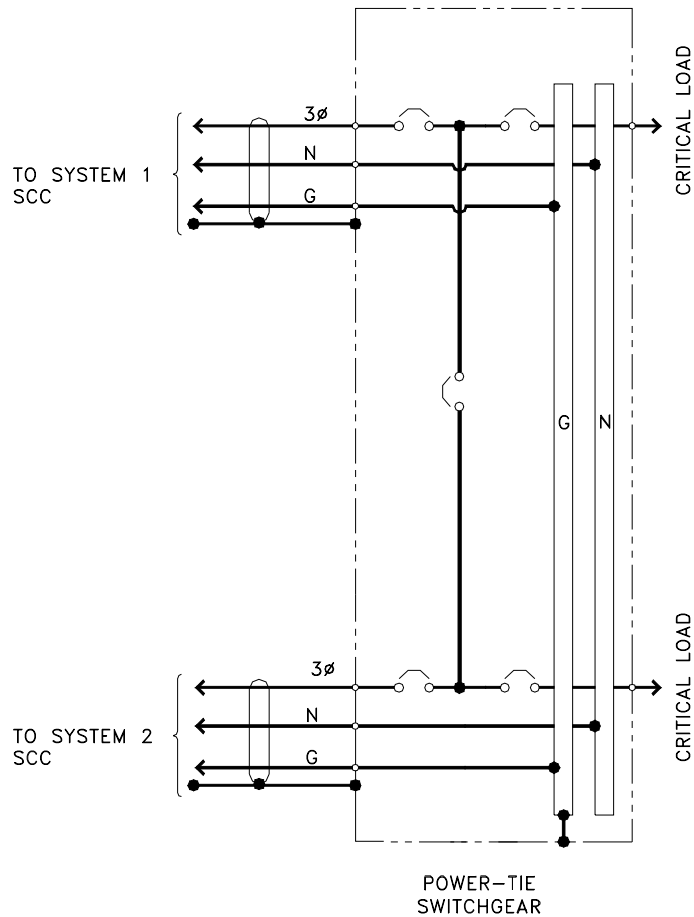


NOTE

The Artificial Neutral Kit introduces a maximum current of 0.3 amps to ground. Take care to ensure that this does not interfere with the operation of any upstream ground-fault detection devices.

7.3 Preferred Grounding Configuration with Power-Tie Switchgear

Figure 5 Preferred Grounding Configuration, Power-Tie Systems



Multi-Module Systems can be used with Power-Tie switchgear to provide dual critical load busses. The Power-Tie switchgear permits transferring critical loads from one critical bus to the other so that one UPS system and associated breakers can be de-energized for maintenance. Certain configurations of Power-Tie equipment also permit the operator to continuously parallel the output of both UPS systems.

In tied systems, each SCC must have its neutral solidly connected to the Power-Tie switchgear neutral. The UPS modules, as usual, must have their output neutrals solidly connected to their respective SCC neutrals. There should *not* be a connection between the service entrance neutral and either the SCC or module neutrals.

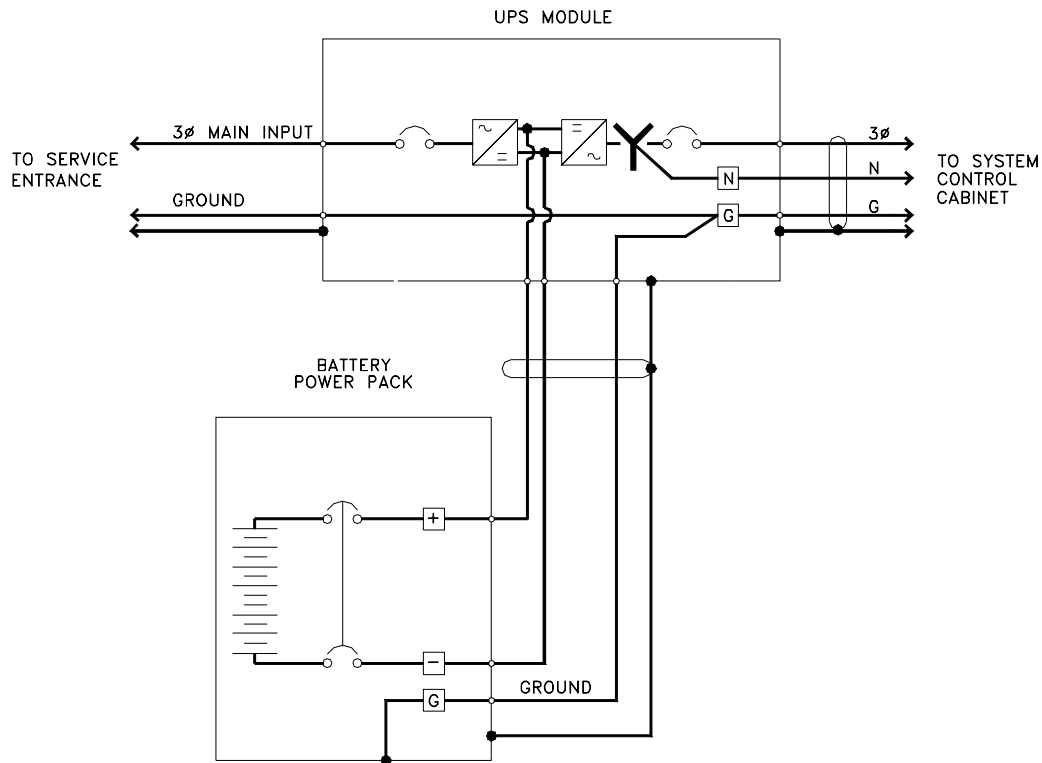


NOTE

It is essential to run a neutral connection between the tie switchgear and both SCCs as shown in the illustration above.

7.4 Grounding Configurations, Battery Systems

Figure 6 Battery Cabinet Grounding Configuration



Large, open-rack battery systems are normally either locally grounded or left ungrounded, depending on local code requirements.

Battery cabinet systems, on the other hand, should be grounded to the UPS module ground bus. The figure above illustrates how a simple one-cabinet system would be grounded. For systems with multiple cabinets, the same configuration would apply. However, for simplicity the installer can connect all the battery cabinet grounds for a particular module together and run a single ground conductor to that UPS module ground.

8.0 WIRING CONSIDERATIONS



WARNING

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN THAT IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DAMAGE TO THE EQUIPMENT OR INJURY TO PERSONNEL.

VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

Refer to **Appendix A - Site Planning Data** and installation drawings (**Figure 8** through **Figure 55**). Determine AC currents for your system (kVA, voltage, and options). Also refer to equipment nameplate for the model number, rating, and voltage. Refer to **Table 1** and **Table 2** for wire termination data.



NOTE

*Use 75°C copper wire. Select wire size based on the ampacities in **Table 3** of this manual, a reprint of Table 310-16 and associated notes of the National Electrical Code (NEPA 70).*



CAUTION

The weight of power cables must be adequately supported to avoid stress on bus bars and lugs. In addition to weight support, the following restraining method is recommended to control cable movement during external fault conditions: Wrap line cables together at 6 inches and 12 inches from the terminals with 5 wraps of 3/8 inch nylon rope or equivalent (tensile strength of 2000 pounds). Support remainder of cable with 5 wraps every 6 inches or 1 wrap every 1 inch.

8.1 Power Wiring

1. Power wiring must be run in individual, separate conduits or cable trays. Refer to the Outline and Terminal Details drawings (**Figure 8 to Figure 22** and **Figure 28 to Figure 32**) for locations of the various power connections within the UPS and SCC. In particular, note the location of the rectifier input power connections.



CAUTION

Power and control wiring must be separated!

2. Observe local, state and national electrical codes. Verify utility power and its overcurrent protection rating will accommodate the UPS input rating, including battery recharging.
3. A safety ground wire must be run from building ground to ground point in the UPS Module Cabinets, the System Control Cabinet, and the Power-Tie Cabinet (if applicable). See Sections 7.1 through 7.4. The grounding conductor shall comply with the following conditions of installation:
 - a. An insulated grounding conductor must be sized in accordance with the NEC and local codes. It must be green (with or without one or more yellow stripes) and be installed as part of the branch circuit that supplies the unit or system.
 - b. The grounding conductor described above is to be grounded to earth at the service equipment or, if supplied by a separately derived system, at the supply transformer or motor-generator set in accordance with the instructions in Section 7 of this Manual.
 - c. The attachment-plug receptacles in the vicinity of the unit or system are all to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground at the service equipment.
4. When possible, input to the UPS and bypass should be four wire plus ground. When input is straight delta, the UPS artificial neutral kit should be ordered. When input is corner-grounded delta, the isolated neutral kit should be ordered.
5. Observe clockwise phase rotation of all power wiring. Phase A leads Phase B leads Phase C. A qualified electrician should check the phase rotation.
6. Power cables must be rated for less than 2 volts line drop at maximum rated system current.
7. If site equipment includes a backup generator and automatic transfer switch(es), consult the manufacturers of those devices for information on sizing and interfacing to the UPS system.
8. The installing contractor can remove the access plates from the left and right side of the cable-access area in the top of the UPS in order to cut entry holes for conduit. For units that also have bottom cable access, there is a third access plate on the right side of the module.



CAUTION

After cutting holes in the access plates, be certain that no foreign matter (metal shavings, sawdust, insulation or wire fragments, etc.) remains inside the UPS. Likewise be certain to block any “extra” holes in the plates through which foreign matter could later enter the UPS.

8.2 Control Wiring

Control wiring must be stranded and tinned and run in individual separate steel conduits. Control wiring must be separated from power wiring. In addition, each control wiring cable group should be run in a separate conduit to minimize control signal interference.

Refer to the Control Connection Locations and Control Wire Lists, **Figure 33** through **Figure 48**. Notice that there are nine cable groups in a typical system:

- Cable group 1 carries signals for the Module Battery Disconnect.
- Cable group 2 is for the remote communications options: modem, remote terminal and remote CRT.
- Cable group 3 carries signals for the Remote Emergency Module Off and Remote Emergency Power Off.
- Cable group 4 carries signals for the optional Remote Monitor Panel.
- Cable group 5 is for the optional SiteScan system.
- Cable group 6 carries signals for the reduced battery charge limit and the reduced input current limit.
- Cable group 7 carries signals to and from the maintenance bypass switchgear.
- Cable groups 20 and 21 carry signals for general housekeeping, modules to SCC.

Other cable groups will be required for other optional equipment. If your system has any installed options, special wire lists will be included in your Submittal Drawing Package. Contact your Liebert Sales Representative for assistance if the submittal drawings have been lost or misplaced.

Figure 33 through **Figure 36** show the typical location of control connections inside the UPS and SCC. The position of a particular control connection may be different for your system, depending on the model and the installed options.



NOTE

The UPS control and communication wiring are considered Class 2 circuits by NEC standards. However, NEC Class 1 wiring methods are required for these circuits to ensure proper operation of the UPS.

8.3 Battery Wiring

Power wiring to the Battery Cabinet connects positive, negative, and ground power cables from the Battery Cabinet to the associated UPS. Connection of the UPS to the Battery Cabinet serves to both charge and discharge the batteries (when needed). The battery disconnect (circuit breaker) requires a control cable. Liebert Battery Cabinets include power and control cables to join multiple cabinets together into a system. Additional (field-supplied) power or control wiring might be necessary to connect the battery cabinet system to the UPS. Refer to **Figure 18** through **Figure 22**.



DANGER

A BATTERY INTERCELL CONNECTION ON EACH TIER OF THE LIEBERT BATTERY CABINET IS DISCONNECTED FOR SAFETY DURING SHIPMENT. DO NOT COMPLETE THESE CONNECTIONS. THE LIEBERT GLOBAL SERVICES REPRESENTATIVE WILL COMPLETE THESE CONNECTIONS AS PART OF START-UP. AN IMPROPERLY INSTALLED UNIT CAN RESULT IN INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.



CAUTION

Be sure polarity is correct when wiring the Battery Cabinet to the connected equipment (positive to positive; negative to negative). If polarity is not correct, fuse failures or equipment damage can result.



CAUTION

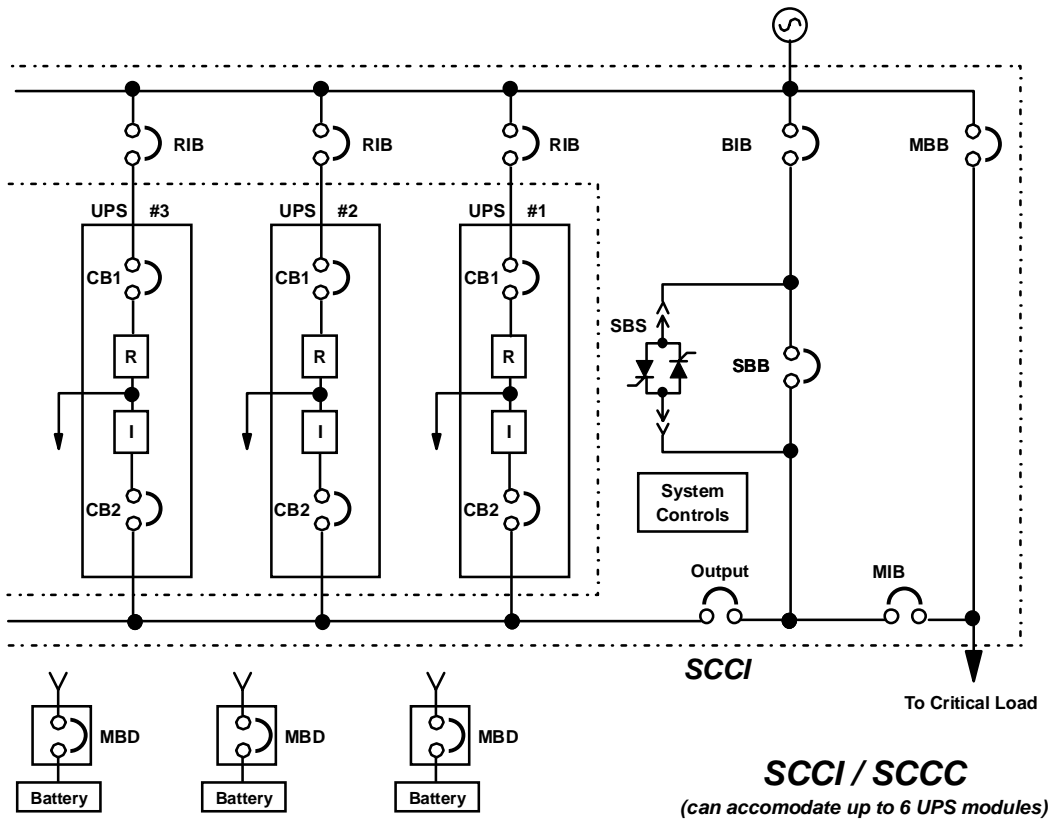
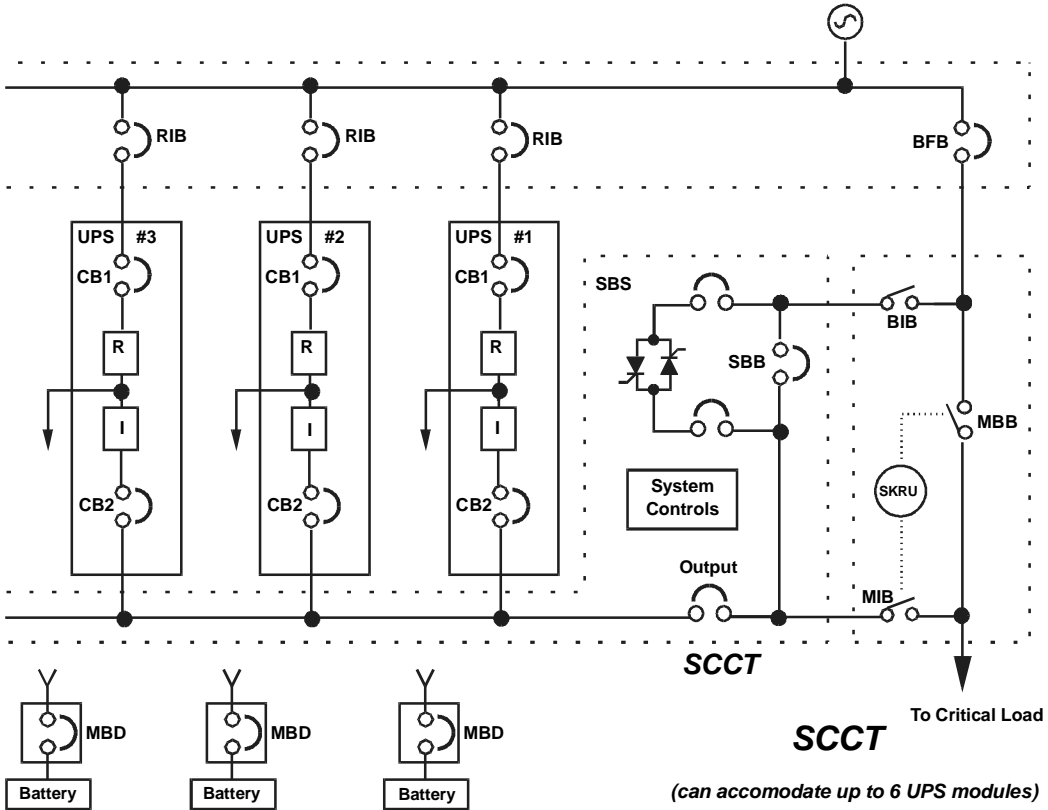
DC power cables should be installed in conduit with conductors in matched pairs (positive and negative).



NOTE

A Liebert Battery Specialist can perform a detailed inspection of the entire battery system to ensure it meets current IEEE standards. This inspection service is recommended because batteries are a very critical part of the UPS system.

Figure 7 Typical Multi-Module Configurations



9.0 WIRING CONNECTIONS



DANGER

VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ELECTRICAL CONNECTIONS.

ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN EXPERIENCED IN WIRING UPS EQUIPMENT, AND IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES.

IMPROPER WIRING MAY CAUSE DAMAGE TO THE UPS OR INJURY TO PERSONNEL.



CAUTION

All shielded cables, non-shielded cables, non-shielded control wires, non-shielded battery breaker control wires, and non-shielded remote control wires must be housed in individual, separate, steel conduits. Placing multiple cables in the same conduit with other control or power wiring may cause system failure.

Refer to the drawings in this manual and any other drawings provided by Liebert for this installation. Make all of the following connections:

1. AC power cables from input power source circuit breaker (RIB) to UPS Module Input. Observe phase rotation.
2. AC power cables from bypass power source circuit breaker (BIB) to UPS system bypass input at System Control Cabinet (SCC). Observe phase rotation.



CAUTION

See Section 7 of this Manual for an explanation of proper grounding techniques.

3. AC power cables from UPS Module Outputs to SCC or to switchgear for critical load bus. Observe phase rotation.



NOTE

Make sure all required wiring between each UPS module and the optional cabinet(s) is completed. Observe phase rotation.

4. Each UPS Module Output Neutral to SCC or to switchgear for critical load bus. See Section 7.

| Abbreviations for Circuit Breakers | |
|------------------------------------|-----------------------------------|
| BFB | Bypass Feeder Breaker |
| BIB | Bypass Input Breaker |
| CB1 | Module Input Breaker |
| CB2 | Module Output Breaker |
| MBB | Maintenance Bypass Breaker |
| MBD | Module Battery Disconnect |
| MBFB | Maintenance Bypass Feeder Breaker |
| MIB | Maintenance Isolation Breaker |
| RIB | Rectifier Input Breaker |
| SBB | System Bypass Breaker |
| SBS | Static Bypass Switch |

- The UPS System Output Neutral is connected to one common point and solidly grounded per requirements of the National Electrical Code. The ground connection inside the UPS SCC cabinet may be required by the power wiring configuration at your site.



CAUTION

UPS bypass and system output neutral must be connected to only one common point in the UPS system. This neutral line must be grounded at the source.

- For Battery Cabinets:
DC power cables (and ground) from Battery Cabinet to UPS Module, and between Battery Cabinets. Observe polarity. DC power cables should be installed in matched pairs (positive and negative).



NOTE

DC power and battery circuit breaker control cables are provided with some Liebert-brand Battery Cabinets. Power cables are sized for interconnecting Battery Cabinets. Field-supplied cabling might be required to connect Battery Cabinets to the UPS module, depending on cabinet configuration and layout.



DANGER

DO NOT MAKE ANY CONNECTIONS BETWEEN BATTERY TIERS IN THE BATTERY CABINET. THESE CONNECTIONS WILL BE MADE BY THE LIEBERT CUSTOMER SERVICE REPRESENTATIVE DURING START-UP.

- For remote battery, install DC power cables (and ground) from battery to Module Battery Disconnect, and then to UPS Module DC bus. Observe polarity.
- Module Battery Disconnect control wiring to UPS Module, and between Battery Cabinets if applicable.
- Control wiring from System Control Cabinet (SCC) to UPS modules. Wiring must be run in individual separate steel conduit.
- Power and control connections required for the Maintenance Bypass.
- Power connections from SCC to critical load bus. Observe phase rotation.
- Control wiring to Remote Monitor Panel, if used. Selected alarm messages are also available for customer use through a set of contacts on a separate terminal board. Wiring must be run in individual separate steel conduit.
- Emergency Power Off control wiring (to SCC) must be run in separate steel conduit.
- Communications wiring (to SCC) for terminals, site monitoring or for modem must be run in separate steel conduit.
- Any additional special wiring required at your site.

10.0 WIRING INSPECTION

1. Verify all power connections are tight.
2. Verify all control wire terminations are tight.
3. Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to-ground.
4. Verify that all control wires are run in individual, separate, steel conduit.

Table 1 Power Wiring Terminals - Factory Supplied

| UPS Module Rating | Connection Type |
|--|---|
| 65 & 80 kVA | Rectifier input is top entry, to lugs in the top of the input circuit breaker. Lugs will accommodate cabling up to 350MCM. DC link and critical bus output connections are top entry, to frame-mounted terminal blocks with one 3/8-16x1 stud per phase or polarity. All units have two access plates in the top grille assembly. A bottom-entry access plate is also standard, to enable the installer to pull AC cables through the module to the connections on top. |
| 100-225 kVA | For "SpaceSaver" modules in the 48" frame, rectifier input wiring is top-entry, directly to lugs on top of their respective circuit breakers. DC link and critical bus output connection are top entry, to frame-mounted lugs. Standard modules with top-and-bottom entry have access plates and a wireway on the right side of the modules. All power connections are to bus bars in the wireway. |
| Use 75°C copper wire. Select wire size based on the ampacities in Table 310-16 (see Table 3 of this manual) and associated notes of the National Electrical Code (NFPA 70). Use commercially available solderless lugs for the wire size required for your application. Connect wire to the lug using tool and procedure specified by the lug manufacturer. | |

Table 2 Torque Specifications

| Nut and Bolt Combinations | | | | |
|---|------------------|------------|--|-----|
| Bolt Shaft Size | Grade 2 Standard | | Electrical Connections with Belleville Washers | |
| | Lb-in | N-m | Lb-in | N-m |
| 1/4 | 53 | 6.0 | 46 | 5.2 |
| 5/16 | 107 | 12 | 60 | 6.8 |
| 3/8 | 192 | 22 | 95 | 11 |
| 1/2 | 428 | 48 | 256 | 29 |
| Circuit Breakers With Compression Lugs (For Power Wiring) | | | | |
| Cable Size or Range | Lb-in | N-m | | |
| #6 - #4 | 100 | 11 | | |
| #3 - #1 | 125 | 14 | | |
| 1/0 - 2/0 | 150 | 17 | | |
| 3/0 - 200 MCM | 200 | 23 | | |
| 250 - 400 MCM | 250 | 28 | | |
| 500 - 700 MCM | 300 | 34 | | |
| Terminal Block Compression Lugs (For Control Wiring) | | | | |
| AWG Wire Size or Range | Lb-in | N-m | | |
| #22 - #14 | 3.5 to 5.3 | 0.4 to 0.6 | | |

Use the values in this table unless the equipment is labeled with a different torque value.

Table 3 Table 310-16

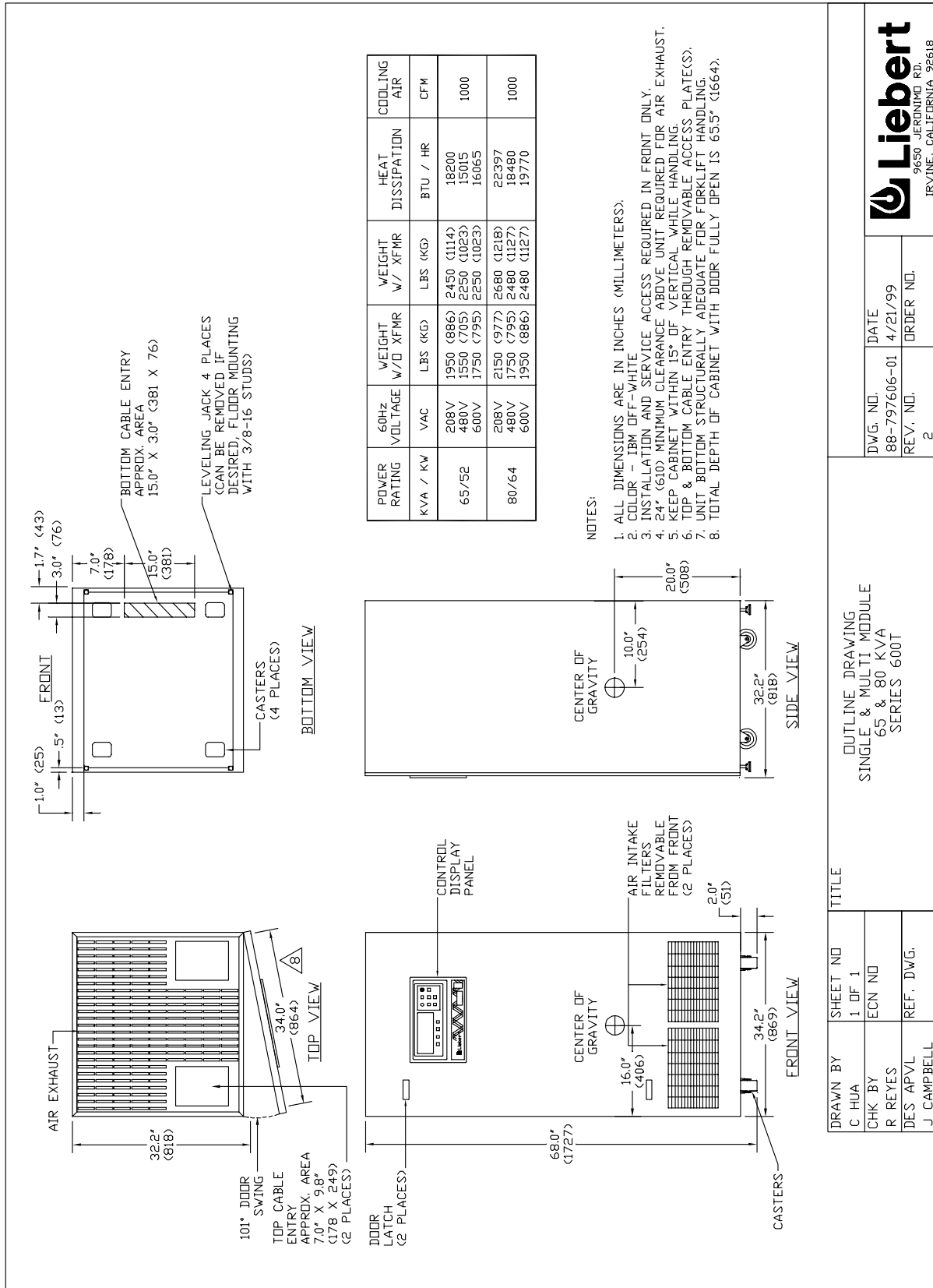
Allowable Ampacities of Insulated Conductors Rated 0-2000 Volts, 60° to 90°C (140° to 194°F)¹

Not More than Three Conductors in Raceway or Cable or Earth (Directly Buried), based on Ambient Temperature of 30° (86°F)

| Size | Temperature Rating of Conductor. See Table 310-13. | | | | | | Size |
|---|---|--|---|---------------------|--|--|-----------------|
| | 60°C (140°F) | 75°C (167°F) | 90°C (194°F) | 60°C (140°F) | 75°C (167°F) | 90°C (194°F) | |
| | 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 | | | Aluminum or Copper-Clad Aluminum | | | AWG kcmil | |
| 18 | ..... | ..... | 14 | ..... | ..... | ..... | ..... |
| 16 | ..... | ..... | 18 | ..... | ..... | ..... | ..... |
| 14 | 20† | 20† | 25† | ..... | ..... | ..... | ..... |
| 12 | 25† | 25† | 30† | 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 |
| 1/0 | 125 | 150 | 170 | 100 | 120 | 135 | 1/0 |
| 2/0 | 145 | 175 | 195 | 115 | 135 | 150 | 2/0 |
| 3/0 | 165 | 200 | 225 | 130 | 155 | 175 | 3/0 |
| 4/0 | 195 | 230 | 260 | 150 | 180 | 205 | 4/0 |
| 250 | 215 | 255 | 290 | 170 | 205 | 230 | 250 |
| 300 | 240 | 285 | 320 | 190 | 230 | 255 | 300 |
| 350 | 260 | 310 | 350 | 210 | 250 | 280 | 350 |
| 400 | 280 | 335 | 380 | 225 | 270 | 305 | 400 |
| 500 | 320 | 380 | 430 | 260 | 310 | 350 | 500 |
| 600 | 355 | 420 | 475 | 285 | 340 | 385 | 600 |
| 700 | 385 | 460 | 520 | 310 | 375 | 420 | 700 |
| 750 | 400 | 475 | 535 | 320 | 385 | 435 | 750 |
| 800 | 410 | 490 | 555 | 330 | 395 | 450 | 800 |
| 900 | 435 | 520 | 585 | 355 | 425 | 480 | 900 |
| 1000 | 455 | 545 | 615 | 375 | 445 | 500 | 1000 |
| 1250 | 495 | 590 | 665 | 405 | 485 | 545 | 1250 |
| 1500 | 520 | 625 | 705 | 435 | 520 | 585 | 1500 |
| 1750 | 545 | 650 | 735 | 455 | 545 | 615 | 1750 |
| 2000 | 560 | 665 | 750 | 470 | 560 | 630 | 2000 |
| Correction Factors | | | | | | | |
| Ambient Temp °C | For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below. | | | | | | Ambient Temp °F |
| 21-25 | 1.08 | 1.05 | 1.04 | 1.08 | 1.05 | 1.04 | 70-77 |
| 26-30 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 78-86 |
| 31-35 | .91 | .94 | .96 | .91 | .94 | .96 | 87-95 |
| 36-40 | .82 | .88 | .91 | .82 | .88 | .91 | 96-104 |
| 41-45 | .71 | .82 | .87 | .71 | .82 | .87 | 105-113 |
| 46-50 | .58 | .75 | .82 | .58 | .75 | .82 | 114-122 |
| 51-55 | .41 | .67 | .76 | .41 | .67 | .76 | 123-131 |
| 56-60 | ..... | .58 | .71 | ..... | .58 | .71 | 132-140 |
| 61-70 | ..... | .33 | .58 | ..... | .33 | .58 | 141-158 |
| 71-80 | ..... | ..... | .41 | ..... | ..... | .41 | 159-176 |
| <p>* Unless otherwise specifically permitted elsewhere in this Code, the overcurrent protection for conductor types marked with an asterisk (*) shall not exceed 15 amperes for No. 14, 20 amperes for No. 12, and 30 amperes for No. 10 copper; or 15 amperes for No. 12 and 25 amperes for No. 10 aluminum and copper-clad aluminum after any correction factors for ambient temperature and number of conductors have been applied.</p> <p>¹ Reprinted with permission from NEC 1999, NFPA 70, the National Electrical Code®, Copyright 1998, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.</p> | | | | | | | |

11.0 INSTALLATION DRAWINGS

Figure 8 Outline Drawing, Single & Multi-Module 65 & 80 kVA



9650 JEROME RD.
IRVINE, CALIFORNIA 92618

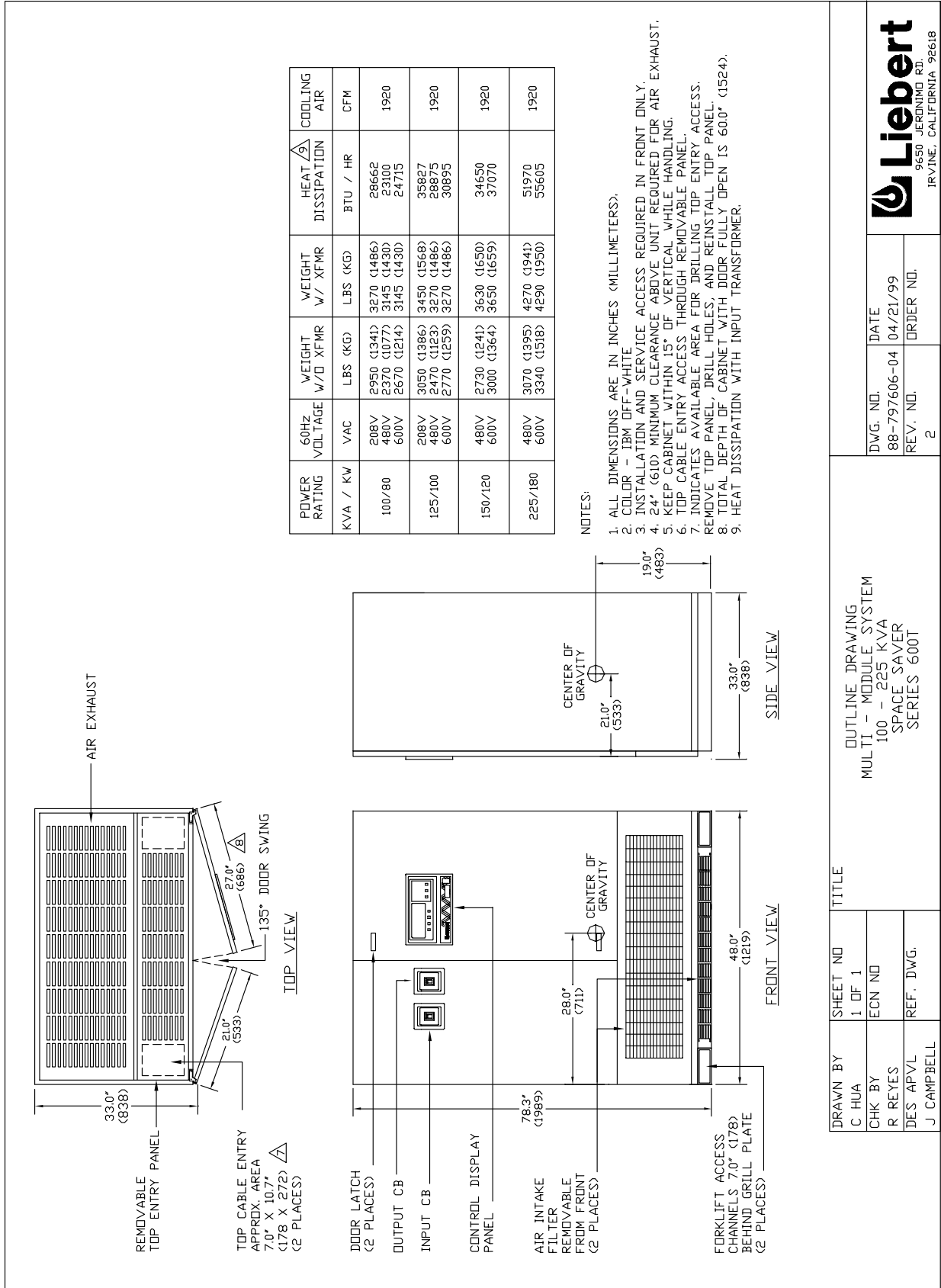
| | |
|--------------|-----------|
| DWG. NO. | DATE |
| 88-797606-01 | 4/21/99 |
| REV. NO. | ORDER NO. |
| 2 | |

FILE NAME: 88-797606-01-03.DWG

OUTLINE DRAWING
SINGLE & MULTI MODULE
65 & 80 KVA
SERIES 600T

| | | |
|------------|-----------|-------|
| DRAWN BY | SHEET NO | TITLE |
| C HUA | 1 OF 1 | |
| CHK BY | ECN NO | |
| R REYES | | |
| DES APVL | REF. DWG. | |
| J CAMPBELL | | |


Figure 9 Outline Drawing, Multi-Module System, 100 - 225 kVA, Space Saver



| POWER RATING KVA / KW | 60HZ VOLTAGE VAC | WEIGHT W/O XFMR LBS (KG) | WEIGHT W/ XFMR LBS (KG) | HEAT DISSIPATION BTU / HR | COOLING AIR CFM |
|--------------------------|----------------------|---|---|------------------------------|--------------------|
| 100/80 | 208V 480V 600V | 2950 (1341) 2370 (1077) 2670 (1214) | 3270 (1486) 3145 (1430) 3145 (1430) | 28662 23100 24715 | 1920 |
| 125/100 | 208V 480V 600V | 3050 (1386) 2470 (1123) 2770 (1259) | 3450 (1568) 3270 (1486) 3270 (1486) | 35827 28875 30855 | 1920 |
| 150/120 | 480V 600V | 2730 (1241) 3000 (1364) | 3630 (1650) 3650 (1659) | 34650 37070 | 1920 |
| 225/180 | 480V 600V | 3070 (1395) 3340 (1518) | 4270 (1941) 4290 (1950) | 51970 55605 | 1920 |

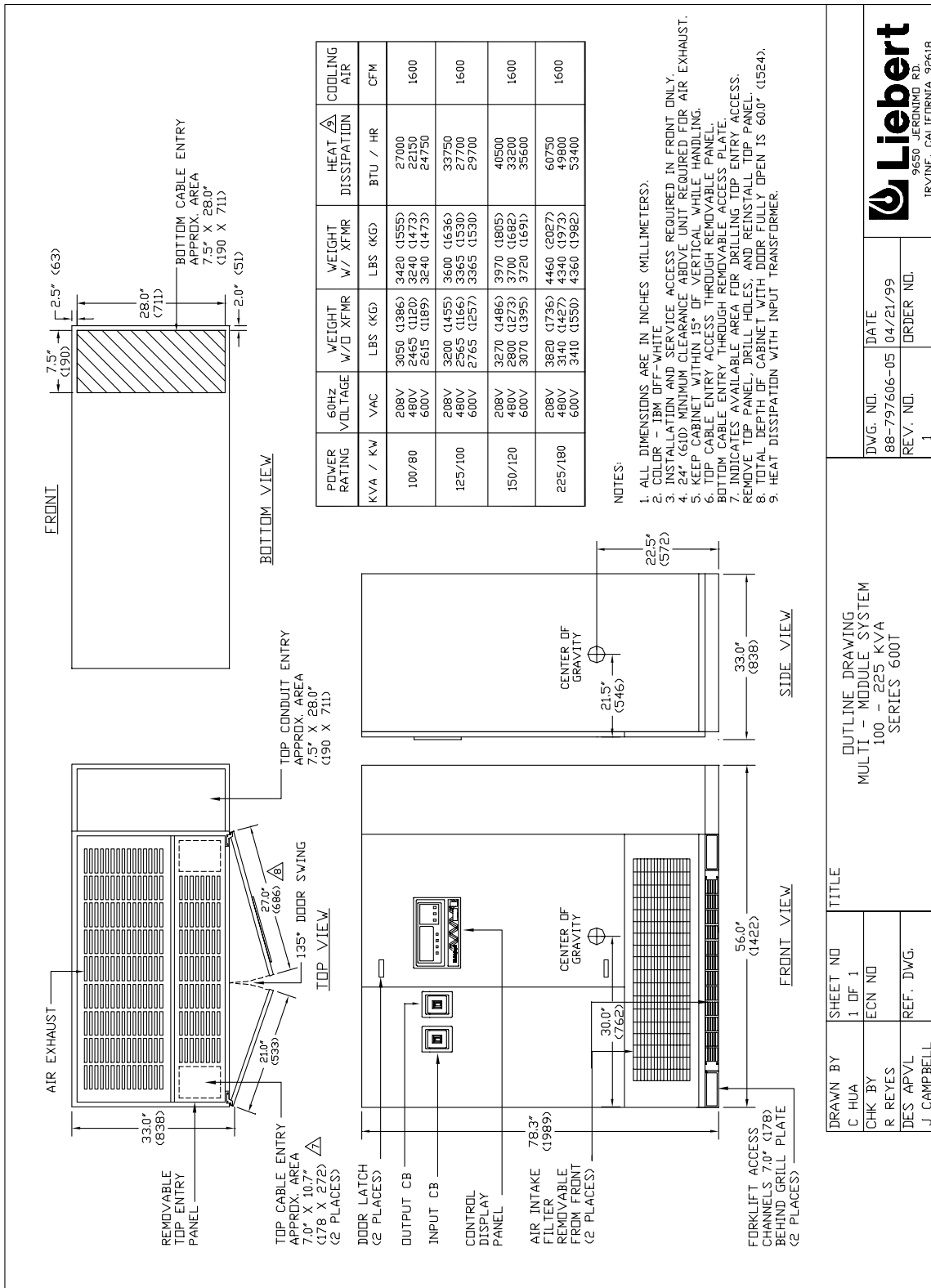
NOTES:

1. ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).
2. COLOR - IBM OFF-WHITE
3. INSTALLATION AND SERVICE ACCESS REQUIRED IN FRONT ONLY.
4. 24" (610) MINIMUM CLEARANCE ABOVE UNIT REQUIRED FOR AIR EXHAUST.
5. KEEP CABINET WITHIN 15" OF VERTICAL WHILE HANDLING.
6. TOP CABLE ENTRY ACCESS THROUGH REMOVABLE PANEL.
7. INDICATES AVAILABLE AREA FOR DRILLING TOP ENTRY ACCESS. REMOVE TOP PANEL, DRILL HOLES, AND REINSTALL TOP PANEL.
8. TOTAL DEPTH OF CABINET WITH DOOR FULLY OPEN IS 60.0" (1524).
9. HEAT DISSIPATION WITH INPUT TRANSFORMER.

| | | | | | |
|-------------------|------------------------|--------------------|-----------|--|------------------|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE OUTLINE DRAWING MULTI - MODULE SYSTEM 100 - 225 KVA SPACE SAVER SERIES 600T | |
| CHK BY R REYES | DES APVL J CAMPBELL | ECN NO | REF. DWG. | DWG. NO. 88-797606-04 | DATE 04/21/99 |
| | | REV. NO. 2 | ORDER NO. |  9650 JEROME RD. IRVINE, CALIFORNIA 92618 | |

FILE NAME: 88-797606-04-02.DWG

Figure 10 Outline Drawing, Multi-Module System, 100 - 225 kVA



| | |
|--------------|-----------|
| DWG. NO. | DATE |
| 88-797606-05 | 04/21/99 |
| REV. NO. | ORDER NO. |
| 1 | |

FILE NAME: 88-797606-05-0.DWG

OUTLINE DRAWING
MULTI - MODULE SYSTEM
100 - 225 KVA
SERIES 600T

| | | |
|------------|-----------|-------|
| DRAWN BY | SHEET NO | TITLE |
| C HUA | 1 OF 1 | |
| CHK BY | ECN NO | |
| R REYES | | |
| DES. APVL | REF. DWG. | |
| J CAMPBELL | | |

Figure 11 Outline Drawing, System Control Cabinet (SCCT), 200-1200 Amps

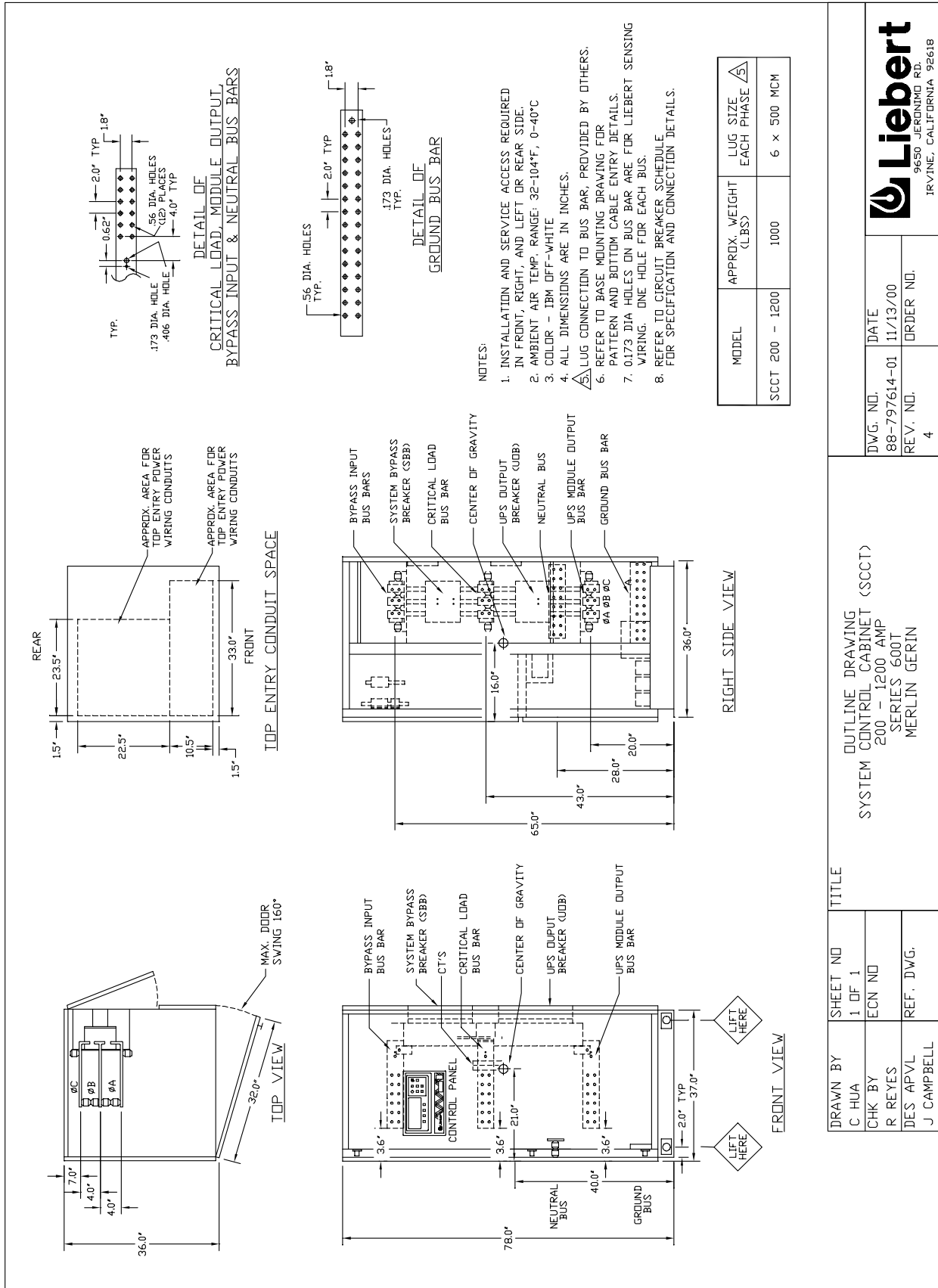


Figure 12 Outline Drawing, System Control Cabinet (SCCT), 1600-2500 Amps

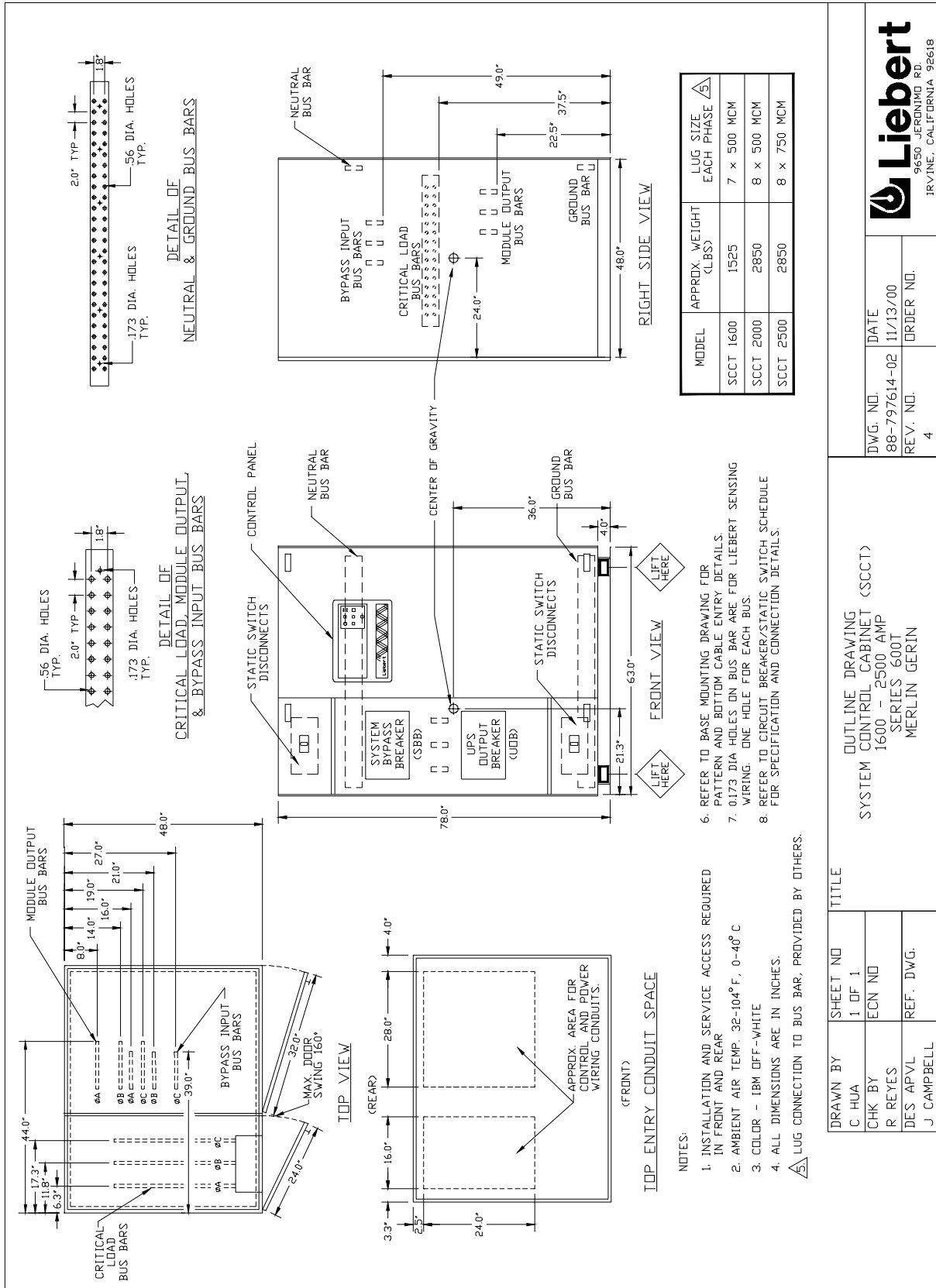


Figure 14 Outline Drawing, System Control Cabinet (SCCP) 560-960 Amps

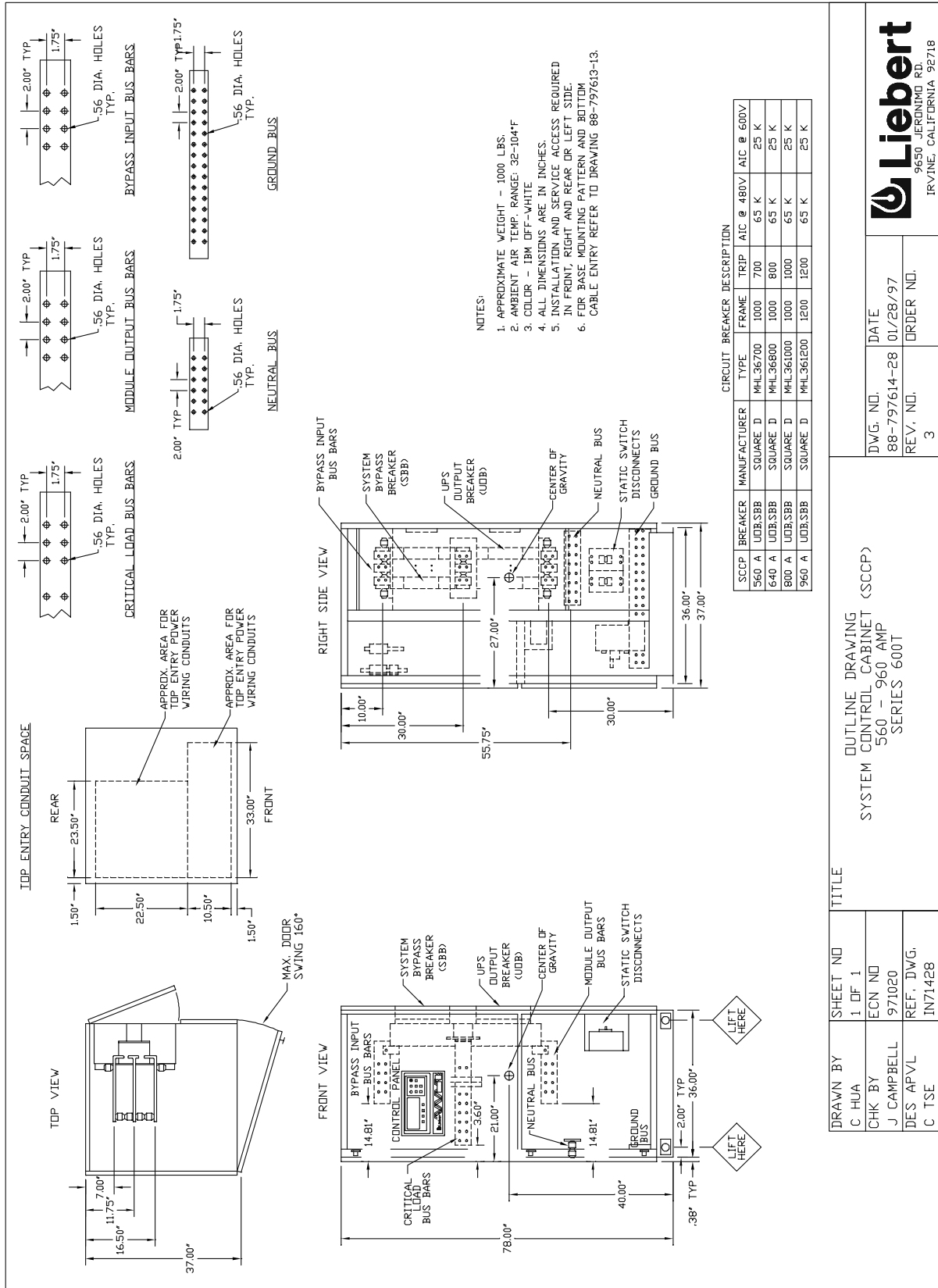
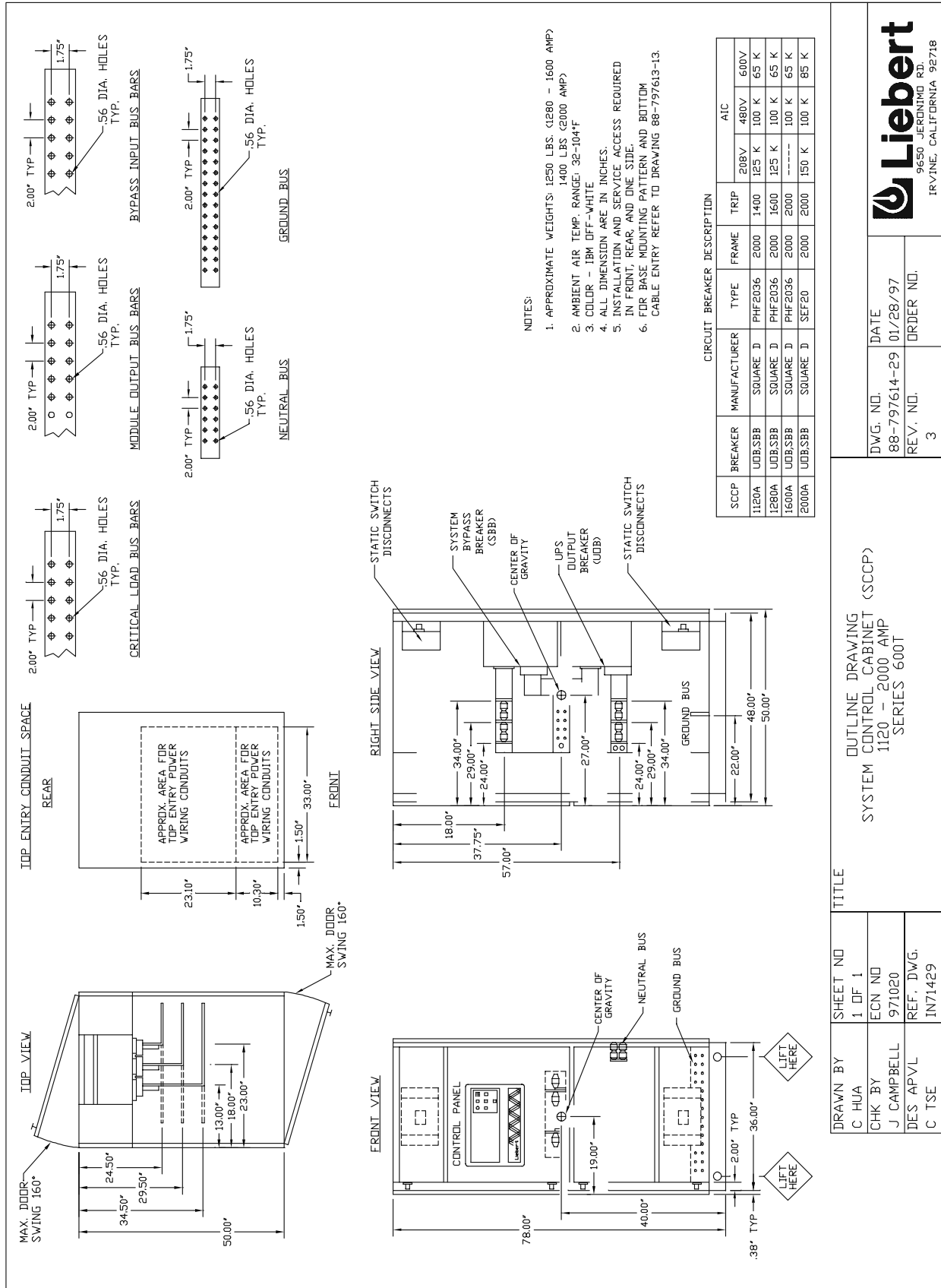


Figure 15 Outline Drawing, System Control Cabinet (SCCP) 1120 to 2000 Amp



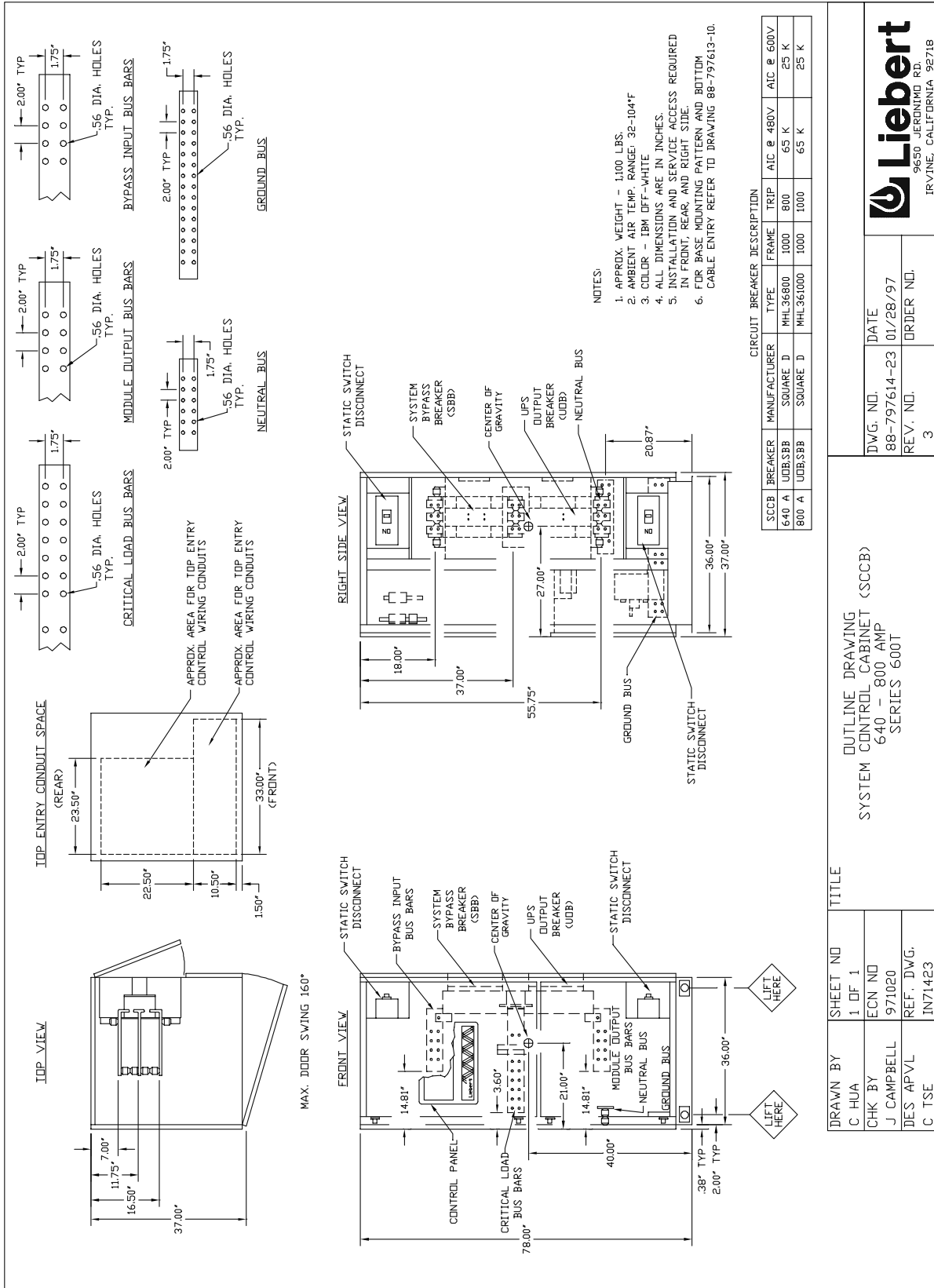
- NOTES:
1. APPROXIMATE WEIGHTS: 1250 LBS. (1280 - 1600 AMP)
1400 LBS (2000 AMP)
 2. AMBIENT AIR TEMP. RANGE: 32-104°F
 3. COLOUR - IBM OFF-WHITE
 4. ALL DIMENSION ARE IN INCHES.
 5. INSTALLATION AND SERVICE ACCESS REQUIRED IN FRONT, REAR, AND ONE SIDE.
 6. FOR BASE MOUNTING PATTERN AND BOTTOM CABLE ENTRY REFER TO DRAWING 88-797613-13.

| CIRCUIT BREAKER DESCRIPTION | | | | | | |
|-----------------------------|---------|--------------|---------|-------|------|---------------------------------|
| SCCP | BREAKER | MANUFACTURER | TYPE | FRAME | TRIP | AIC |
| 1120A | UDB.SBB | SQUARE D | PHF2036 | 2000 | 1400 | 208V 125 K |
| 1280A | UDB.SBB | SQUARE D | PHF2036 | 2000 | 1600 | 480V 100 K |
| 1600A | UDB.SBB | SQUARE D | PHF2036 | 2000 | 2000 | 65 K |
| 2000A | UDB.SBB | SQUARE D | SEF20 | 2000 | 2000 | 100 K 150 K 100 K 85 K |

| | | | |
|---|--|----------------------|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | |
| CHK BY J CAMPBELL | | ECN NO 971020 | |
| DES APVL C TSE | | REF. DWG. IN71429 | |
| TITLE OUTLINE DRAWING SYSTEM CONTROL CABINET (SCCP) 1120 - 2000 AMP SERIES 600T | | | |
| DWG. NO. 88-797614-29 | | DATE 01/28/97 | |
| REV. NO. 3 | | ORDER NO. | |

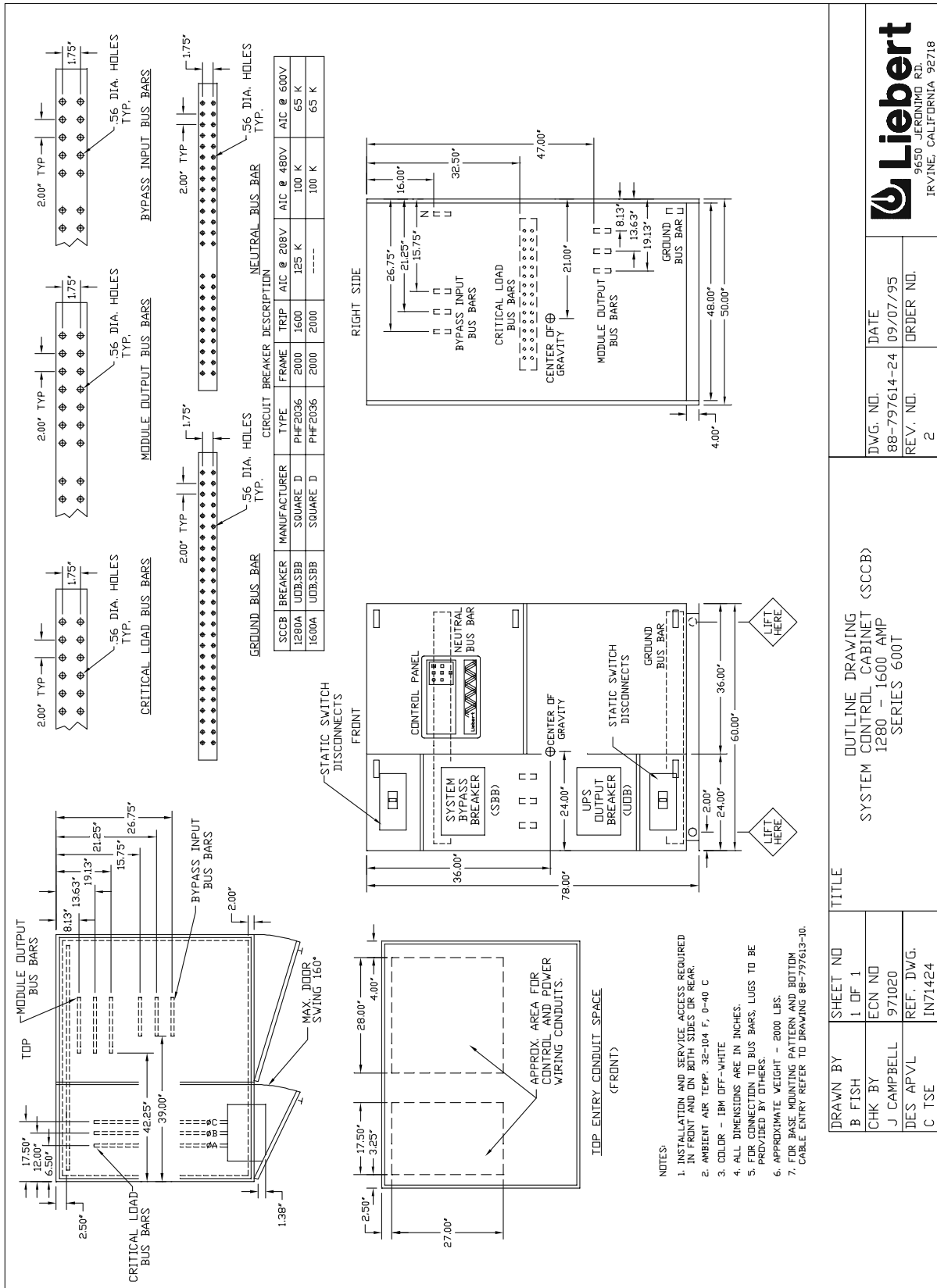


Figure 16 Outline Drawing, System Control Cabinet (SCCB) 640 to 800 Amps



| | | | | | |
|----------------------|--|----------------------|--|---|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE OUTLINE DRAWING SYSTEM CONTROL CABINET (SCCB) 640 - 800 AMP SERIES 600T | |
| CHK BY J CAMPBELL | | ECN NO 971020 | | DATE 01/28/97 | |
| DES APVL C TSE | | REF. DWG. IN71423 | | ORDER NO. 3 | |
| | | | | DWG. NO. 88-797614-23 | |
| | | | | REV. NO. 3 | |
| | | | | FILE NAME: IN71423.DWG | |
| | | | | 9650 JERDIND RD. IRVINE, CALIFORNIA 92718 | |

Figure 17 Outline Drawing, System Control Cabinet (SCCB) 1280 to 1600 Amps



- NOTES:
1. INSTALLATION AND SERVICE ACCESS REQUIRED IN FRONT AND ON BOTH SIDES OR REAR.
 2. AMBIENT AIR TEMP. 32-104 F, 0-40 C
 3. COLOR - IBM OFF-WHITE
 4. ALL DIMENSIONS ARE IN INCHES.
 5. FOR CONNECTION TO BUS BARS, LUGS TO BE PROVIDED BY OTHERS.
 6. APPROXIMATE WEIGHT - 2000 LBS.
 7. FOR BASE MOUNTING PATTERN AND BOTTOM CABLE ENTRY REFER TO DRAWING 88-797613-10.

| | | | | | |
|----------------------|----------------------|--------------------|----------------|---|--|
| DRAWN BY B FISH | | SHEET NO 1 OF 1 | | TITLE OUTLINE DRAWING SYSTEM CONTROL CABINET (SCCB) 1280 - 1600 AMP SERIES 600T | |
| CHK BY J CAMPBELL | ECN NO 971020 | DATE 09/07/95 | ORDER NO. 2 | DWG. NO. 88-797614-24 | |
| DES APVL C TSE | REF. DWG. IN71424 | REV. NO. | | FILE NAME: INT42423V6 | |



Figure 18 Outline Drawing, Battery Power Pack, 65 & 80 kVA

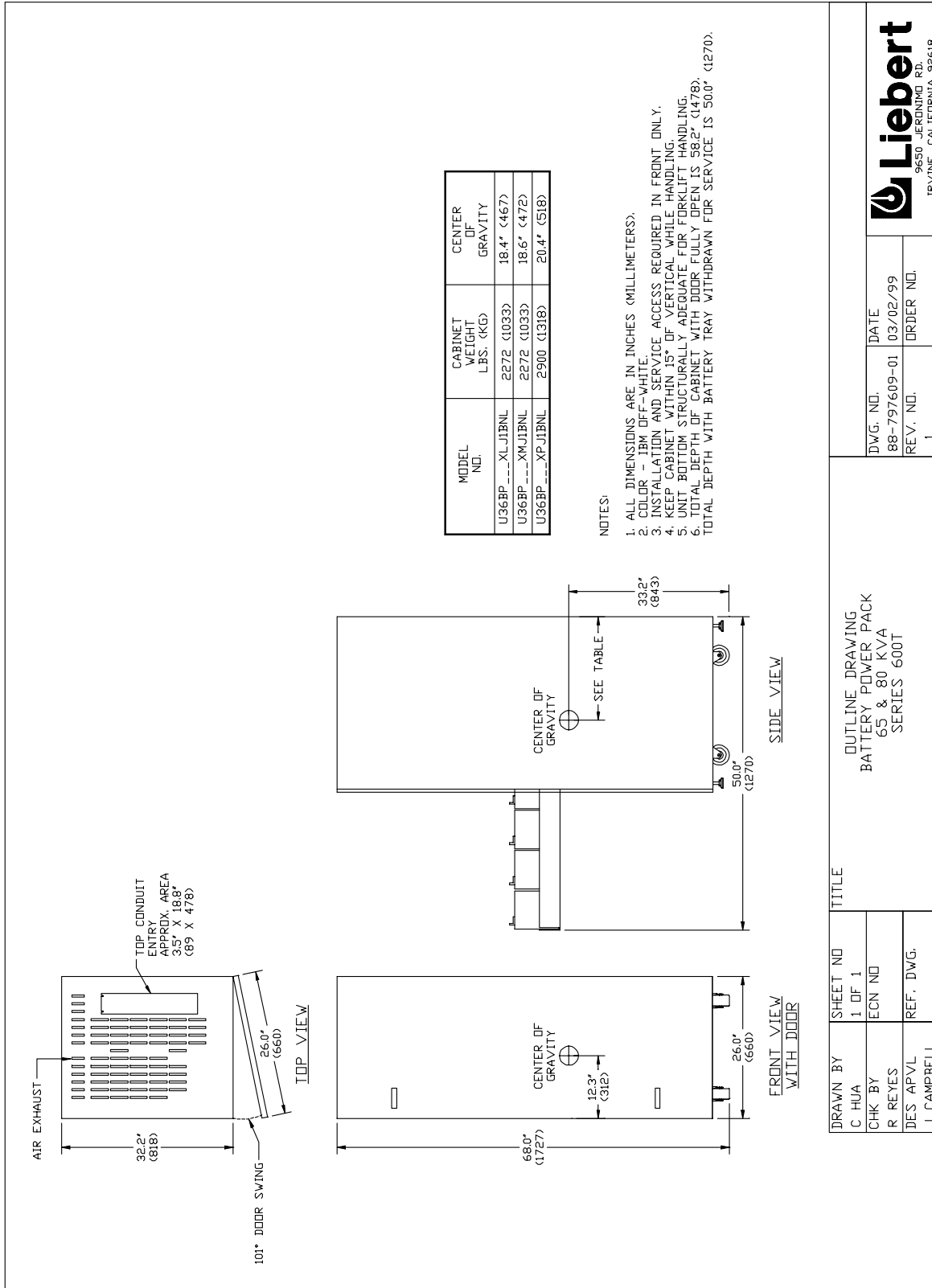


Figure 19 Battery Power Pack, Size A

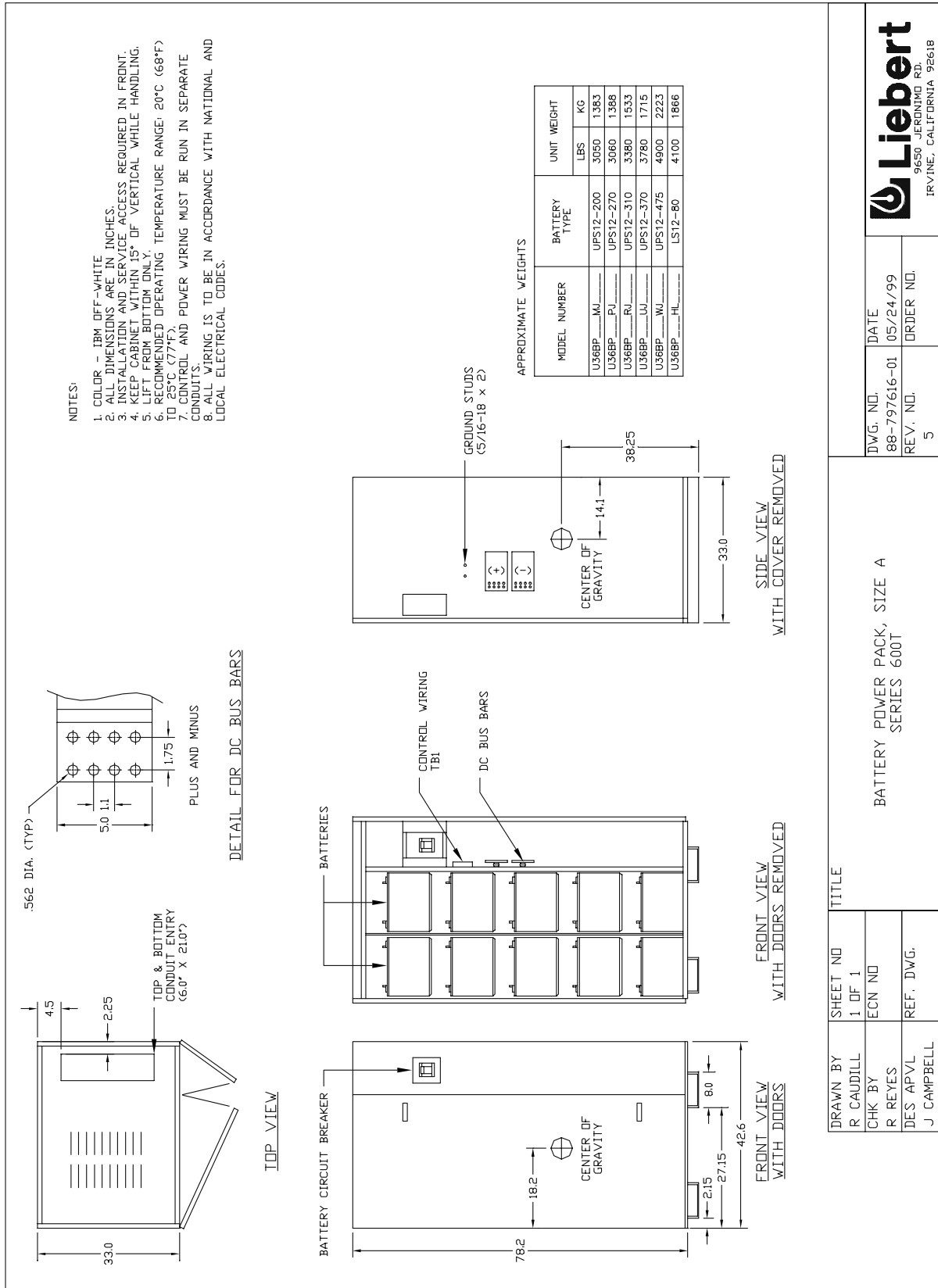


Figure 20 Line-Up Detail, Single or Multi-Module System, 65 & 80 kVA with Battery Cabinets

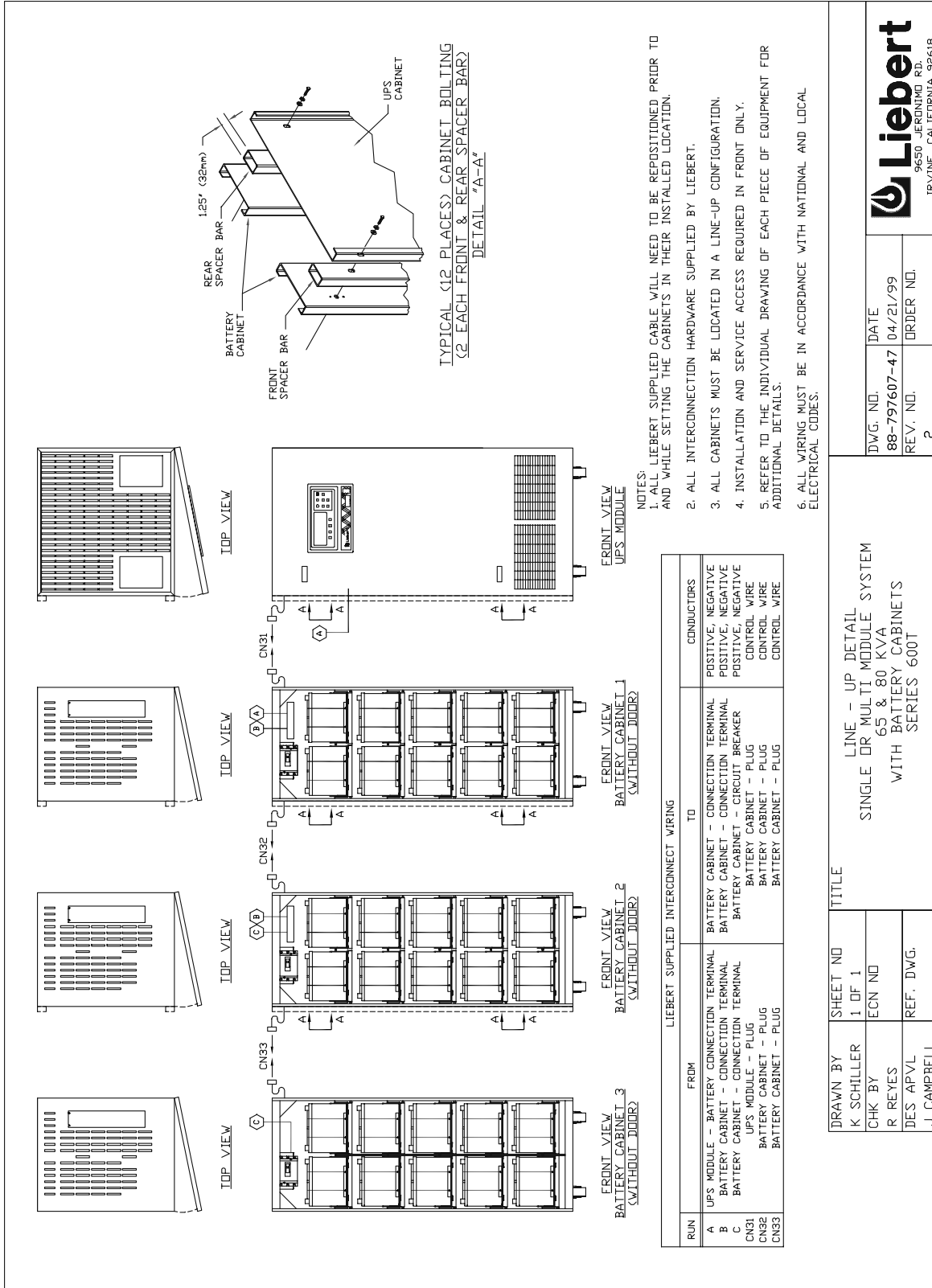
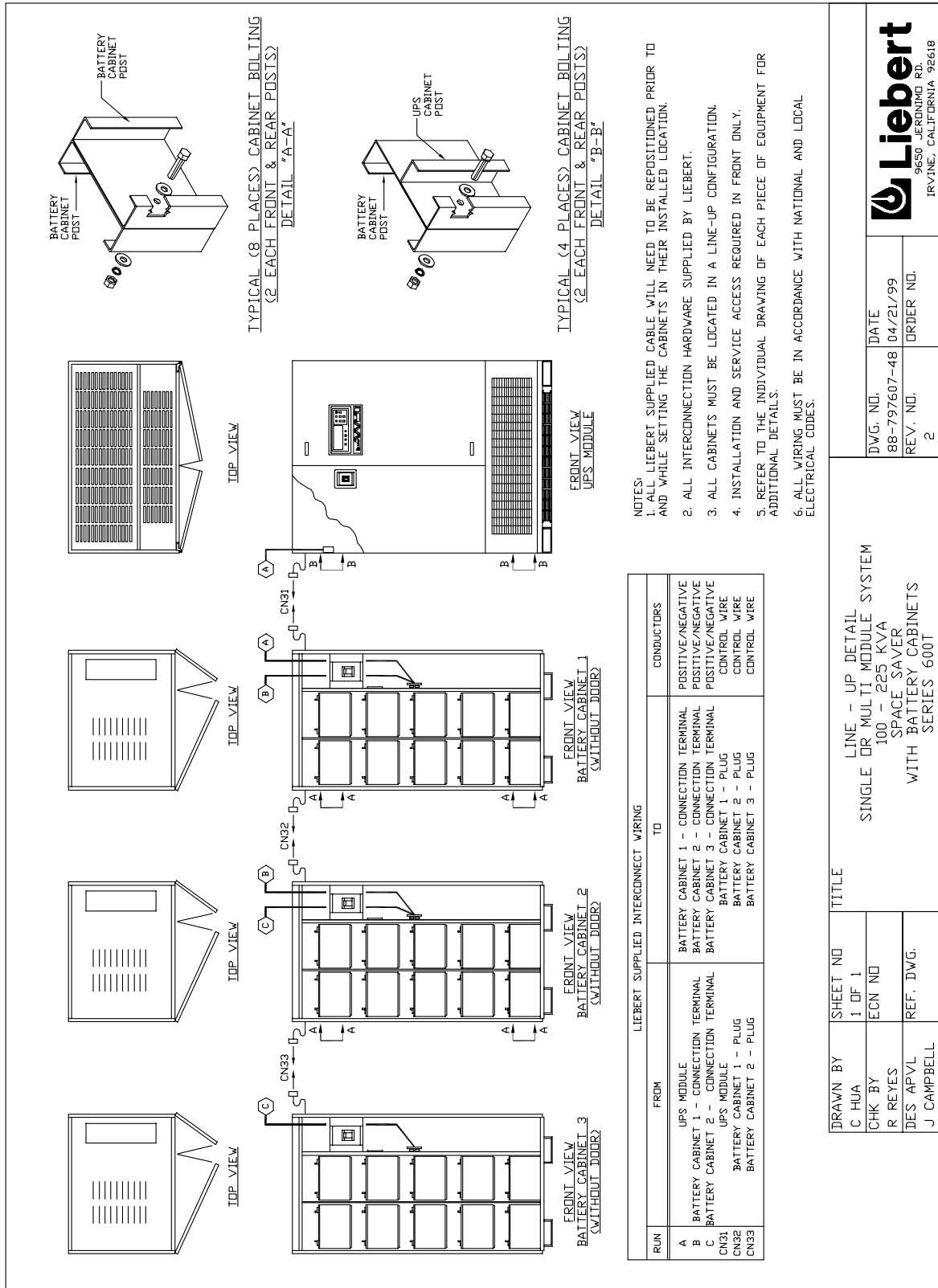


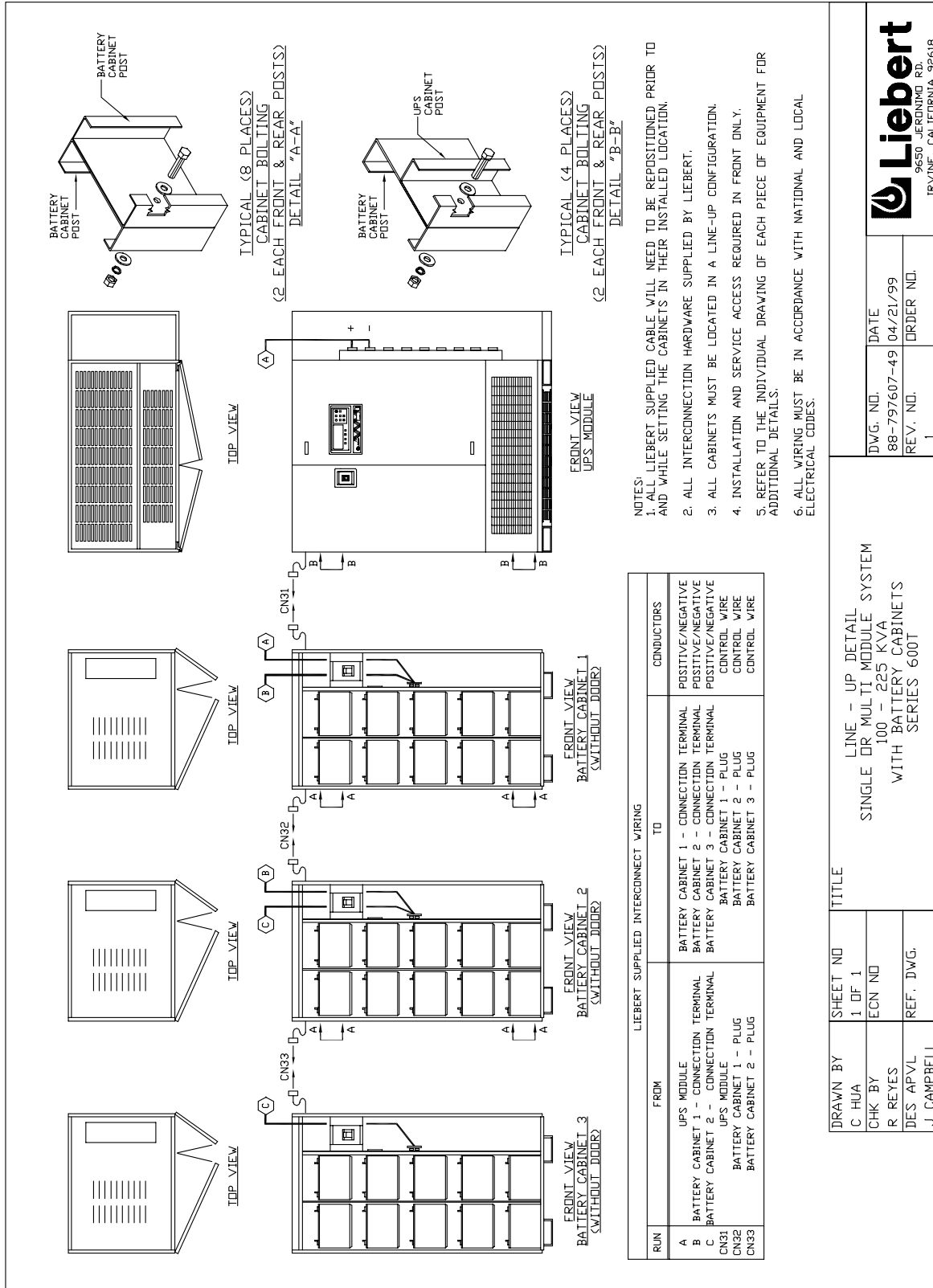
Figure 21 Line-Up Detail, Single or MM System, 100-225 kVA, Space Saver with Battery Cabinets



| | | | | | |
|--------------------------|------------------|--------------------|---------------|--|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE LINE - UP DETAIL | |
| CHK BY R REYES | | ECN NO | | SINGLE OR MULTI MODULE SYSTEM | |
| DES APVL J CAMPBELL | | REF. DWG. | | 100 - 225 KVA SPACE SAVER WITH BATTERY CABINETS SERIES 600T | |
| DWG. NO. 88-797607-48 | DATE 04/21/99 | ORDER NO. | REV. NO. 2 | FILE NAME: 88-797607-48-02.DWG | |



Figure 22 Line-Up Detail, Single or Multi-Module System, 100-225 kVA, with Battery Cabinets



| | | | | | |
|------------------------|--|--------------------|--|---|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE LINE - UP DETAIL SINGLE OR MULTI MODULE SYSTEM 100 - 225 KVA WITH BATTERY CABINETS SERIES 600T | |
| CHK BY R REYES | | ECN NO | | DWG. NO. 88-797607-49 | |
| DES/APVL J CAMPBELL | | REF. DWG. | | DATE 04/21/99 | |
| | | | | REV. NO. 1 | |
| | | | | ORDER NO. | |
| | | | | FILE NAME: 88-797607-49-01.DWG | |

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9650 JERDIND RD.
IRVINE, CALIFORNIA 92618

Figure 23 Base Mounting Patterns, System Control Cabinets (SCCT), 200 & 1200 Amps

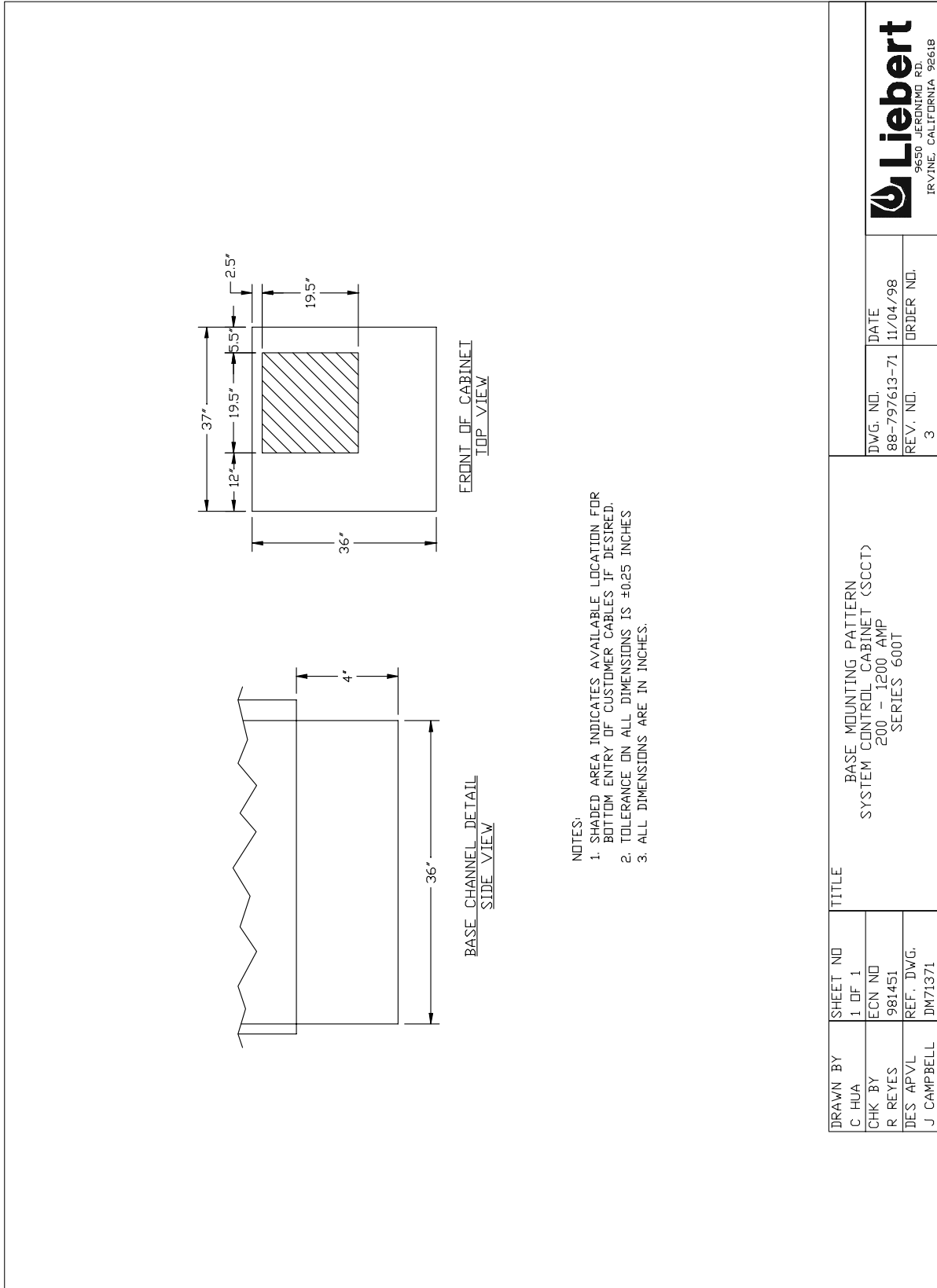


Figure 24 Base Mounting Patterns, System Control Cabinets (SCCT), 1600-2500 Amps

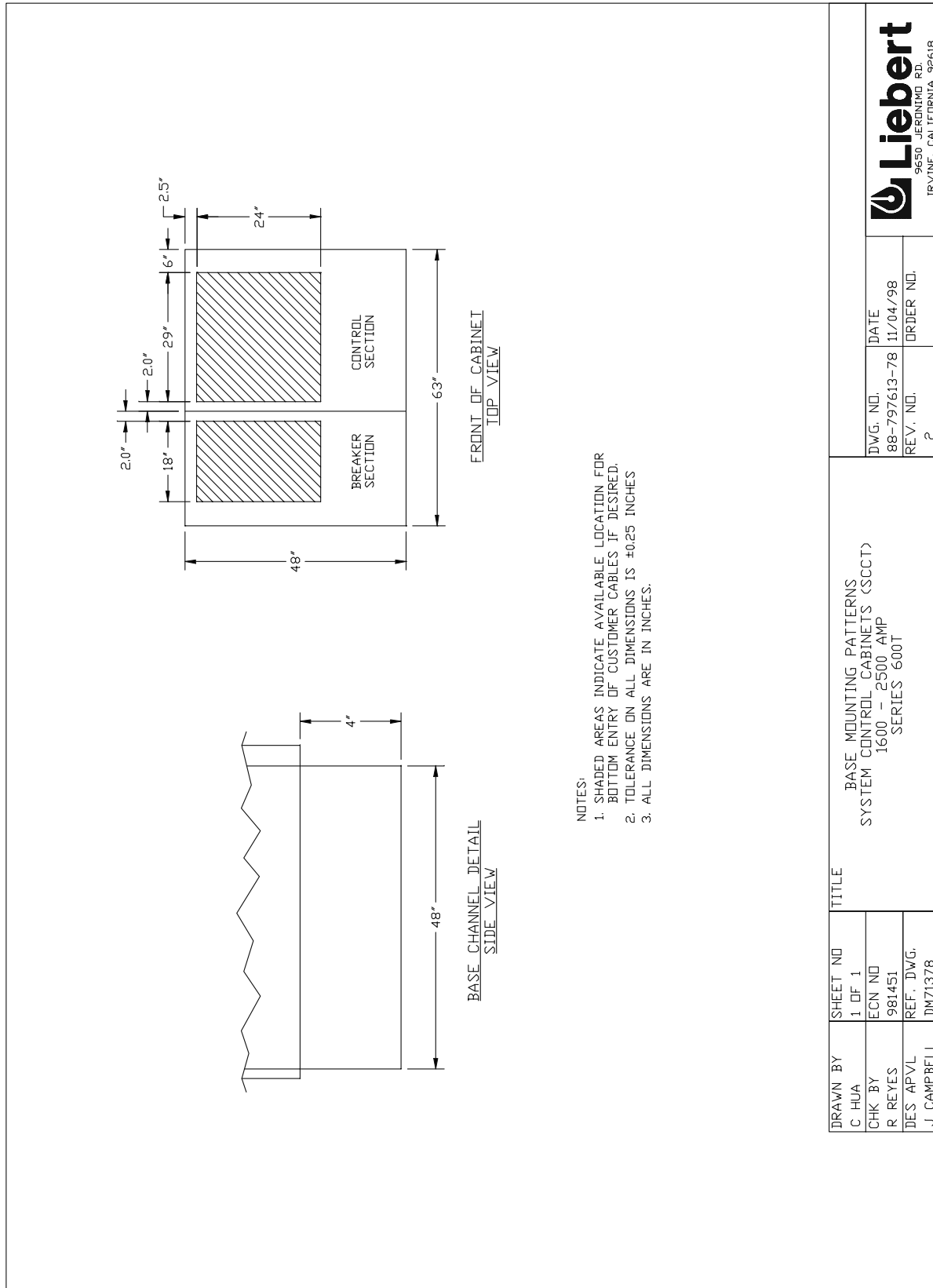
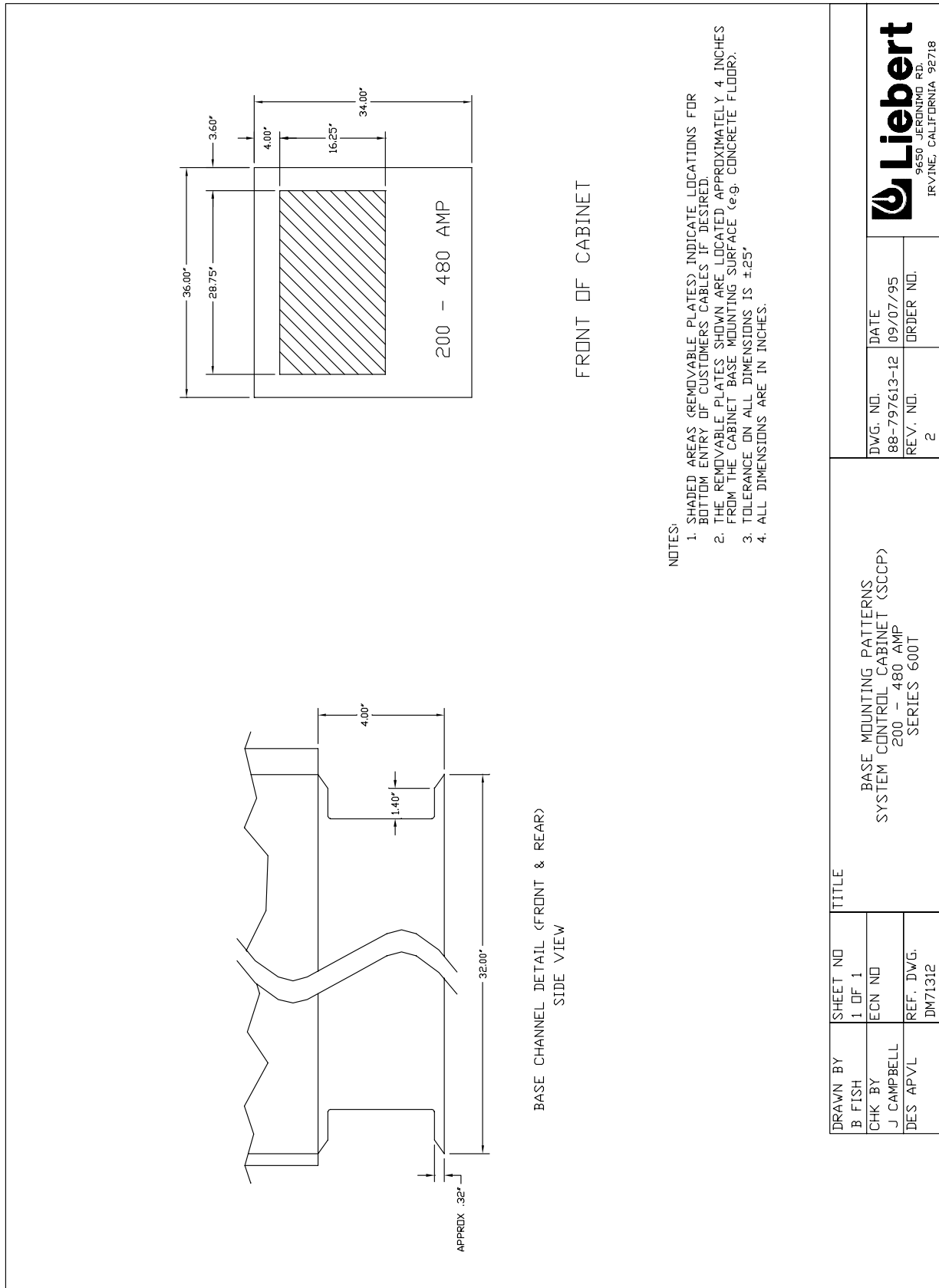



Figure 25 Base Mounting Patterns, System Control Cabinets (SCCP), 200-480 Amps



NOTES:

1. SHADED AREAS (REMOVABLE PLATES) INDICATE LOCATIONS FOR BOTTOM ENTRY OF CUSTOMER'S CABLES IF DESIRED.
2. THE REMOVABLE PLATES SHOWN ARE LOCATED APPROXIMATELY 4 INCHES FROM THE CABINET BASE MOUNTING SURFACE (e.g. CONCRETE FLOOR).
3. TOLERANCE ON ALL DIMENSIONS IS $\pm .25$ '
4. ALL DIMENSIONS ARE IN INCHES.

| | | | | |
|----------------------|--|----------------------|--|------------------|
| DRAWN BY B FISH | | SHEET NO 1 OF 1 | TITLE BASE MOUNTING PATTERNS SYSTEM CONTROL CABINET (SCCP) 200 - 480 AMP SERIES 600T | |
| CHK BY J CAMPBELL | | ECN NO | DWG. NO. 88-797613-12 | DATE 09/07/95 |
| DES. APVL | | REF. DWG. DM71312 | REV. NO. 2 | ORDER NO. |
| | | |  9650 JERONIMO RD. IRVINE, CALIFORNIA 92718 | |

FILE NAME: DM71312.DWG

Figure 26 Base Mounting Patterns, System Control Cabinets (SCCP), 560-2000 Amps

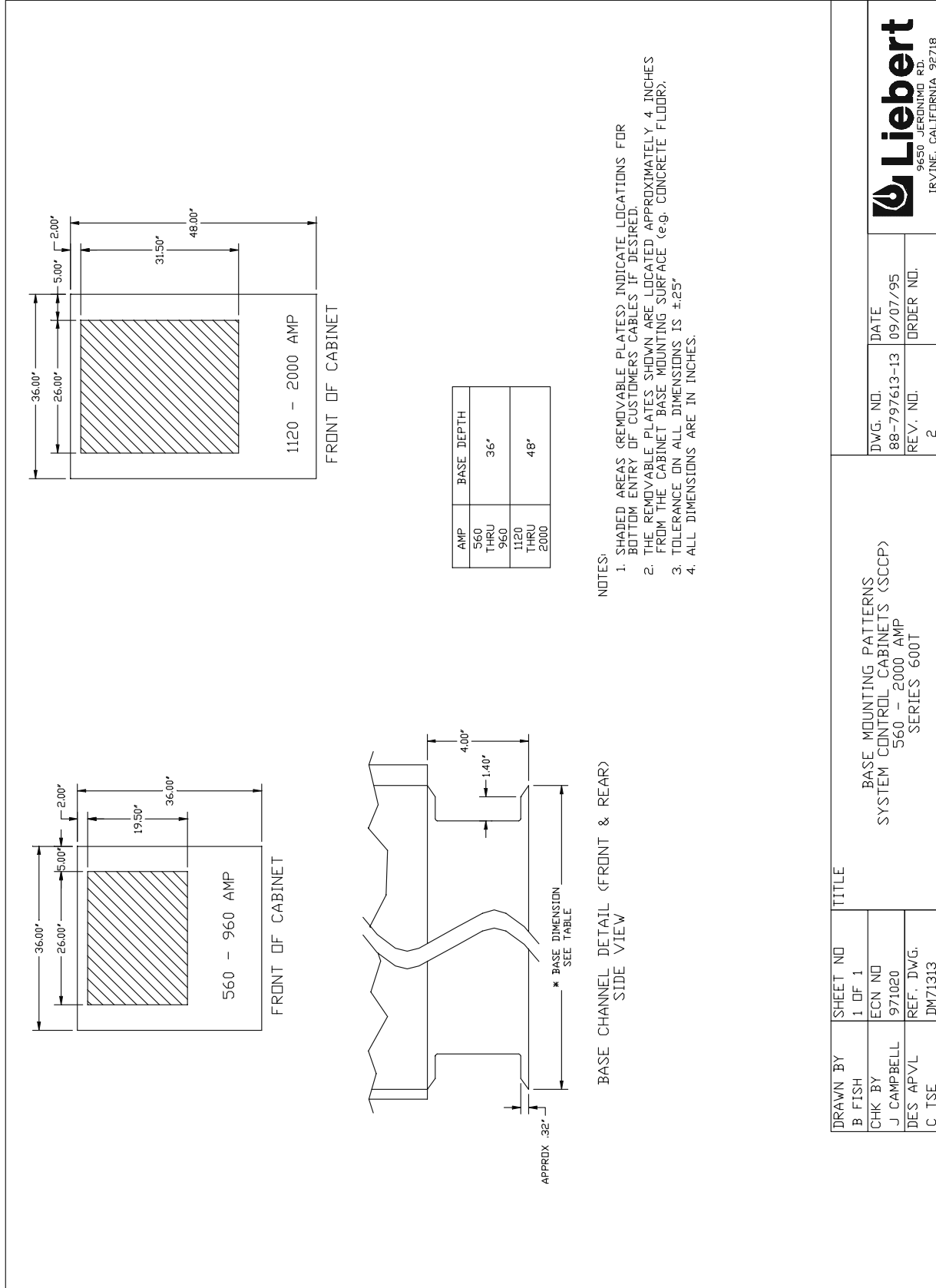
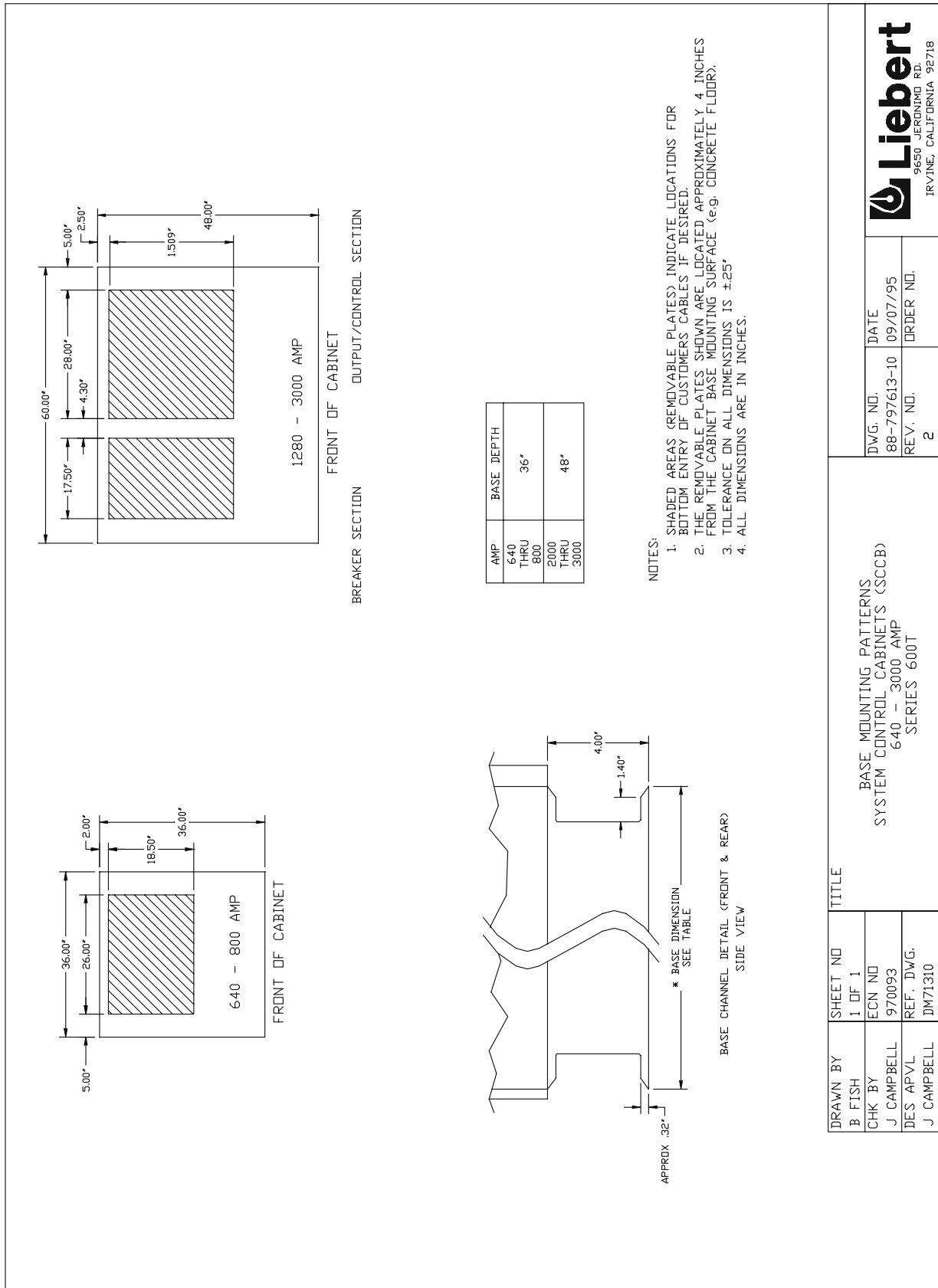


Figure 27 Base Mounting Patterns, System Control Cabinet (SCCB), 640-3000 Amps



| | |
|--------------|-----------|
| DWG. NO. | DATE |
| 88-797613-10 | 09/07/95 |
| REV. NO. | ORDER NO. |
| 2 | |

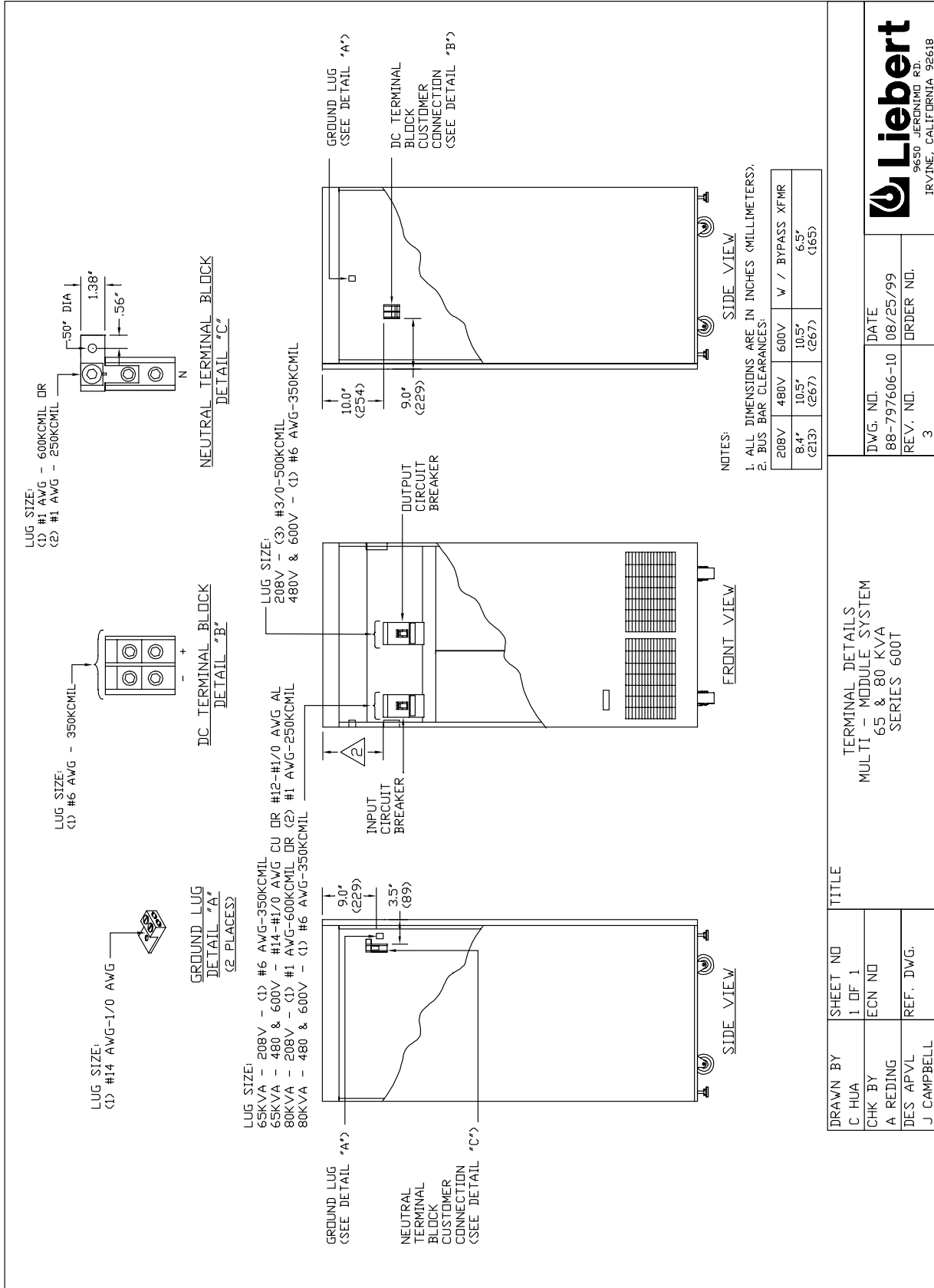
FILE NAME: DM71310.DWG

TITLE

BASE MOUNTING PATTERNS
SYSTEM CONTROL CABINETS (SCCB)
640 - 3000 AMP
SERIES 600T

| | |
|-----------------|------------------|
| DRAWN BY | SHEET NO |
| B FISH | 1 OF 1 |
| CHK BY | ECN NO |
| J CAMPBELL | 970093 |
| DES APVL | REF. DWG. |
| J CAMPBELL | DM71310 |

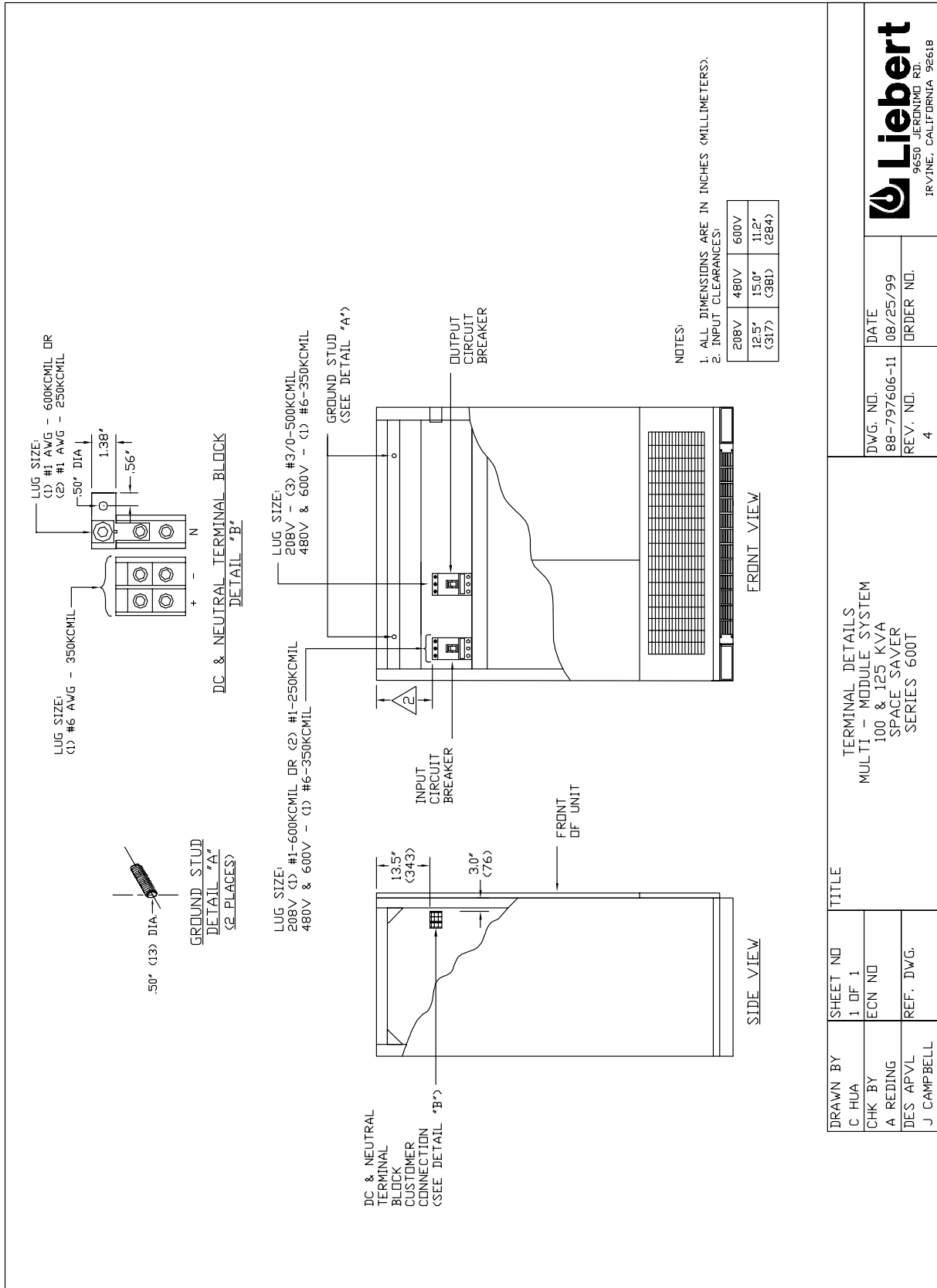
Figure 28 Terminal Details, 65 & 80 kVA Module



| | | | | | |
|--------------|--|-----------|--|-----------------------|--|
| DRAWN BY | | SHEET NO | | TITLE | |
| C HUA | | 1 OF 1 | | TERMINAL DETAILS | |
| CHK BY | | ECN NO | | MULTI - MODULE SYSTEM | |
| A REDING | | | | 65 & 80 KVA | |
| DES: APVL | | REF. DWG. | | SERIES 600T | |
| J CAMPBELL | | | | | |
| DWG. NO. | | DATE | | | |
| 88-797606-10 | | 08/25/99 | | | |
| REV. NO. | | ORDER NO. | | | |
| 3 | | | | | |



Figure 29 Terminal Details, Multi-Module System, 100 & 125 kVA Space Saver



| | | | | | |
|--------------------------|--|--------------------|--|---|--|
| DRAWN BY C. HUA | | SHEET NO 1 OF 1 | | TITLE TERMINAL DETAILS | |
| CHK BY A. REDDING | | ECN NO | | MULTI - MODULE SYSTEM | |
| DES APVL J. CAMPBELL | | REF. DWG. | | 100 & 125 KVA SPACE SAVER SERIES 600T | |
| DWG. NO. 88-797606-11 | | DATE 08/25/99 | | REV. NO. 4 | |
| REV. NO. 4 | | ORDER NO. | | IRVINE, CALIFORNIA 92618 | |



Figure 30 Terminal Details, Multi-Module System, 150 & 225 kVA, Space Saver

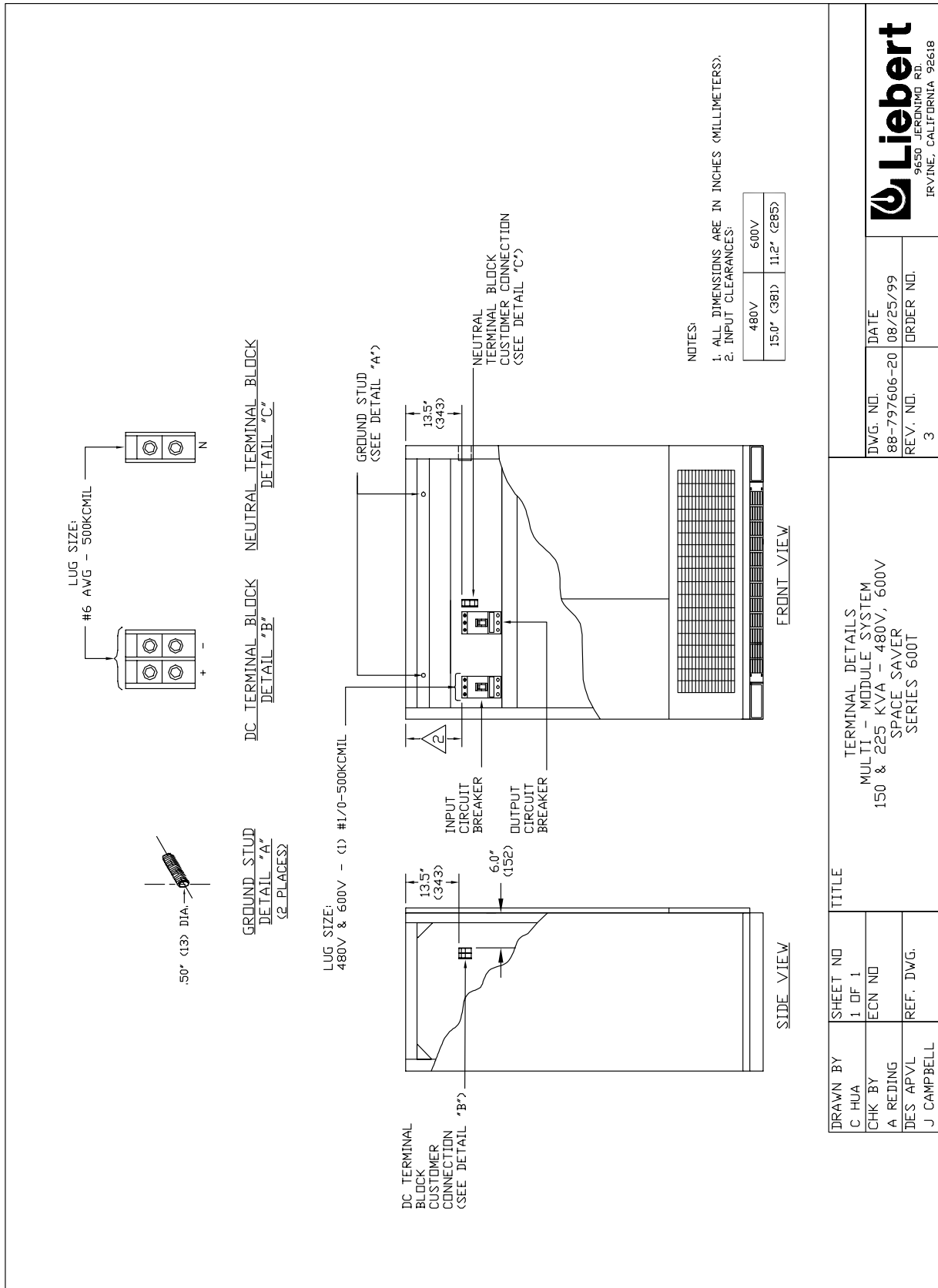
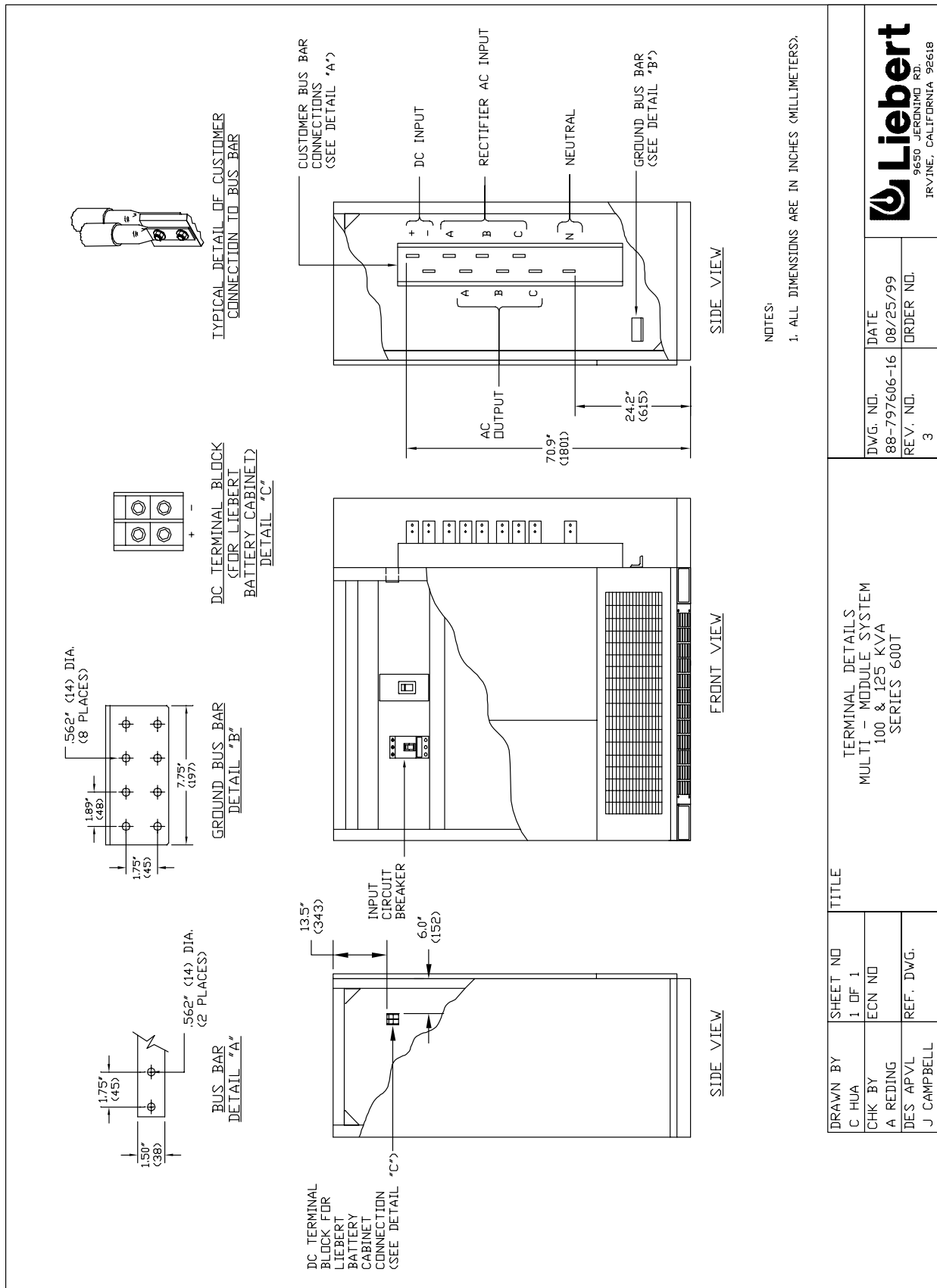


Figure 31 Terminal Details, Multi-Module System, 100 & 125 kVA



| | | | | | |
|--------------------------|--|--------------------|--|--|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE TERMINAL DETAILS MULTI - MODULE SYSTEM 100 & 125 KVA SERIES 600T | |
| CHK BY A REDING | | ECN NO | | DWG. NO. 88-797606-16 | |
| DES. APV/L J CAMPBELL | | REF. DWG. | | DATE 08/25/99 | |
| | | | | ORDER NO. | |



REV. NO. 3
 FILE NAME: 88-797606-16-03.DWG

Figure 33 Control Connection Location Diagram, 65 & 80 kVA

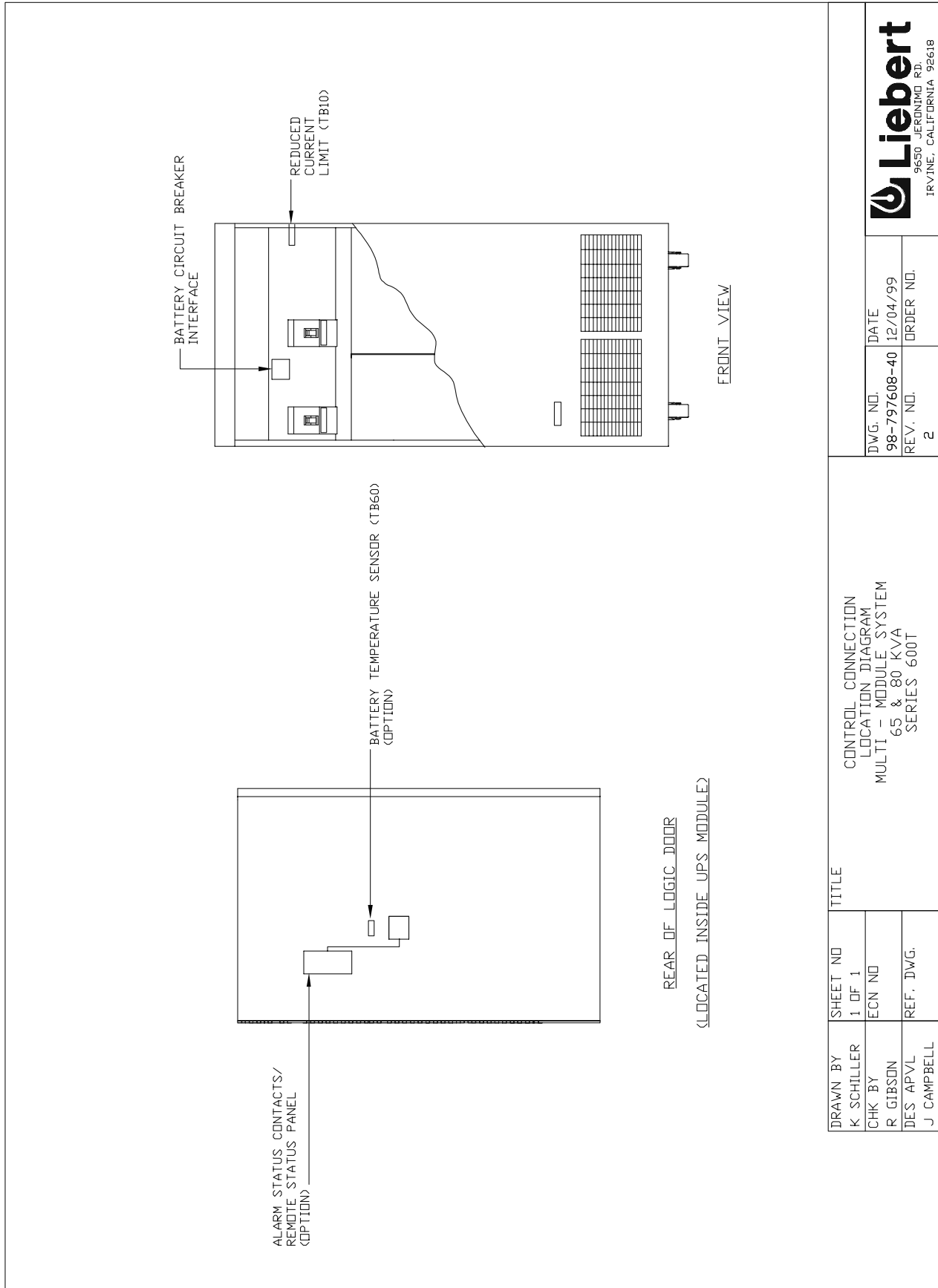


Figure 34 Control Connection Location Diagram, 100-225 kVA

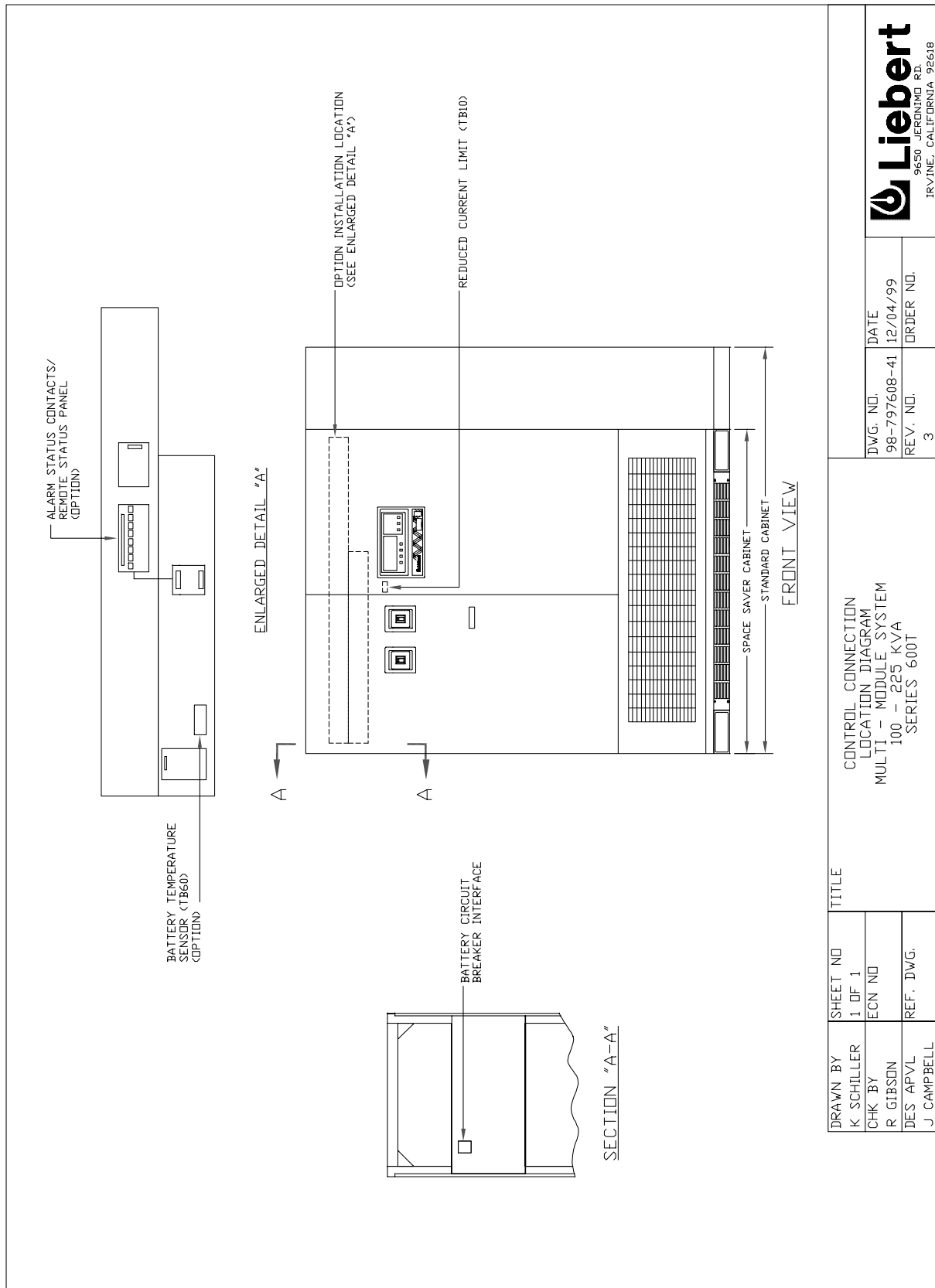
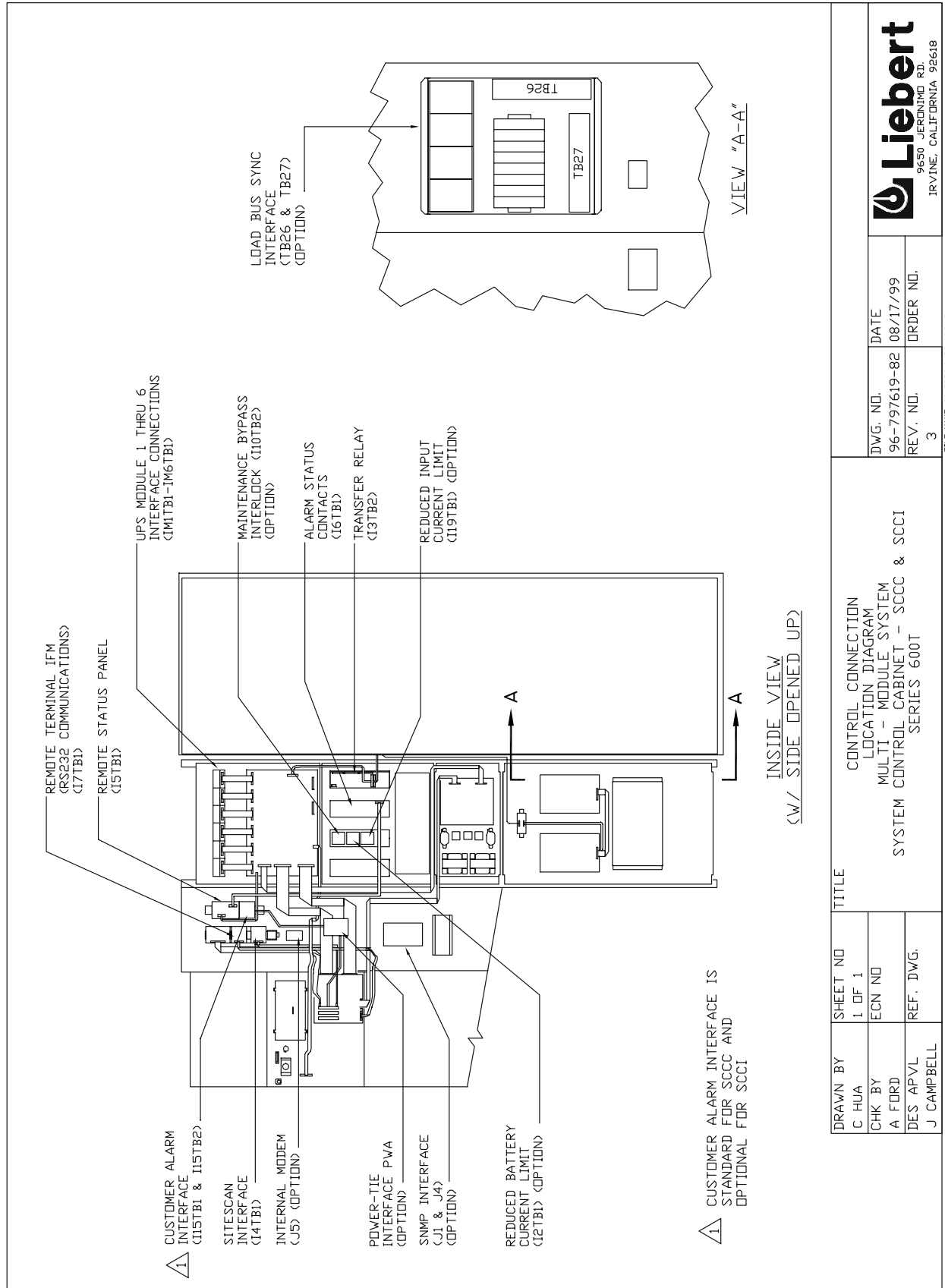


Figure 35 Control Connection Location Diagram, SCCC & SCCI




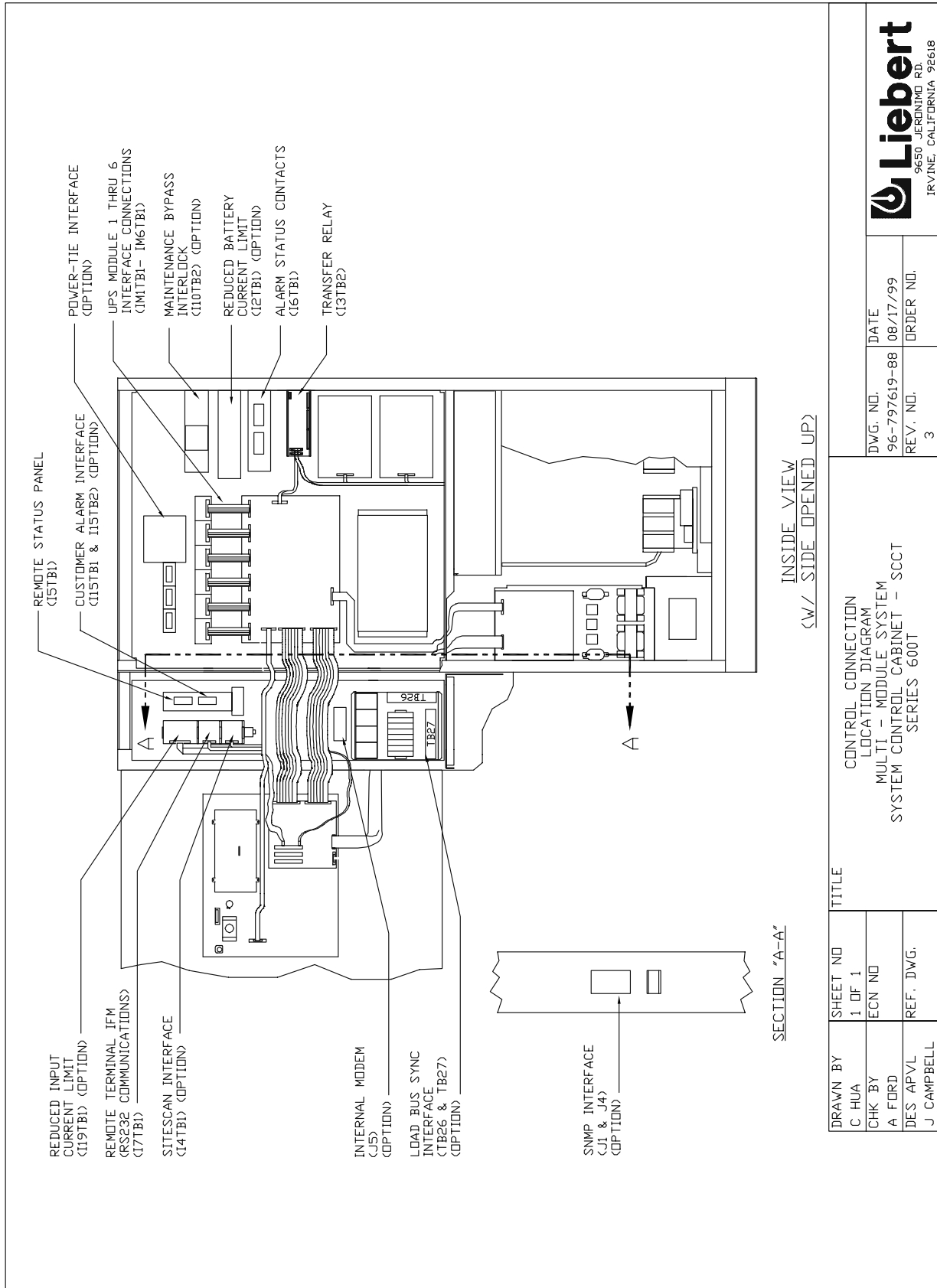
| | | | | | |
|--------------------------------|--|--------------------|--|---|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE CONTROL CONNECTION LOCATION DIAGRAM | |
| CHK BY A FORD | | ECN NO | | MULTI - MODULE SYSTEM | |
| DES APVL J CAMPBELL | | REF. DWG. | | SYSTEM CONTROL CABINET - SCCC & SCCI SERIES 600T | |
| DWG. NO. 96-797619-82 | | DATE 08/17/99 | | REV. NO. 3 | |
| REV. NO. 3 | | ORDER NO. | |  9650 JERDIND RD. IRVINE, CALIFORNIA 92618 | |
| FILE NAME: 96-797619-82-03.DWG | | | | | |

Figure 36 Control Connection - Location Diagram, System Control Cabinet - SCCT



| | | | | |
|-------------------------|--------------------|--|--|------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CONTROL CONNECTION LOCATION DIAGRAM MULTI - MODULE SYSTEM SYSTEM CONTROL CABINET - SCCT SERIES 600T | DWG. NO. 96-797619-88 | DATE 08/17/99 |
| CHK BY A FORD | ECN NO | | REV. NO. 3 | ORDER NO. |
| DES. APVL J CAMPBELL | REF. DWG. | |  9650 JERONIMO RD. IRVINE, CALIFORNIA 92618 | |

Figure 37 Control Wiring, External Interconnect Diagram

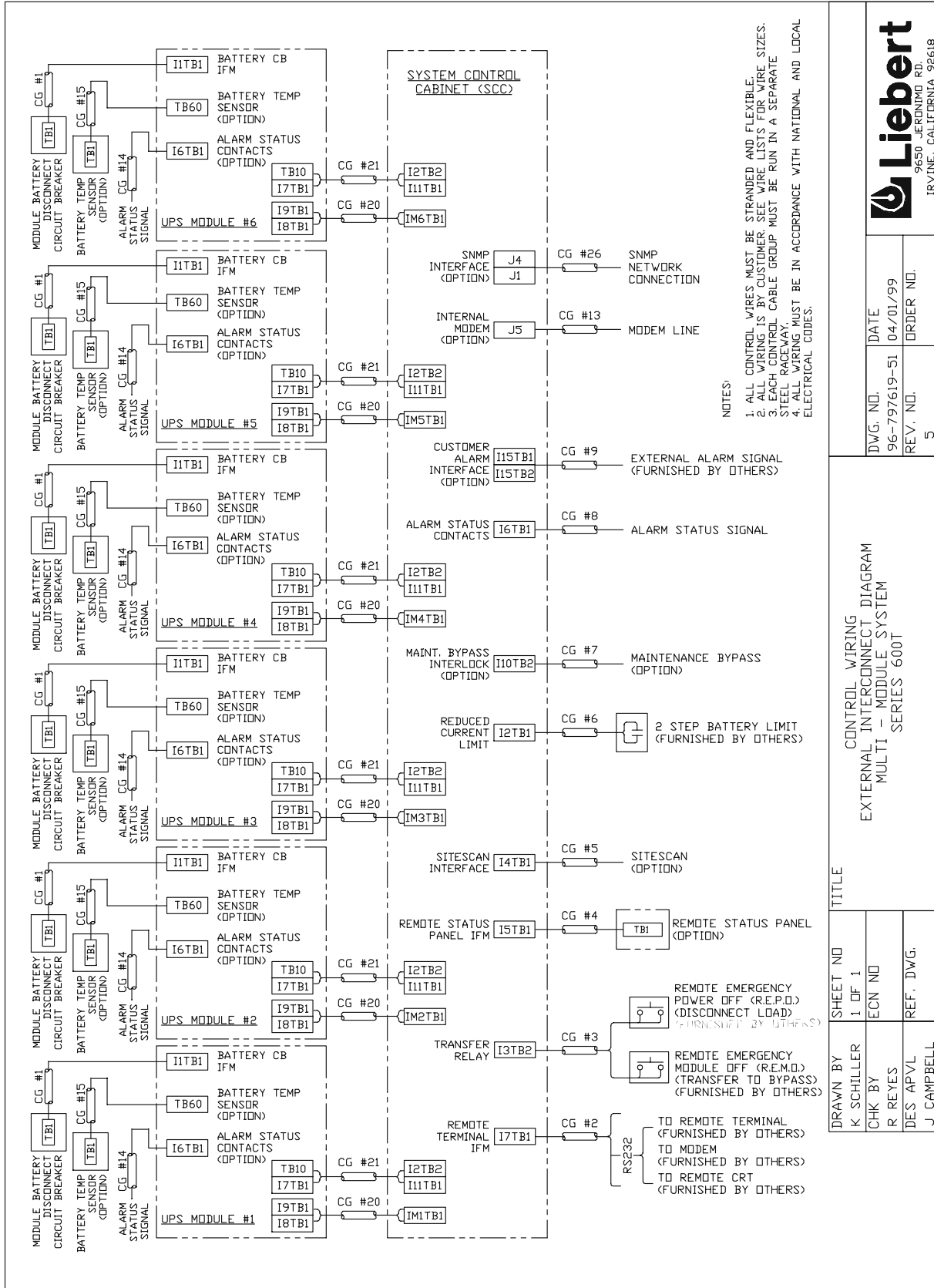



Figure 38 Control Wire List, External Interconnections, UPS Module

| WIRE NO. | TERMINAL DESIGNATION | | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|----------------------|-------|-----------------|-----------------|-----------------|-------|-----------------------|-------------------------|---------|
| | FROM | TO | | | | | | | |
| CABLE GROUP #1 (BATTERY CB IFM) FROM I1 IN UPS MODULE TO TB1 ON MODULE BATTERY DISCONNECT (MBD) | | | | | | | | | |
| 901 | I1TB1-1 | TB1-1 | TRIP SIGNAL (+) | + 24VDC | 100mA | | 1/C #14 (2.5 mmsq) | 500 FT. (150 METERS) | |
| 902 | I1TB1-2 | TB1-2 | TRIP SIGNAL (-) | - 24VDC | 100mA | | | | |
| 903 | I1TB1-7 | TB1-7 | AUX COMM. | 24VDC | 100mA | | | | |
| 904 | I1TB1-8 | TB1-8 | AUX N.D. | 24VDC | 100mA | | | | |

NOTES:

- EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
- REFER TO UPS MODULE CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
- FOR OPTION WIRING CONNECTIONS, REFER TO INDIVIDUAL CONTROL WIRE LISTS.
- ALL EXTERNAL WIRE FURNISHED BY OTHERS.
- N.D. = NORMALLY OPEN, COMM. = COMMON.
- ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | | |
|------------------------|--------------------|--|--------------------------|------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS STANDARD WIRING | DWG. NO. 96-797619-60 | DATE 08/23/00 |
| CHK BY R REYES | ECN NO | MULTI - MODULE SYSTEM - UPS MODULE SERIES 600T | REV. NO. 5 | ORDER NO. |
| DES APVL J CAMPBELL | REF. DWG. | | | |



 9650 JERONIMO RD.
 IRVINE, CALIFORNIA 92618

FILE NAME: 96-797619-60-03.DWG

Figure 39 Control Wire List, External Interconnections, Standard Wiring, SCCT, Part 1 of 3

| WIRE NO. | TERMINAL DESIGNATION FROM | TO | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|---------------------------|--------|------------------------|-----------------|-----------------|-------|---|----------------------|---------------------------------|
| CABLE GROUP #2 (REMOTE TERMINAL IFM - RS232) FROM I7 IN SYSTEM CONTROL CABINET TO CUSTOMER CONNECTION (F.B.D) | | | | | | | | | |
| 700 | I7TB1-1 | F.B.D. | REM. TERM. T X D | 24VDC | 100mA | | 3/C #22 (0.50 mmsq) TWISTED SHIELDED | 100 FT. (30 METERS) | BELDEN 9939 OR EQUAL SEE NOTE 2 |
| 701 | I7TB1-2 | F.B.D. | REM. TERM. R X D | 24VDC | 100mA | | | | |
| 702 | I7TB1-3 | F.B.D. | REM. TERM. GND | 24VDC | 100mA | | | | |
| --- | I7TB1-4 | F.B.D. | REM. TERM. SHD | 24VDC | 100mA | | | | |
| 703 | I7TB1-6 | F.B.D. | MODEM DCD | 24VDC | 100mA | | 4/C #22 (0.50 mmsq) TWISTED SHIELDED | | |
| 704 | I7TB1-7 | F.B.D. | MODEM T X D | 24VDC | 100mA | | | | |
| 705 | I7TB1-8 | F.B.D. | MODEM R X D | 24VDC | 100mA | | | | |
| 706 | I7TB1-9 | F.B.D. | MODEM GND | 24VDC | 100mA | | | | |
| --- | I7TB1-10 | F.B.D. | MODEM SHD | 24VDC | 100mA | | | | |
| 707 | I7TB1-11 | F.B.D. | REM. CRT T X D | 24VDC | 100mA | | 2/C #22 (0.50 mmsq) TWISTED PAIR SHIELDED | | |
| 708 | I7TB1-12 | F.B.D. | REM. CRT GND | 24VDC | 100mA | | | | |
| --- | I7TB1-13 | F.B.D. | REM. CRT SHD | 24VDC | 100mA | | | | |
| CABLE GROUP #3 (TRANSFER RELAY) FROM I3 IN SYSTEM CONTROL CABINET TO REMO. & RE.P.D. | | | | | | | | | |
| 711 | I3TB2-1 | N.O. | REMOTE EMER. MOD. OFF | 24VDC | 1A | | 1/C #14 (2.5 mmsq) | 500 FT. (150 METERS) | |
| 712 | I3TB2-2 | COMM. | REMOTE EMER. MOD. OFF | 24VDC | 1A | | | | |
| 713 | I3TB2-3 | N.O. | REMOTE EMER. POWER OFF | 24VDC | 1A | | | | |
| 714 | I3TB2-4 | COMM. | REMOTE EMER. POWER OFF | 24VDC | 1A | | | | |

NOTES:

- EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
- CABLE GROUP #2 AND #5 MAY BE RUN IN THE SAME CONDUIT.
- REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
- FOR OPTION WIRING CONNECTIONS, REFER TO INDIVIDUAL CONTROL WIRE LISTS.
- F.B.D. - FURNISHED BY OTHERS.
- ALL EXTERNAL WIRE FURNISHED BY OTHERS.
- N.O. = NORMALLY OPEN, COMM. = COMMON.
- ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | | |
|------------------------|--------------------|---|--------------------------|------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST | DWG. NO. 96-797619-19 | DATE 08/23/00 |
| CHK BY R REYES | ECN NO | EXTERNAL INTERCONNECTIONS STANDARD WIRING MULTI - MODULE SYSTEM | REV. NO. 5 | ORDER NO. |
| DES APVL J CAMPBELL | REF. DWG. | SYSTEM CONTROL CABINET - PART 1 OF 3 SERIES 600T | | |



FILE NAME: 96-797619-19-05.DWG

Figure 40 Control Wire List, External Interconnections, Standard Wiring, SCCT, Part 2 of 3

| WIRE NO. | TERMINAL DESIGNATION FROM | TO | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|--|---------------------------|----------|----------------------|-----------------|-----------------|-------|--|--------------------------|---------------------------------------|
| CABLE GROUP #5 (SITESCAN INTERFACE BOARD) FROM I4 IN SYSTEM CONTROL CABINET TO OPTIONAL SITESCAN | | | | | | | | | |
| 741 | I4TB1-1 | SITESCAN | SITESCAN SCC (+) | 5VDC | 10mA | BLACK | 2/C #22 (0.50 mm ²) TWISTED PAIR | 1000 FT. (300 METERS) | BELDEN 8761 OR EQUAL SEE NOTE 2 |
| 742 | I4TB1-2 | SITESCAN | SITESCAN SCC (-) | 5VDC | 10mA | CLEAR | | | |
| 743 | I4TB1-3 | SITESCAN | SITESCAN MOD1 (+) | 5VDC | 10mA | BLACK | | | |
| 744 | I4TB1-4 | SITESCAN | SITESCAN MOD1 (-) | 5VDC | 10mA | CLEAR | | | |
| 745 | I4TB1-5 | SITESCAN | SITESCAN MOD2 (+) | 5VDC | 10mA | BLACK | | | |
| 746 | I4TB1-6 | SITESCAN | SITESCAN MOD2 (-) | 5VDC | 10mA | CLEAR | | | |
| 747 | I4TB1-7 | SITESCAN | SITESCAN MOD3 (+) | 5VDC | 10mA | BLACK | | | |
| 748 | I4TB1-8 | SITESCAN | SITESCAN MOD3 (-) | 5VDC | 10mA | CLEAR | | | |
| 749 | I4TB1-9 | SITESCAN | SITESCAN MOD4 (+) | 5VDC | 10mA | BLACK | | | |
| 750 | I4TB1-10 | SITESCAN | SITESCAN MOD4 (-) | 5VDC | 10mA | CLEAR | | | |
| 751 | I4TB1-11 | SITESCAN | SITESCAN MOD5 (+) | 5VDC | 10mA | BLACK | | | |
| 752 | I4TB1-12 | SITESCAN | SITESCAN MOD5 (-) | 5VDC | 10mA | CLEAR | | | |
| 753 | I4TB1-13 | SITESCAN | SITESCAN MOD6 (+) | 5VDC | 10mA | BLACK | | | |
| 754 | I4TB1-14 | SITESCAN | SITESCAN MOD6 (-) | 5VDC | 10mA | CLEAR | | | |
| CABLE GROUP #6 (REDUCED CURRENT LIMIT) FROM I2 IN SYSTEM CONTROL CABINET TO CUSTOMER CONNECTION (F.B.O.) | | | | | | | | | |
| 761 | I2TB1-3 | N.O. | 2 STEP BATTERY LIMIT | 24VDC | 100mA | | 1/C #14 (2.5 mm ²) | 500 FT. (150 METERS) | |
| 762 | I2TB1-4 | COMM. | 2 STEP BATTERY LIMIT | 24VDC | 100mA | | | | |

- NOTES:
1. EACH CABLE GROUP MUST BE RUN IN A SEPARATE FLEET RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
 2. CABLE GROUP #2 AND #5 MAY BE RUN IN THE SAME CONDUIT.
 3. REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
 4. FOR OPTION WIRING CONNECTIONS, REFER TO INDIVIDUAL CONTROL WIRE LISTS.
 5. F.B.O. - FURNISHED BY OTHERS.
 6. ALL EXTERNAL WIRE FURNISHED BY OTHERS.
 7. N.O. = NORMALLY OPEN, COMM. = COMMON.
 8. ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | |
|------------------------|--------------------|--|------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS STANDARD WIRING | |
| CHK BY R REYES | ECN NO | DWG. NO. 96-797619-20 | DATE 08/23/00 |
| DES APVL J CAMPBELL | REF. DWG. | REV. NO. 5 | ORDER NO. |
| | | SYSTEM CONTROL CABINET - PART 2 OF 3 SERIES 600T | |

FILE NAME: 96-797619-20-053VG



Figure 41 Control Wire List, External Interconnections, Standard Wiring, SCCT, Part 3 of 3

| WIRE NO. | TERMINAL DESIGNATION FROM | TO | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|--|---------------------------|-------|----------------------|-----------------|-----------------|-------|-------------------------------------|-------------------------|------------|
| CABLE GROUP #8 (ALARM STATUS CONTACTS) FROM I6 IN SYSTEM CONTROL CABINET TO CUSTOMER CONNECTION (F.B.O.) | | | | | | | | | |
| 801 | 16TB1-1 | N.D. | LOAD ON UPS | 125VAC | 500mA | | | | |
| 802 | 16TB1-3 | N.C. | LOAD ON UPS | 125VAC | 500mA | | | | |
| 803 | 16TB1-5 | COMM. | LOAD ON UPS | 125VAC | 500mA | | | | |
| 804 | 16TB1-7 | N.D. | LOAD ON BYPASS | 125VAC | 500mA | | | | |
| 805 | 16TB1-9 | N.C. | LOAD ON BYPASS | 125VAC | 500mA | | | | |
| 806 | 16TB1-11 | COMM. | LOAD ON BYPASS | 125VAC | 500mA | | | | |
| 807 | 16TB1-13 | N.D. | BATTERY DISCHARGING | 125VAC | 500mA | | | | |
| 808 | 16TB1-15 | N.C. | BATTERY DISCHARGING | 125VAC | 500mA | | | | |
| 809 | 16TB1-17 | COMM. | BATTERY DISCHARGING | 125VAC | 500mA | | | | |
| 810 | 16TB1-19 | N.D. | LOW BATTERY WARNING | 125VAC | 500mA | | | | |
| 811 | 16TB1-21 | N.C. | LOW BATTERY WARNING | 125VAC | 500mA | | | | |
| 812 | 16TB1-23 | COMM. | LOW BATTERY WARNING | 125VAC | 500mA | | | | |
| 813 | 16TB1-25 | N.D. | OVERLOAD | 125VAC | 500mA | | | | |
| 814 | 16TB1-27 | N.C. | OVERLOAD | 125VAC | 500mA | | | | |
| 815 | 16TB1-29 | COMM. | OVERLOAD | 125VAC | 500mA | | | | |
| 816 | 16TB1-31 | N.D. | AMBIENT OVERTEMP | 125VAC | 500mA | | | | |
| 817 | 16TB1-33 | N.C. | AMBIENT OVERTEMP | 125VAC | 500mA | | | | |
| 818 | 16TB1-35 | COMM. | AMBIENT OVERTEMP | 125VAC | 500mA | | | | |
| 819 | 16TB1-37 | N.D. | SYSTEM SUMMARY ALARM | 125VAC | 500mA | | | | |
| 820 | 16TB1-39 | N.C. | SYSTEM SUMMARY ALARM | 125VAC | 500mA | | | | |
| 821 | 16TB1-41 | COMM. | SYSTEM SUMMARY ALARM | 125VAC | 500mA | | | | |
| 822 | 16TB1-43 | N.D. | NEW ALARM | 125VAC | 500mA | | | | |
| 823 | 16TB1-45 | N.C. | NEW ALARM | 125VAC | 500mA | | | | |
| 824 | 16TB1-47 | COMM. | NEW ALARM | 125VAC | 500mA | | | | |
| | | | | | | | 1/C #14 (2.5 mm ² sq) | 500 FT. (150 METERS) | SEE NOTE 2 |

NOTES:

- EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
- CABLE GROUP #8 AND #14 MAY BE RUN IN THE SAME CONDUIT.
- REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
- FOR OPTION WIRING CONNECTIONS, REFER TO INDIVIDUAL CONTROL WIRE LISTS.
- F.B.O. - FURNISHED BY OTHERS.
- ALL EXTERNAL WIRE FURNISHED BY OTHERS.
- N.D. = NORMALLY OPEN, N.C. = NORMALLY CLOSED, COMM. = COMMON.
- ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | | | |
|------------------------|--------------------|--|--|--------------------------|------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS STANDARD WIRING MULTI - MODULE SYSTEM SYSTEM CONTROL CABINET - PART 3 OF 3 SERIES 600T | | DWG. NO. 96-797619-21 | DATE 08/23/00 |
| CHK BY R REYES | ECN NO | | | REV. NO. 5 | ORDER NO. |
| DES APVL J CAMPBELL | REF. DWG. | | | | |



FILE NAME: 96-797619-21-05.DWG

Figure 42 Control Wire List, External Interconnections, Alarm Status Contacts Option

| WIRE NO. | TERMINAL DESIGNATION | | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|----------------------|-------|----------------------|-----------------|-----------------|-------|------------------------------------|-------------------------|----------------------|
| | FROM | TO | | | | | | | |
| CABLE GROUP #14 FROM I6 IN UPS MODULE TO CUSTOMER CONNECTION (F.B.O.) | | | | | | | | | |
| 910 | I6TB2-22 | N.D. | OUTPUT CB OPEN | 125VAC | 500mA | | 1/2 #14 (25 mm ² sq) | 500 FT. (150 METERS) | SEE NOTES 2 AND 3 |
| 911 | I6TB2-24 | N.C. | OUTPUT CB OPEN | 125VAC | 500mA | | | | |
| 912 | I6TB2-23 | COMM. | OUTPUT CB OPEN | 125VAC | 500mA | | | | |
| 913 | I6TB2-19 | N.D. | BATTERY CB OPEN | 125VAC | 500mA | | | | |
| 914 | I6TB2-21 | N.C. | BATTERY CB OPEN | 125VAC | 500mA | | | | |
| 915 | I6TB2-20 | COMM. | BATTERY CB OPEN | 125VAC | 500mA | | | | |
| 916 | I6TB2-16 | N.D. | BATTERY DISCHARGING | 125VAC | 500mA | | | | |
| 917 | I6TB2-18 | N.C. | BATTERY DISCHARGING | 125VAC | 500mA | | | | |
| 918 | I6TB2-17 | COMM. | BATTERY DISCHARGING | 125VAC | 500mA | | | | |
| 919 | I6TB2-13 | N.D. | LDW BATTERY WARNING | 125VAC | 500mA | | | | |
| 920 | I6TB2-15 | N.C. | LDW BATTERY WARNING | 125VAC | 500mA | | | | |
| 921 | I6TB2-14 | COMM. | LDW BATTERY WARNING | 125VAC | 500mA | | | | |
| 922 | I6TB2-10 | N.D. | CONTROL FAILURE | 125VAC | 500mA | | | | |
| 923 | I6TB2-12 | N.C. | CONTROL FAILURE | 125VAC | 500mA | | | | |
| 924 | I6TB2-11 | COMM. | CONTROL FAILURE | 125VAC | 500mA | | | | |
| 925 | I6TB2-7 | N.D. | AMBIENT OVERTEMP | 125VAC | 500mA | | | | |
| 926 | I6TB2-9 | N.C. | AMBIENT OVERTEMP | 125VAC | 500mA | | | | |
| 927 | I6TB2-8 | COMM. | AMBIENT OVERTEMP | 125VAC | 500mA | | | | |
| 928 | I6TB2-4 | N.D. | MODULE SUMMARY ALARM | 125VAC | 500mA | | | | |
| 929 | I6TB2-6 | N.C. | MODULE SUMMARY ALARM | 125VAC | 500mA | | | | |
| 930 | I6TB2-5 | COMM. | MODULE SUMMARY ALARM | 125VAC | 500mA | | | | |
| 931 | I6TB2-1 | N.D. | NEW ALARM | 125VAC | 500mA | | | | |
| 932 | I6TB2-3 | N.C. | NEW ALARM | 125VAC | 500mA | | | | |
| 933 | I6TB2-2 | COMM. | NEW ALARM | 125VAC | 500mA | | | | |

NOTES:
 1. EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
 2. CABLE GROUP #14 AND STANDARD SCC CABLE GROUP #8 MAY BE RUN IN THE SAME CONDUIT.
 3. THE CONTACTS ARE ALSO RATED 2A MAX. AT 30 VDC MAX.
 4. REFER TO UPS MODULE CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
 5. F.B.O. - FURNISHED BY OTHERS.
 6. ALL EXTERNAL WIRE FURNISHED BY OTHERS.
 7. N.D. = NORMALLY OPEN, N.C. = NORMALLY CLOSED, COMM. = COMMON.
 8. ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | | | |
|------------------------|--|--------------------|--|---|------------------|
| DRAWN BY K SCHILLER | | SHEET NO 1 OF 1 | | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS MULTI - MODULE SYSTEM ALARM STATUS CONTACTS OPTION SERIES 600T | |
| CHK BY R GIBSON | | ECN NO | | DWG. NO. 96-797619-128 | DATE 08/23/00 |
| DES APVL J CAMPBELL | | REF. DWG. | | REV. NO. 3 | ORDER NO. |




FILE NAME: 96-797619-128-63.DWG

Figure 43 Control Wire List, External Interconnections, Maintenance Bypass Interlock Option

| WIRE NO. | TERMINAL DESIGNATION | | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|--|----------------------|----|------------------|-----------------|-----------------|-------|-----------------------|-------------------------|---------|
| | FROM | TO | | | | | | | |
| CABLE GROUP #7 FROM I10 IN SYSTEM CONTROL CABINET TO OPTIONAL MAINTENANCE BYPASS | | | | | | | | | |
| 771 | I10TB2-1 | 1 | DN BYPASS N.D. | 120VAC | 5 A | | | | |
| 772 | I10TB2-3 | 2 | DN BYPASS COMM. | 120VAC | 5 A | | | | |
| 773 | I10TB2-4 | 3 | MBB EPO N.D. | 120VAC | 5 A | | | | |
| 774 | I10TB2-6 | 4 | MBB EPO COMM. | 120VAC | 5 A | | 1/C #14 (2.5 mmsq) | 500 FT. (150 METERS) | |
| 775 | I10TB2-7 | 5 | TRANSFER INHIBIT | 120VAC | 5 A | | | | |
| 777 | I10TB2-8 | 6 | TRANSFER INHIBIT | 120VAC | 5 A | | | | |

NOTES:

- EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
- REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
- ALL EXTERNAL WIRE FURNISHED BY OTHERS.
- N.D. = NORMALLY OPEN, COMM. = COMMON.
- ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.



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| | | | |
|------------------------|--------------------|--|--------------------------|
| DRAWN BY K SCHILLER | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS MULTI - MODULE SYSTEM MAINTENANCE BYPASS INTERLOCK OPTION SERIES 600T | DWG. NO. 96-797619-90 |
| CHK BY R REYES | ECN NO | | DATE 08/23/00 |
| DES APVL J CAMPBELL | REF. DWG. | | ORDER NO. |
| | | | 3 |

FILE NAME: 96-797619-90-03.DWG

Figure 44 Control Wire List, External Interconnections, Remote Status Panel Option

| WIRE NO. | TERMINAL DESIGNATION | | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|----------------------|--------|----------------------|-----------------|-----------------|-------|----------------------|-------------------------|---------|
| | FROM | TO | | | | | | | |
| CABLE GROUP #4 FROM I5 IN SYSTEM CONTROL CABINET TO TB1 IN OPTIONAL REMOTE STATUS PANEL | | | | | | | | | |
| 721 | 15TB1-1 | TB1-1 | LOAD ON UPS | 24VDC | 1 A | | | | |
| 722 | 15TB1-2 | TB1-2 | LOAD ON BYPASS | 24VDC | 1 A | | | | |
| 723 | 15TB1-3 | TB1-3 | BATTERY DISCHARGING | 24VDC | 1 A | | | | |
| 724 | 15TB1-4 | TB1-4 | LOW BATTERY WARNING | 24VDC | 1 A | | | | |
| 725 | 15TB1-5 | TB1-5 | OVERLOAD | 24VDC | 1 A | | 1/C #14 (25 mmsq) | 500 FT. (150 METERS) | |
| 726 | 15TB1-6 | TB1-6 | AMBIENT OVERTEMP | 24VDC | 1 A | | | | |
| 727 | 15TB1-7 | TB1-7 | SYSTEM SUMMARY ALARM | 24VDC | 1 A | | | | |
| 728 | 15TB1-8 | TB1-8 | NEW ALARM | 24VDC | 1 A | | | | |
| 729 | 15TB1-9 | TB1-9 | + 24 VDC | 24VDC | 1 A | | | | |
| 730 | 15TB1-10 | TB1-10 | GROUND | 24VDC | 1 A | | | | |

NOTES:

1. EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
2. REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
3. ALL EXTERNAL WIRE FURNISHED BY OTHERS.
4. ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | |
|------------------------|--------------------|---|-----------------------|
| DRAWN BY K SCHILLER | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS | |
| | CHK BY R REYES | ECN NO | MULTI - MODULE SYSTEM |
| DES APVL J CAMPBELL | REF. DWG. | REV. NO. 2 | ORDER NO. |
| | | DWG. NO. 96-797619-130 | DATE 08/23/00 |



FILE NAME: 96-797619-130-02.DWG

Figure 45 Control Wire List, External Interconnections, Internal Modem Option

| WIRE NO. | TERMINAL DESIGNATION | | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|----------------------|--------|------------------|-----------------|-----------------|-------|------------------|-------------|---------|
| | FROM | TO | | | | | | | |
| 871 | J5 | F.B.O. | MODEM LINE COMM. | N/A | N/A | | TELEPHONE CABLE | | |
| CABLE GROUP #13 FROM J5 IN SYSTEM CONTROL CABINET TO CUSTOMER CONNECTION (F.B.O.) | | | | | | | | | |

NOTES:

1. EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
2. REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
3. F.B.O. - FURNISHED BY OTHERS.
4. ALL EXTERNAL WIRE FURNISHED BY OTHERS.
5. ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | |
|--------------------------|--------------------|---|------------------|
| DRAWN BY C. HUA | SHEET NO 1 OF 1 | TITLE | DWG. NO. |
| CHK BY R. REYES | ECN NO | CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS MULTI - MODULE SYSTEM INTERNAL MODEM OPTION SERIES 600T | DATE 04/01/99 |
| DES. APVL J. CAMPBELL | REF. DWG. | | REV. NO. 4 |

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Figure 46 Control Wire List, External Interconnections, Customer Alarm Interface Option

| WIRE NO. | TERMINAL DESIGNATION FROM TO | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|------------------------------|-------------|-------------------------|-----------------|-------|------------------|-------------|---------|
| CABLE GROUP #9 FROM I15 TB1 & TB2 IN SYSTEM CONTROL CABINET TO CUSTOMER CONNECTION (F.B.D.) | | | | | | | | |
| 781 | I15TB1-1 | N.D. | PROGRAMMABLE (ALARM #1) | 24VDC | 100mA | | | |
| 782 | I15TB1-2 | COMM. | PROGRAMMABLE (ALARM #1) | 24VDC | 100mA | | | |
| 783 | I15TB1-3 | N.D. | PROGRAMMABLE (ALARM #2) | 24VDC | 100mA | | | |
| 784 | I15TB1-4 | COMM. | PROGRAMMABLE (ALARM #2) | 24VDC | 100mA | | | |
| 785 | I15TB1-5 | N.D. | PROGRAMMABLE (ALARM #3) | 24VDC | 100mA | | | |
| 786 | I15TB1-6 | COMM. | PROGRAMMABLE (ALARM #3) | 24VDC | 100mA | | | |
| 787 | I15TB1-7 | N.D. | PROGRAMMABLE (ALARM #4) | 24VDC | 100mA | | | |
| 788 | I15TB1-8 | COMM. | PROGRAMMABLE (ALARM #4) | 24VDC | 100mA | | | |
| 789 | I15TB1-9 | N.D. | PROGRAMMABLE (ALARM #5) | 24VDC | 100mA | | | |
| 790 | I15TB1-10 | COMM. | PROGRAMMABLE (ALARM #5) | 24VDC | 100mA | | | |
| 791 | I15TB2-1 | N.D. | PROGRAMMABLE (ALARM #6) | 24VDC | 100mA | | | |
| 792 | I15TB2-2 | COMM. | PROGRAMMABLE (ALARM #6) | 24VDC | 100mA | | | |
| 793 | I15TB2-3 | N.D. | PROGRAMMABLE (ALARM #7) | 24VDC | 100mA | | | |
| 794 | I15TB2-4 | COMM. | PROGRAMMABLE (ALARM #7) | 24VDC | 100mA | | | |
| 795 | I15TB2-5 | N.D. | PROGRAMMABLE (ALARM #8) | 24VDC | 100mA | | | |
| 796 | I15TB2-6 | COMM. | PROGRAMMABLE (ALARM #8) | 24VDC | 100mA | | | |

NOTES:

1. EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
2. REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
3. F.B.D. - FURNISHED BY OTHERS.
4. ALL EXTERNAL WIRE FURNISHED BY OTHERS.
5. N.C. = NORMALLY OPEN, COMM. = COMMON.
6. ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | | | | | | | |
|------------------------|--|--------------------|--|---|--|--------------------------|--|------------------|--|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS MULTI - MODULE SYSTEM (SCC WITH MOMENTARY DUTY STATIC SWITCH) CUSTOMER ALARM INTERFACE OPTION SERIES 600T | | DWG. NO. 96-797619-28 | | DATE 08/23/00 | |
| CHK BY R REYES | | ECON NO | | | | REV. NO. 5 | | ORDER NO. | |
| DES APVL J CAMPBELL | | REF. DWG. | | | | | | | |



FILE NAME: 96-797619-28-05.DWG


Figure 47 Control Wire List, External Interconnections, Battery Temperature Sensor Option

| WIRE NO. | TERMINAL DESIGNATION | | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|---|----------------------|-------|----------------------|-----------------|-----------------|--------|--------------------------|------------------------|-------------------------|
| | FROM | TO | | | | | | | |
| CABLE GROUP #15 FROM TB60 IN UPS MODULE TO OPTIONAL BATTERY TEMP SENSOR | | | | | | | | | |
| 940 | TB60-1 | TB1-1 | BATTERY TEMP. SENSOR | 24VDC | 100mA | WHITE | 2/C #18 (1.0 mmSQ) | 100 FT. (30 METERS) | BELDEN 8760 OR EQUAL |
| 941 | TB60-2 | TB1-2 | BATTERY TEMP. SENSOR | 24VDC | 100mA | BLACK | TWISTED PAIR SHIELDED | | |
| 942 | TB60-3 | --- | SHIELD | 24VDC | 100mA | SHIELD | | | |

NOTES:

1. EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
2. REFER TO UPS MODULE CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
3. ALL EXTERNAL WIRE FURNISHED BY OTHERS.
4. ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

| | | | | | |
|------------------------|--|--------------------|--|--|------------------|
| DRAWN BY K SCHILLER | | SHEET NO 1 OF 1 | | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS MULTI - MODULE SYSTEM BATTERY TEMPERATURE SENSOR OPTION SERIES 600T | |
| CHK BY R REYES | | EON NO | | DWG. NO. 96-797619-62 | DATE 08/23/00 |
| DES APVL J CAMPBELL | | REF. DWG. | | REV. NO. 5 | ORDER NO. |



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FILE NAME: 96-797619-62-05.DWG

Figure 48 Control Wire List, External Interconnections, SNMP Interface Option


| WIRE NO. | TERMINAL DESIGNATION FROM | TERMINAL DESIGNATION TO | SIGNAL NAME | MAXIMUM VOLTAGE | MAXIMUM CURRENT | COLOR | WIRE SIZE & TYPE | MAX. LENGTH | REMARKS |
|----------|---|----------------------------|------------------|-----------------|-----------------|-------|------------------|--------------------------------------|---------|
| --- | CABLE GROUP #26 FROM J1 & J4 IN SYSTEM CONTROL CABINET TO CUSTOMER CONNECTION (F.B.D) | | | | | | | | |
| --- | J1 | ETHERNET NETWORK CONNECTOR | ETHERNET NETWORK | N/A | N/A | | TELEPHONE CABLE | LENGTH LIMITED BY INTERNET STANDARDS | |
| --- | J4 | SETUP PORT ON PC | SETUP | --- | --- | | | | |

NOTES:

- EACH CABLE GROUP MUST BE RUN IN A SEPARATE STEEL RACEWAY TO PREVENT CONTROL SIGNAL INTERFERENCE.
- REFER TO SCC CONTROL CONNECTION LOCATION DIAGRAM FOR LOCATION OF WIRING CONNECTIONS.
- F.B.D. - FURNISHED BY OTHERS.
- ALL EXTERNAL WIRE FURNISHED BY OTHERS.
- ALL WIRING MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES.

FILE NAME: 96-797619-91-01.DWG

| | | | |
|------------------------|--------------------|--|--------------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CONTROL WIRE LIST EXTERNAL INTERCONNECTIONS MULTI - MODULE SYSTEM SNMP INTERFACE OPTION SERIES 600T | DWG. NO. 96-797619-91 |
| CHK BY R REYES | ECN NO | | DATE 04/01/99 |
| DES APVL J CAMPBELL | REF. DWG. | | ORDER NO. |
| | | | 1 |



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Figure 49 Outline Drawing, Module Battery Disconnect, 175-250 Amps

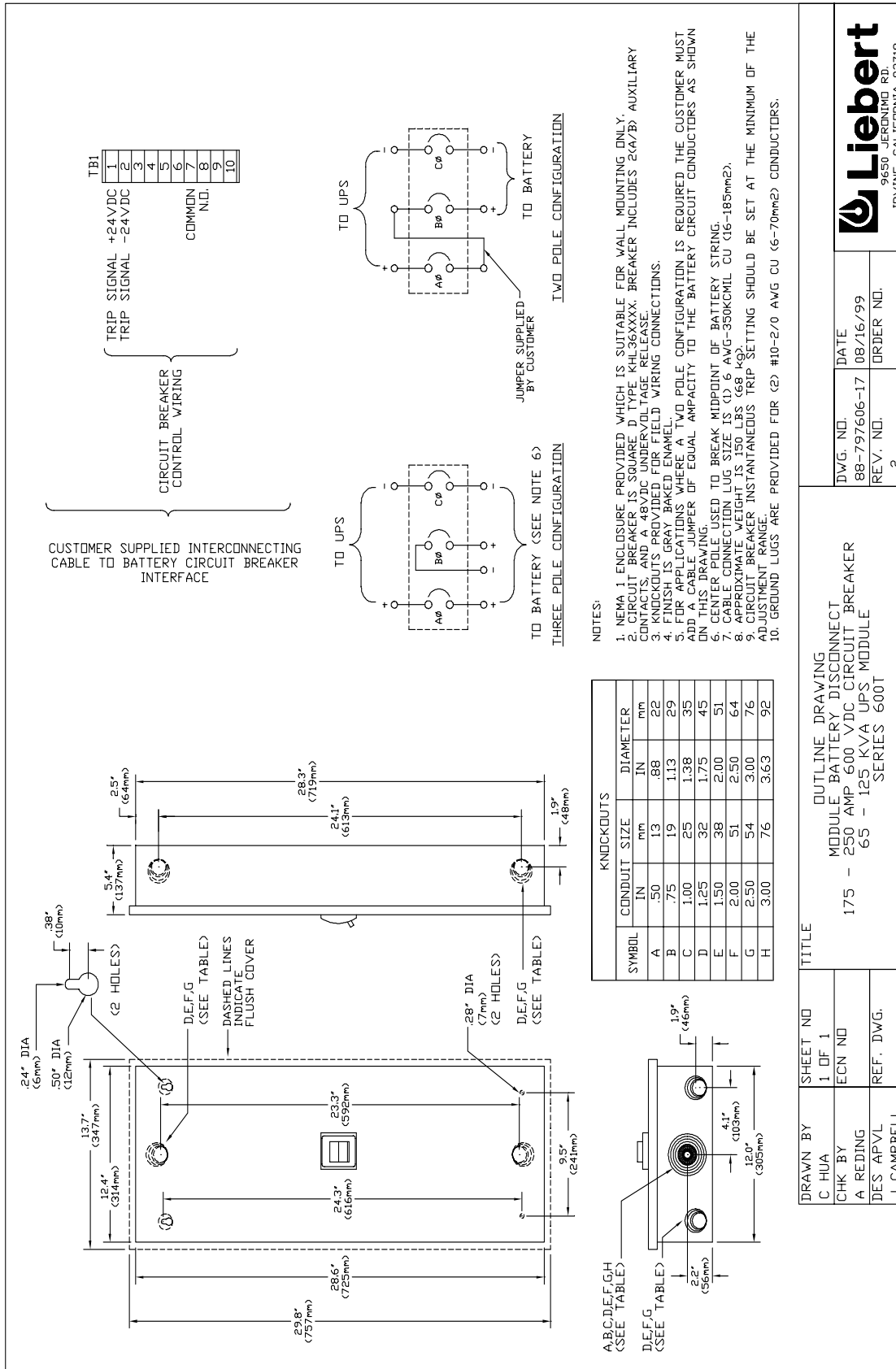
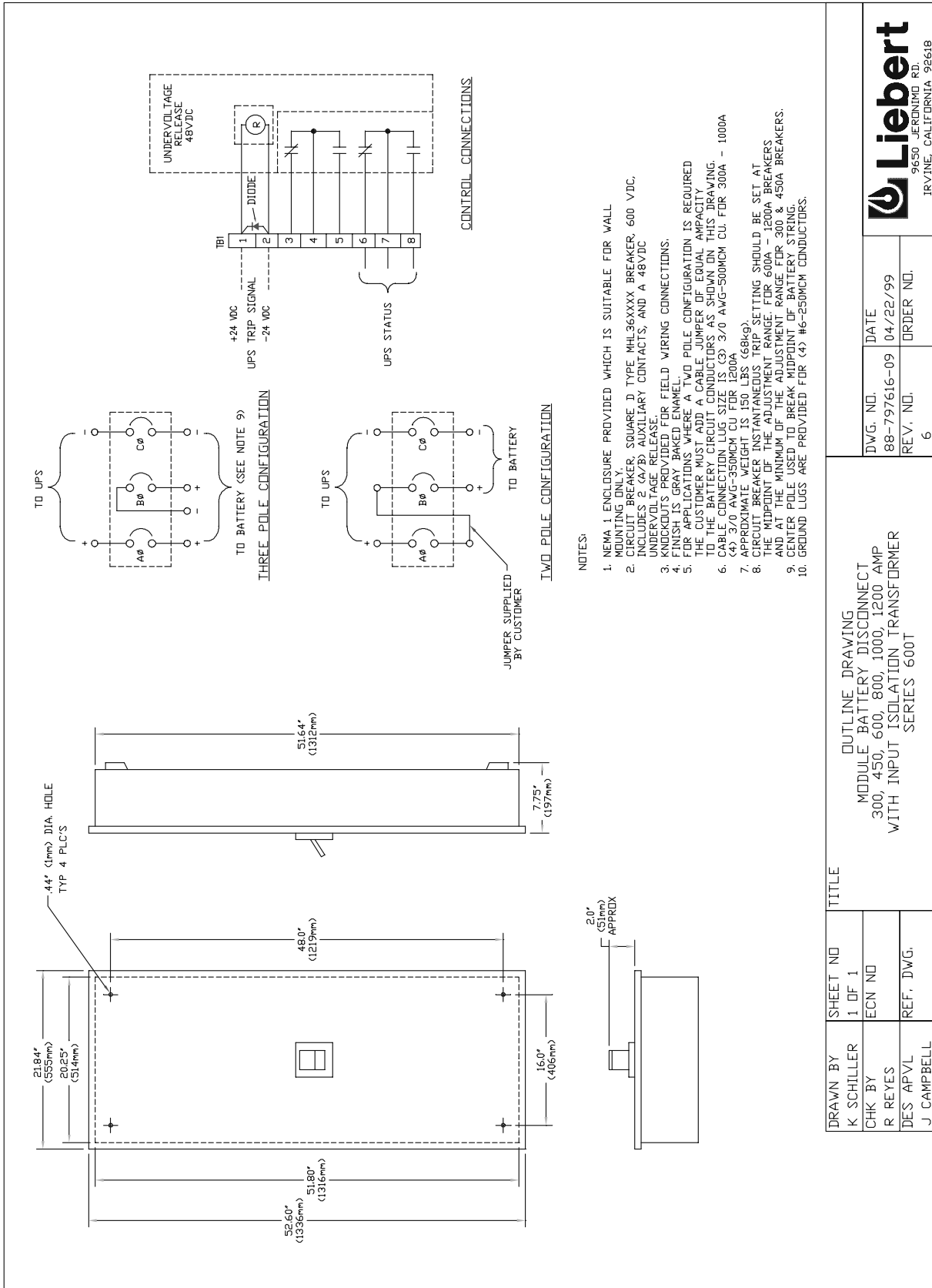


Figure 50 Outline Drawing, Module Battery Disconnect, 300-1200 Amps (modules w/input iso. xfmr)



| | | | | | |
|------------------------|--|--------------------|--|--|--|
| DRAWN BY K SCHILLER | | SHEET NO 1 OF 1 | | TITLE OUTLINE DRAWING MODULE BATTERY DISCONNECT 300, 450, 600, 800, 1000, 1200 AMP WITH INPUT ISOLATION TRANSFORMER SERIES 600T | |
| CHK BY R REYES | | ECN NO | | DWG. NO. 88-797616-09 | |
| DES APVL J CAMPBELL | | REF. DWG. | | DATE 04/22/99 | |
| | | | | ORDER NO. | |
| | | | | 6 | |



FILE NAME: 88-797616-09-06.DWG

Figure 52 Circuit Breaker Schedule, Multi-Module UPS, 65-225 kVA


| SERIES 600T MULTI - MODULE CIRCUIT BREAKER SCHEDULE | | | | | | | | | |
|---|----------------------|----------|-------------------|----------------------------|------------------------------|--------------|----------------------|----------------------------|--|
| INPUT CIRCUIT BREAKER (CB1) | | | | | OUTPUT (CB2) CIRCUIT BREAKER | | | | |
| USAGE KVA/KW | VOLTAGE IN | VENDOR | TYPE | INTERRUPTING RATING AIC | VOLTAGE OUT | VENDOR | TYPE | INTERRUPTING RATING AIC | |
| 65/52 | 208V 480V 600V | SQUARE D | KHL FHL FHL | 65K 25K 18K | 208V 480V 600V | MERLIN GERIN | NFHF NFHF NFHF | 100K 65K 25K | |
| 80/64 | 208V 480V 600V | SQUARE D | LHL KHL KHL | 65K 35K 25K | 208V 480V 600V | MERLIN GERIN | NFHF NFHF NFHF | 100K 65K 25K | |
| 100/80 | 208V 480V 600V | SQUARE D | LHL KHL KHL | 65K 35K 25K | 208V 480V 600V | SQUARE D | LHL KHL KHL | 65K 35K 25K | |
| 125/100 | 208V 480V 600V | SQUARE D | MHL KHL KHL | 65K 35K 25K | 208V 480V 600V | SQUARE D | MHL KHL KHL | 65K 35K 25K | |
| 150/120 | 208V 480V 600V | SQUARE D | MHL KHL KHL | 65K 35K 25K | 208V 480V 600V | SQUARE D | MHL KHL KHL | 65K 35K 25K | |
| 225/180 | 208V 480V 600V | SQUARE D | MHL LHL LHL | 65K 35K 25K | 208V 480V 600V | SQUARE D | MHL LHL LHL | 65K 35K 25K | |

| | | | | |
|------------------------|--------------------|--|---------------------------------|------------------|
| DRAWN BY K SCHILLER | SHEET NO 1 OF 1 | TITLE CIRCUIT BREAKER SCHEDULE MULTI - MODULE UPS 65 - 225 KVA SERIES 600T | DWG. NO. 84-797605-109 | DATE 04/21/99 |
| CHK BY R REYES | ECN NO | | REV. NO. 2 | ORDER NO. |
| DES APVL J CAMPBELL | REF. DWG. | | FILE NAME: 84-797605-109-02.DWG | |



Figure 53 Circuit Breaker Schedule, Battery Cabinet, 65-500 kVA

| BATTERY CABINET CIRCUIT BREAKER SCHEDULE | | | | | |
|--|----------|-------------|------------|-----------|--|
| UPS KVA RATING | VENDOR | TYPE | FRAME AMPS | TRIP AMPS | |
| 65, 80 | SQUARE D | KHL36175-DC | 250 | 175 | |
| 100, 125 | SQUARE D | KHL36250-DC | 250 | 250 | |
| 150 | SQUARE D | MHL34300-DC | 1000 | 300 | |
| 225, 300, 400, 450, 500 | SQUARE D | MHL36450-DC | 1000 | 450 | |

| | | | | | | | | | |
|---|--|--------------------|--|---|--|---------------------------|--|------------------|--|
| DRAWN BY K SCHILLER | | SHEET NO 1 OF 1 | | TITLE CIRCUIT BREAKER SCHEDULE BATTERY CABINET 65 - 500 KVA SERIES 600T | | DWG. NO. 84-797605-110 | | DATE 04/21/99 | |
| CHK BY R REYES | | ECN NO | | | | REV. NO. 1 | | ORDER NO. | |
| DES APVL J CAMPBELL | | REF. DWG. | | | | | | | |
|  Liebert 9650 JEROME RD. IRVINE, CALIFORNIA 92618 | | | | | | | | | |

FILE NAME: 84-797605-110-01.DWG

Figure 54 Circuit Breaker Schedule, Merlin Gerin, System Control Cabinet (SCCT), 200-4000 Amps

| SYSTEM CONTROL CABINET (SCCT) 200 - 4000 AMP CIRCUIT BREAKER SCHEDULE | | | | | | | | | |
|--|------------------------|--------|----------|---------------|--------------|--------------|--------------|--------------|--|
| SCCT CONTINUOUS AMPERES | BREAKER DESIGNATION | VENDOR | TYPE | FRAME AMPS | TRIP AMPS | AIC@ 240V | AIC@ 480V | AIC@ 600V | |
| 200 | | | CJ400H | 400 | 250 | 100K | 42K | 25K | |
| 280 | | | CJ400H | 400 | 350 | 100K | 42K | 25K | |
| 360 | | | CJ600H | 600 | 450 | 100K | 42K | 25K | |
| 480 | | | CJ600H | 600 | 600 | 100K | 42K | 25K | |
| 560 | | | CK800H | 700 | 700 | 100K | 65K | 42K | |
| 640 | | | CK800H | 800 | 800 | 100K | 65K | 42K | |
| 800 | | | CK1200H | 1200 | 1000 | 100K | 65K | 42K | |
| 960 | | | CK1200H | 1200 | 1200 | 100K | 65K | 42K | |
| 1000 | | | CK1200HH | 1200 | 1000 | 100K | 65K | 42K | |
| 1200 | | | CK1200HH | 1200 | 1200 | 100K | 65K | 42K | |
| 1600 | | | MP16H2 | 1600 | 1600 | 100K | 100K | 75K | |
| 2000 | | | MP20H2 | 2000 | 2000 | 100K | 100K | 75K | |
| 2500 | | | MP25H2 | 2500 | 2500 | 100K | 100K | 75K | |
| 3000 | | | MP30H2 | 3000 | 3000 | 100K | 100K | 75K | |
| 4000 | | | MP40H1 | 4000 | 4000 | 100K | 100K | 100K | |

| | | | | | | |
|------------------------|--|--------------------|--|--|---------------------------|------------------|
| DRAWN BY C HUA | | SHEET NO 1 OF 1 | TITLE CIRCUIT BREAKER SCHEDULE MERLIN GERIN SYSTEM CONTROL CABINET (SCCT) | | DWG. NO. 84-797605-115 | DATE 09/15/99 |
| CHK BY R REYES | | ECN NO | 200 - 4000 AMP SERIES 600T | | REV. NO. | ORDER NO. |
| DES APVL J CAMPBELL | | REF. DWG. | | | 2 | |

FILE NAME: 84-797605-115-02.DWG
LIEBERT
9650 JERONIMO RD.
IRVINE, CALIFORNIA 92618

Figure 55 Circuit Breaker Schedule, G.E., System Control Cabinet (SCCT), 1600-4000 Amps

| SYSTEM CONTROL CABINET (SCCT) 1600 - 4000 AMP CIRCUIT BREAKER SCHEDULE | | | | | | | | | |
|---|------------------------|---------------------|-------|---------------|--------------|--------------|--------------|--------------|--|
| SCCT CONTINUOUS AMPERES | BREAKER DESIGNATION | VENDOR | TYPE | FRAME AMPS | TRIP AMPS | AIC@ 240V | AIC@ 480V | AIC@ 600V | |
| 1600 | | | SSD16 | 1600 | 1600 | 85K | 65K | 50K | |
| 2000 | | | SSD20 | 2000 | 2000 | 85K | 65K | 50K | |
| 2500 | UDB, SBB | GENERAL ELECTRIC | SSD25 | 2500 | 2500 | 100K | 100K | 85K | |
| 3000 | | | SSD30 | 3000 | 3000 | 100K | 100K | 85K | |
| 4000 | | | SSD40 | 4000 | 4000 | 100K | 100K | 85K | |

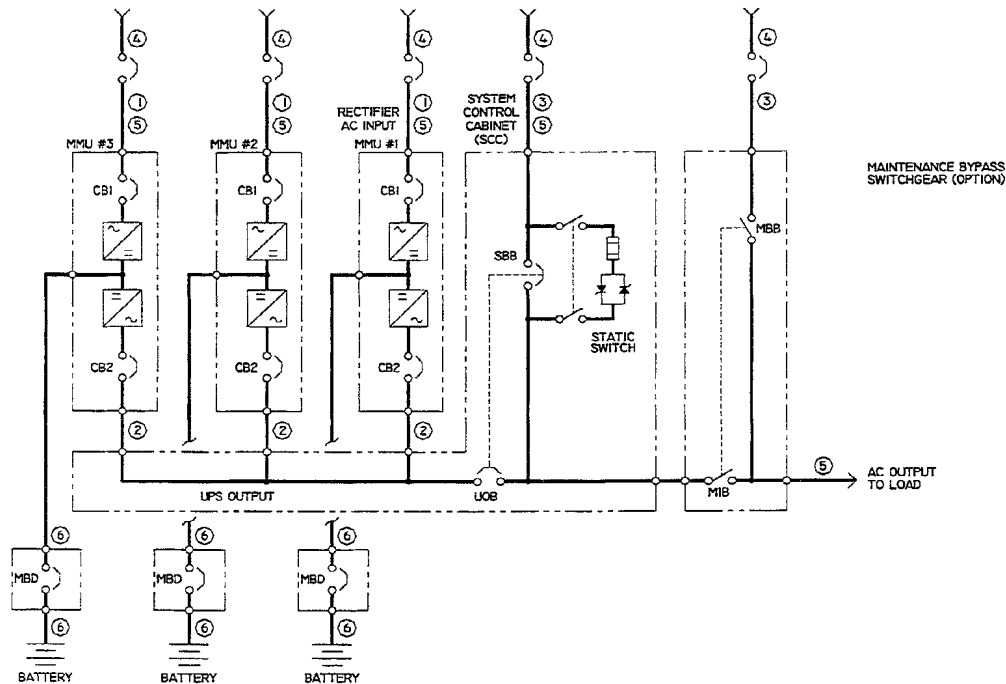
| | | | | |
|-------------------------|--------------------|--|---------------------------|------------------|
| DRAWN BY C HUA | SHEET NO 1 OF 1 | TITLE CIRCUIT BREAKER SCHEDULE GENERAL ELECTRIC SYSTEM CONTROL CABINET (SCCT) | DWG. NO. 84-797605-116 | DATE 09/15/99 |
| CHK BY R REYES | ECN NO | 1600 - 4000 AMP SERIES 600T | REV. NO. 1 | ORDER NO. |
| DES. APVL J CAMPBELL | REF. DWG. | | | |

FILE NAME: 84-797605-116-01.DWG



12.0 APPENDIX A - SITE PLANNING DATA

65-225 kVA Multi-Module Systems



12.1 Notes

1. Nominal rectifier AC input current (considered continuous) is based on full rated output load. Maximum current includes nominal input current and maximum battery recharge current (considered noncontinuous). Continuous and noncontinuous current limit are defined in NEC 100. Maximum input current is controlled by current limit setting which is adjustable. Values shown are for maximum setting of 125%. Standard factory setting is 115%.
2. Nominal AC output current (considered continuous) is based on full rated output load. Maximum current includes nominal output current and overload for 10 minutes.
3. Bypass AC input current (considered continuous) is based on full rated output load.
4. Feeder protection (by others in external equipment) for rectifier AC input and bypass AC input is recommended to be provided by separate overcurrent protection devices.
5. UPS output load cables must be run in separate conduit from input cables.
6. Power cable from module DC bus to battery should be sized for a total maximum 2.0 volt line drop (measured at the module) at maximum discharge current.
7. Grounding conductors to be sized per NEC 250-122. Neutral conductors to be sized for full capacity—per NEC 310-15 (b)(4)—for systems with 4-wire loads and half capacity for systems with 3-wire loads. NOTE: A neutral conductor is required from each Multi-Module Unit output to the System Control Cabinet.
8. Rectifier AC Input: 3-phase, 3-wire, plus ground
AC Output to Load: 3-phase, 3 or 4-wire, plus ground
Bypass AC Input: 3-phase, 3 or 4-wire, plus ground
Module DC Input from Battery: 2-wire, (positive and negative)
9. All wiring is to be in accordance with National and Local Electrical Codes.
10. Minimum clearance is 2 feet above UPS.
11. Top or bottom cable entry through removable access plates. Cut plate to suit conduit size.
12. Control wiring and power cables must be run in separate conduits. Control wiring must be stranded tinned conductors.
13. 7% maximum input harmonic current and 0.92 lagging input power factor at full load with optional input filter.

30% maximum input harmonic current and 0.85 lagging input power factor at full load without optional input filter.

14. Dimensions and weights do not include the System Control Cabinet required for Multi-Module Systems.

Table 4 Series 600T Multi-Module Systems, 65-225 kVA - 208 Volt Input

| UPS Rating | | AC Output Voltage | Options | | Rectifier AC Input Current | | Inverter AC Output Current | | Required Battery Disconnect Rating | Maximum Battery Current at End of Discharge | Maximum Heat Dissipation BTU/hr. | Dimensions Inches | Approx. Weight Lb. | Floor Loading Lb./Sq.Ft. |
|--------------------------|-----|-------------------|--------------|-------------------|----------------------------|-----|----------------------------|-----|------------------------------------|---|----------------------------------|-------------------|--------------------|--------------------------|
| kVA | kW | | Input Filter | Input Transformer | Nom | Max | Nom | Max | Amperes | Amperes | Full Load | (WxDxH) | (Un-packed) | (Distributed Loading) |
| 65 | 52 | 208 | NO | NO | 185 | 231 | 180 | 226 | 150 | 142 | 15,450 | 34x32x68 | 1,870 | 248 |
| 65 | 52 | 208 | YES | NO | 171 | 214 | 180 | 226 | 150 | 142 | 16,050 | 34x32x68 | 1,920 | 254 |
| 65 | 52 | 208 | NO | YES | 187 | 233 | 180 | 226 | 150 | 142 | 17,550 | 34x32x68 | 2,370 | 314 |
| 65 | 52 | 208 | YES | YES | 173 | 216 | 180 | 226 | 150 | 142 | 18,200 | 34x32x68 | 2,420 | 320 |
| 80 | 64 | 208 | NO | NO | 227 | 284 | 222 | 278 | 175 | 175 | 19,000 | 34x32x68 | 2,070 | 274 |
| 80 | 64 | 208 | YES | NO | 211 | 263 | 222 | 278 | 175 | 175 | 19,750 | 34x32x68 | 2,120 | 281 |
| 80 | 64 | 208 | NO | YES | 230 | 287 | 222 | 278 | 175 | 175 | 21,600 | 34x32x68 | 2,600 | 344 |
| 80 | 64 | 208 | YES | YES | 213 | 266 | 222 | 278 | 175 | 175 | 22,400 | 34x32x68 | 2,650 | 351 |
| 100 | 80 | 208 | NO | NO | 284 | 355 | 278 | 347 | 225 | 218 | 23,750 | 48x33x79 | 2,850 | 259 |
| 100 | 80 | 208 | YES | NO | 263 | 329 | 278 | 347 | 225 | 218 | 24,700 | 48x33x79 | 2,900 | 264 |
| 100 | 80 | 208 | NO | YES | 287 | 359 | 278 | 347 | 225 | 218 | 27,000 | 48x33x79 | 3,220 | 293 |
| 100 | 80 | 208 | YES | YES | 266 | 333 | 278 | 347 | 225 | 218 | 28,000 | 48x33x79 | 3,270 | 297 |
| 125 | 100 | 208 | NO | NO | 355 | 444 | 347 | 434 | 250 | 273 | 29,700 | 48x33x79 | 3,000 | 273 |
| 125 | 100 | 208 | YES | NO | 329 | 411 | 347 | 434 | 250 | 273 | 30,900 | 48x33x79 | 3,050 | 277 |
| 125 | 100 | 208 | NO | YES | 359 | 449 | 347 | 434 | 250 | 273 | 35,750 | 48x33x79 | 3,400 | 309 |
| 125 | 100 | 208 | YES | YES | 333 | 416 | 347 | 434 | 250 | 273 | 35,000 | 48x33x79 | 3,450 | 314 |
| 150 | 120 | 208 | NO | NO | 424 | 530 | 416 | 520 | 350 | 326 | 33,200 | 56x33x79 | 3,270 | 255 |
| 150 | 120 | 208 | YES | NO | 393 | 491 | 416 | 520 | 350 | 326 | 34,650 | 56x33x79 | 3,400 | 265 |
| 150 | 120 | 208 | NO | YES | 431 | 538 | 416 | 520 | 350 | 326 | 40,500 | 56x33x79 | 3,970 | 309 |
| 150 | 120 | 208 | YES | YES | 399 | 499 | 416 | 520 | 350 | 326 | 42,000 | 56x33x79 | 4,100 | 319 |
| 225 | 180 | 208 | NO | NO | 635 | 794 | 625 | 781 | 500 | 488 | 49,800 | 56x33x79 | 3,820 | 298 |
| 225 | 180 | 208 | YES | NO | 589 | 736 | 625 | 781 | 500 | 488 | 52,950 | 56x33x79 | 3,950 | 308 |
| 225 | 180 | 208 | NO | YES | 646 | 807 | 625 | 781 | 500 | 488 | 60,750 | 56x33x79 | 4,460 | 348 |
| 225 | 180 | 208 | YES | YES | 599 | 748 | 625 | 781 | 500 | 488 | 63,000 | 56x33x79 | 4,590 | 358 |
| Applicable Notes: | | — | 13 | — | 1,4,5,7,8,9,11,12 | | 2,3,5,7,8,9,11,12 | | 6 | 6,8,9,11,12 | — | 14 | 14 | — |

For explanation of notes, see referenced numbers in **12.1 - Notes**

Table 5 Series 600T Multi-Module Systems, 65-225 kVA - 480 Volt Input

| UPS Rating | | AC Output Voltage | Options | | Rectifier AC Input Current | | Inverter or Bypass AC Output Current | | Required Battery Disconnect Rating | Maximum Battery Current at End of Discharge | Maximum Heat Dissipation BTU/hr. | Dimensions Inches (WxDxH) | Approx. Weight Lb. (Un-packed) | Floor Loading Lb./ Sq.ft. (Distributed Loading) |
|--------------------------|-----|-------------------|--------------|-------------------|----------------------------|-------------------|--------------------------------------|-----|------------------------------------|---|----------------------------------|---------------------------|--------------------------------|---|
| | | | Input Filter | Input Transformer | Nom | Max | Nom | Max | Amperes | Amperes | Full Load | | | |
| 65 | 52 | 480 | NO | NO | 79 | 98 | 78 | 98 | 150 | 141 | 12,350 | 34x32x68 | 1,470 | 195 |
| 65 | 52 | 480 | YES | NO | 73 | 91 | 78 | 98 | 150 | 141 | 12,950 | 34x32x68 | 1,520 | 201 |
| 65 | 52 | 480 | NO | YES | 80 | 100 | 78 | 98 | 150 | 141 | 15,450 | 34x32x68 | 2,170 | 287 |
| 65 | 52 | 480 | YES | YES | 74 | 93 | 78 | 98 | 150 | 141 | 16,050 | 34x32x68 | 2,220 | 294 |
| 65 | 52 | 208 | NO | NO | 79 | 99 | 180 | 226 | 150 | 142 | 13,350 | 34x32x68 | 1,670 | 221 |
| 65 | 52 | 208 | YES | NO | 73 | 92 | 180 | 226 | 150 | 142 | 14,000 | 34x32x68 | 1,720 | 228 |
| 65 | 52 | 208 | NO | YES | 80 | 101 | 180 | 226 | 150 | 142 | 16,500 | 34x32x68 | 2,370 | 314 |
| 65 | 52 | 208 | YES | YES | 75 | 93 | 180 | 226 | 150 | 142 | 17,150 | 34x32x68 | 2,420 | 320 |
| 80 | 64 | 480 | NO | NO | 97 | 121 | 96 | 120 | 175 | 174 | 15,200 | 34x32x68 | 1,670 | 221 |
| 80 | 64 | 480 | YES | NO | 90 | 112 | 96 | 120 | 175 | 174 | 15,950 | 34x32x68 | 1,720 | 228 |
| 80 | 64 | 480 | NO | YES | 98 | 123 | 96 | 120 | 175 | 174 | 19,000 | 34x32x68 | 2,400 | 318 |
| 80 | 64 | 480 | YES | YES | 91 | 114 | 96 | 120 | 175 | 174 | 19,750 | 34x32x68 | 2,450 | 324 |
| 80 | 64 | 208 | NO | NO | 97 | 122 | 222 | 278 | 175 | 175 | 16,450 | 34x32x68 | 1,920 | 254 |
| 80 | 64 | 208 | YES | NO | 90 | 112 | 222 | 278 | 175 | 175 | 17,200 | 34x32x68 | 1,970 | 261 |
| 80 | 64 | 208 | NO | YES | 99 | 124 | 222 | 278 | 175 | 175 | 20,300 | 34x32x68 | 2,650 | 351 |
| 80 | 64 | 208 | YES | YES | 92 | 115 | 222 | 278 | 175 | 175 | 21,100 | 34x32x68 | 2,700 | 357 |
| 100 | 80 | 480 | NO | NO | 121 | 151 | 120 | 150 | 225 | 217 | 19,000 | 48x33x79 | 2,265 | 206 |
| 100 | 80 | 480 | YES | NO | 112 | 140 | 120 | 150 | 225 | 217 | 19,900 | 48x33x79 | 2,335 | 212 |
| 100 | 80 | 480 | NO | YES | 123 | 154 | 120 | 150 | 225 | 217 | 23,750 | 48x33x79 | 3,040 | 276 |
| 100 | 80 | 480 | YES | YES | 114 | 143 | 120 | 150 | 225 | 217 | 24,700 | 48x33x79 | 3,110 | 283 |
| 100 | 80 | 208 | NO | NO | 122 | 152 | 278 | 347 | 225 | 218 | 20,550 | 48x33x79 | 2,565 | 233 |
| 100 | 80 | 208 | YES | NO | 113 | 141 | 278 | 347 | 225 | 218 | 21,500 | 48x33x79 | 2,635 | 240 |
| 100 | 80 | 208 | NO | YES | 124 | 155 | 278 | 347 | 225 | 218 | 25,350 | 48x33x79 | 3,340 | 304 |
| 100 | 80 | 208 | YES | YES | 115 | 143 | 278 | 347 | 225 | 218 | 26,350 | 48x33x79 | 3,410 | 310 |
| 125 | 100 | 480 | NO | NO | 151 | 189 | 150 | 188 | 250 | 271 | 23,750 | 48x33x79 | 2,365 | 215 |
| 125 | 100 | 480 | YES | NO | 140 | 175 | 150 | 188 | 250 | 271 | 24,900 | 48x33x79 | 2,435 | 221 |
| 125 | 100 | 480 | NO | YES | 154 | 192 | 150 | 188 | 250 | 271 | 29,700 | 48x33x79 | 3,165 | 288 |
| 125 | 100 | 480 | YES | YES | 143 | 178 | 150 | 188 | 250 | 271 | 30,900 | 48x33x79 | 3,235 | 294 |
| 125 | 100 | 208 | NO | NO | 152 | 190 | 347 | 434 | 250 | 273 | 25,700 | 48x33x79 | 2,665 | 242 |
| 125 | 100 | 208 | YES | NO | 141 | 176 | 347 | 434 | 250 | 273 | 26,900 | 48x33x79 | 2,735 | 249 |
| 125 | 100 | 208 | NO | YES | 155 | 193 | 347 | 434 | 250 | 273 | 31,700 | 48x33x79 | 3,465 | 315 |
| 125 | 100 | 208 | YES | YES | 143 | 179 | 347 | 434 | 250 | 273 | 32,950 | 48x33x79 | 3,535 | 321 |
| 150 | 120 | 480 | NO | NO | 181 | 226 | 180 | 226 | 300 | 324 | 26,150 | 48x33x79 | 2,600 | 236 |
| 150 | 120 | 480 | YES | NO | 167 | 209 | 180 | 226 | 300 | 324 | 27,550 | 48x33x79 | 2,730 | 248 |
| 150 | 120 | 480 | NO | YES | 184 | 229 | 180 | 226 | 300 | 324 | 33,200 | 48x33x79 | 3,500 | 318 |
| 150 | 120 | 480 | YES | YES | 170 | 213 | 180 | 226 | 300 | 324 | 34,650 | 48x33x79 | 3,630 | 330 |
| 150 | 120 | 208 | NO | NO | 182 | 227 | 416 | 520 | 300 | 326 | 28,450 | 56x33x79 | 3,000 | 234 |
| 150 | 120 | 208 | YES | NO | 168 | 210 | 416 | 520 | 300 | 326 | 29,900 | 56x33x79 | 3,130 | 244 |
| 150 | 120 | 208 | NO | YES | 185 | 231 | 416 | 520 | 300 | 326 | 35,600 | 56x33x79 | 3,900 | 304 |
| 150 | 120 | 208 | YES | YES | 171 | 214 | 416 | 520 | 300 | 326 | 37,050 | 56x33x79 | 4,030 | 314 |
| 225 | 180 | 480 | NO | NO | 271 | 339 | 271 | 338 | 500 | 486 | 39,200 | 48x33x79 | 2,940 | 267 |
| 225 | 180 | 480 | YES | NO | 251 | 314 | 271 | 338 | 500 | 486 | 41,300 | 48x33x79 | 3,070 | 279 |
| 225 | 180 | 480 | NO | YES | 275 | 344 | 271 | 338 | 500 | 486 | 49,800 | 48x33x79 | 4,140 | 376 |
| 225 | 180 | 480 | YES | YES | 255 | 319 | 271 | 338 | 500 | 486 | 51,950 | 48x33x79 | 4,270 | 388 |
| 225 | 180 | 208 | NO | NO | 272 | 341 | 625 | 781 | 500 | 488 | 42,700 | 56x33x79 | 3,425 | 267 |
| 225 | 180 | 208 | YES | NO | 253 | 316 | 625 | 781 | 500 | 488 | 44,800 | 56x33x79 | 3,555 | 277 |
| 225 | 180 | 208 | NO | YES | 277 | 346 | 625 | 781 | 500 | 488 | 53,400 | 56x33x79 | 4,625 | 360 |
| 225 | 180 | 208 | YES | YES | 257 | 321 | 625 | 781 | 500 | 488 | 55,600 | 56x33x79 | 4,755 | 371 |
| Applicable Notes: | | — | 13 | — | 1,4,5,7,8,9,11,12 | 2,3,5,7,8,9,11,12 | — | — | 6 | 6,8,9,11,12 | — | 14 | 14 | — |

For explanation of notes, see referenced numbers in **12.1 - Notes**

Table 6 Series 600T Multi-Module Systems, 65-225 kVA - 600 Volt Input

| UPS Rating | | AC Output Voltage | Options | | Rectifier AC Input Current | | Inverter or Bypass AC Output Current | | Required Battery Disconnect Rating | Maximum Battery Current at End of Discharge | Maximum Heat Dissipation BTU/hr. | Dimensions Inches | Approx. Weight Lb. | Floor Loading Lb./Sq.ft. |
|--------------------------|-----|-------------------|--------------|-------------------|----------------------------|-------------------|--------------------------------------|-------------|------------------------------------|---|----------------------------------|-------------------|--------------------|--------------------------|
| kVA | kW | | Input Filter | Input Transformer | Nom | Max | Nom | Max | Amperes | Amperes | Full Load | (WxDxH) | (Un-packed) | (Distributed Loading) |
| 65 | 52 | 600 | NO | NO | 63 | 79 | 63 | 78 | 150 | 141 | 13,350 | 34x32x68 | 1,570 | 208 |
| 65 | 52 | 600 | YES | NO | 59 | 73 | 63 | 78 | 150 | 141 | 14,000 | 34x32x68 | 1,620 | 214 |
| 65 | 52 | 600 | NO | YES | 64 | 80 | 63 | 78 | 150 | 141 | 16,500 | 34x32x68 | 2,170 | 287 |
| 65 | 52 | 600 | YES | YES | 60 | 75 | 63 | 78 | 150 | 141 | 17,150 | 34x32x68 | 2,220 | 294 |
| 65 | 52 | 208 | NO | NO | 64 | 80 | 180 | 226 | 150 | 142 | 14,400 | 34x32x68 | 1,770 | 234 |
| 65 | 52 | 208 | YES | NO | 59 | 74 | 180 | 226 | 150 | 142 | 15,000 | 34x32x68 | 1,820 | 241 |
| 65 | 52 | 208 | NO | YES | 65 | 81 | 180 | 226 | 150 | 142 | 17,550 | 34x32x68 | 2,370 | 314 |
| 65 | 52 | 208 | YES | YES | 60 | 75 | 180 | 226 | 150 | 142 | 18,200 | 34x32x68 | 2,420 | 320 |
| 80 | 64 | 600 | NO | NO | 78 | 97 | 77 | 96 | 175 | 174 | 16,450 | 34x32x68 | 1,770 | 234 |
| 80 | 64 | 600 | YES | NO | 72 | 90 | 77 | 96 | 175 | 174 | 17,200 | 34x32x68 | 1,820 | 241 |
| 80 | 64 | 600 | NO | YES | 79 | 99 | 77 | 96 | 175 | 174 | 20,300 | 34x32x68 | 2,400 | 318 |
| 80 | 64 | 600 | YES | YES | 73 | 92 | 77 | 96 | 175 | 174 | 21,100 | 34x32x68 | 2,450 | 324 |
| 80 | 64 | 208 | NO | NO | 78 | 98 | 222 | 278 | 175 | 175 | 17,700 | 34x32x68 | 2,020 | 267 |
| 80 | 64 | 208 | YES | NO | 73 | 91 | 222 | 278 | 175 | 175 | 18,500 | 34x32x68 | 2,070 | 274 |
| 80 | 64 | 208 | NO | YES | 80 | 100 | 222 | 278 | 175 | 175 | 21,600 | 34x32x68 | 2,650 | 351 |
| 80 | 64 | 208 | YES | YES | 74 | 92 | 222 | 278 | 175 | 175 | 22,400 | 34x32x68 | 2,700 | 357 |
| 100 | 80 | 600 | NO | NO | 97 | 122 | 96 | 120 | 225 | 217 | 20,550 | 48x33x79 | 2,415 | 220 |
| 100 | 80 | 600 | YES | NO | 90 | 113 | 96 | 120 | 225 | 217 | 21,500 | 48x33x79 | 2,465 | 224 |
| 100 | 80 | 600 | NO | YES | 99 | 124 | 96 | 120 | 225 | 217 | 25,350 | 48x33x79 | 3,040 | 276 |
| 100 | 80 | 600 | YES | YES | 92 | 115 | 96 | 120 | 225 | 217 | 26,350 | 48x33x79 | 3,090 | 281 |
| 100 | 80 | 208 | NO | NO | 98 | 122 | 278 | 347 | 225 | 218 | 22,150 | 48x33x79 | 2,715 | 247 |
| 100 | 80 | 208 | YES | NO | 91 | 113 | 278 | 347 | 225 | 218 | 23,100 | 48x33x79 | 2,785 | 253 |
| 100 | 80 | 208 | NO | YES | 100 | 124 | 278 | 347 | 225 | 218 | 27,000 | 48x33x79 | 3,340 | 304 |
| 100 | 80 | 208 | YES | YES | 92 | 115 | 278 | 347 | 225 | 218 | 28,000 | 48x33x79 | 3,410 | 310 |
| 125 | 100 | 600 | NO | NO | 122 | 152 | 120 | 150 | 250 | 271 | 25,700 | 48x33x79 | 2,565 | 233 |
| 125 | 100 | 600 | YES | NO | 113 | 141 | 120 | 150 | 250 | 271 | 26,900 | 48x33x79 | 2,635 | 240 |
| 125 | 100 | 600 | NO | YES | 124 | 155 | 120 | 150 | 250 | 271 | 31,700 | 48x33x79 | 3,165 | 288 |
| 125 | 100 | 600 | YES | YES | 115 | 143 | 120 | 150 | 250 | 271 | 32,950 | 48x33x79 | 3,235 | 294 |
| 125 | 100 | 208 | NO | NO | 122 | 153 | 347 | 434 | 250 | 273 | 27,650 | 48x33x79 | 2,865 | 260 |
| 125 | 100 | 208 | YES | NO | 113 | 142 | 347 | 434 | 250 | 273 | 28,850 | 48x33x79 | 2,935 | 267 |
| 125 | 100 | 208 | NO | YES | 124 | 156 | 347 | 434 | 250 | 273 | 33,750 | 48x33x79 | 3,465 | 315 |
| 125 | 100 | 208 | YES | YES | 115 | 144 | 347 | 434 | 250 | 273 | 35,000 | 48x33x79 | 3,535 | 321 |
| 150 | 120 | 600 | NO | NO | 145 | 182 | 144 | 180 | 300 | 324 | 28,450 | 48x33x79 | 2,870 | 261 |
| 150 | 120 | 600 | YES | NO | 135 | 168 | 144 | 180 | 300 | 324 | 29,900 | 48x33x79 | 3,000 | 273 |
| 150 | 120 | 600 | NO | YES | 148 | 185 | 144 | 180 | 300 | 324 | 35,600 | 48x33x79 | 3,520 | 320 |
| 150 | 120 | 600 | YES | YES | 137 | 171 | 144 | 180 | 300 | 324 | 37,050 | 48x33x79 | 3,650 | 332 |
| 150 | 120 | 208 | NO | NO | 146 | 183 | 416 | 520 | 300 | 326 | 30,850 | 56x33x79 | 3,220 | 251 |
| 150 | 120 | 208 | YES | NO | 135 | 169 | 416 | 520 | 300 | 326 | 32,250 | 56x33x79 | 3,350 | 261 |
| 150 | 120 | 208 | NO | YES | 148 | 186 | 416 | 520 | 300 | 326 | 38,050 | 56x33x79 | 3,870 | 302 |
| 150 | 120 | 208 | YES | YES | 138 | 172 | 416 | 520 | 300 | 326 | 39,500 | 56x33x79 | 4,000 | 312 |
| 225 | 180 | 600 | NO | NO | 218 | 272 | 217 | 271 | 500 | 486 | 42,700 | 48x33x79 | 3,210 | 288 |
| 225 | 180 | 600 | YES | NO | 202 | 253 | 217 | 271 | 500 | 486 | 44,800 | 48x33x79 | 3,340 | 300 |
| 225 | 180 | 600 | NO | YES | 221 | 277 | 217 | 271 | 500 | 486 | 53,400 | 48x33x79 | 4,160 | 375 |
| 225 | 180 | 600 | YES | YES | 205 | 257 | 217 | 271 | 500 | 486 | 55,600 | 48x33x79 | 4,290 | 386 |
| 225 | 180 | 208 | NO | NO | 219 | 274 | 625 | 781 | 500 | 488 | 46,250 | 56x33x79 | 3,610 | 278 |
| 225 | 180 | 208 | YES | NO | 203 | 254 | 625 | 781 | 500 | 488 | 48,400 | 56x33x79 | 3,740 | 288 |
| 225 | 180 | 208 | NO | YES | 223 | 278 | 625 | 781 | 500 | 488 | 57,050 | 56x33x79 | 4,560 | 352 |
| 225 | 180 | 208 | YES | YES | 206 | 258 | 625 | 781 | 500 | 488 | 59,300 | 56x33x79 | 4,690 | 362 |
| Applicable Notes: | | — | 13 | — | 1,4,5,7,8,9,11,12 | 2,3,5,7,8,9,11,12 | 6 | 6,8,9,11,12 | — | 14 | 14 | — | — | |

For explanation of notes, see referenced numbers in **12.1 - Notes**

13.0 APPENDIX B - FIELD SUPPLIED LUGS

Table 7 One-Hole Lugs

| T & B ¹ Lug Style | | Wire Size | Bolt Size (Inches) | Tongue Width (Inches) | T & B ¹ P/N | Liebert P/N |
|---------------------------------|---|--------------|-----------------------|--------------------------|---------------------------|----------------|
| 1 | Stak-On | 1/0 AWG | 3/8 | 0.88 | J973 | 12-714255-56 |
| 2 | | 2/0 AWG | 3/8 | 1.00 | K973 | 12-714255-66 |
| 3 | | 3/0 AWG | 3/8 | 1.10 | L973 | 12-714255-76 |
| 4 | | 4/0 AWG | 3/8 | 1.20 | M973 | 12-714255-86 |
| 5 | Color-Keyed Aluminum/ Copper | 1/0 AWG | 3/8 | 0.93 | 60130 | — |
| 6 | | 2/0 AWG | 3/8 | 0.97 | 60136 | — |
| 7 | | 3/0 AWG | 3/8 | 1.06 | 60142 | — |
| 8 | Color-Keyed Copper Cable Long Barrel | 1/0 AWG | 3/8 | 0.75 | 54909BE | — |
| 9 | | 2/0 AWG | 3/8 | 0.81 | 54910BE | — |
| 10 | | 3/0 AWG | 1/2 | 0.94 | 54965BE | — |
| 11 | | 4/0 AWG | 1/2 | 1.03 | 54970BE | — |
| 12 | | 250MCM | 1/2 | 1.09 | 54913BE | — |
| 13 | Narrow-Tongue Copper Cable | 350MCM | 1/2 | 1.09 | 55165 | — |
| 14 | | 500MCM | 1/2 | 1.20 | 55171 | — |

¹ NOTE: Manufacturer Thomas & Betts (T & B), 1-800-862-8324

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Series 600T™ UPS

INSTALLATION MANUAL

The Company Behind the Products

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