ADDENDUM NO. 2

TO: PLANS AND SPECIFICATIONS FOR STATE OF MISSOURI

CHANGE IN SCOPE RE-BID: Replace Emergency Generator, Infrastructure
St. Louis Forensic Treatment Center - South
St. Louis, Missouri
PROJECT NO.: M1908-01

Bid Opening Date: 1:30 PM, January 12, 2023 (UNCHANGED)

Bidders are hereby informed that the construction Plans and/or Specifications are modified as follows:

SPECIFICATION CHANGES:

1. Section 260115 – Preventative Maintenance for 4.16 kV Electrical Equipment
   a. Paragraph 3.1-A.1: REPLACE "(Owner has on file)" with "(See Attachment A at the end of this Section)"
   b. Paragraph 3.1-A.2: REPLACE "(Owner has on file)" with "(See Attachment A at the end of this Section)"
   c. ADD the attached Section 260115 Attachment A.

DRAWING CHANGES:

(None)

GENERAL COMMENTS:

(None)

ATTACHMENTS:

1. Section 260115 Attachment A (38 pages)

END ADDENDUM NO. 2

ADDENDUM NO. 2

SECTION 260115
ATTACHMENT A

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S&C Metal-Enclosed Switchgear

Simple, reliable, flexible, and economical . . . the intelligent solution to your in-plant medium-voltage switching and protection needs.

S&C Metal-Enclosed Switchgear, rated 4.16 kv through 34.5 kv, features reliable, time-tested fuses and manual or power-operated interrupter switches in rugged 11-gauge steel enclosures. Switchgear bays are configured into integrated packages for application flexibility, operating simplicity, and superior dependability in switching and protecting medium-voltage power circuits in commercial, institutional, industrial, and high-rise installations. S&C's expertise in this field has been established during nearly 50 years of metal-enclosed-switchgear design and manufacture, and is complemented by UL® listing of all S&C Metal-Enclosed Switchgear rated 4.16 kv through 13.8 kv with 600-ampere or 1200-ampere main bus.

S&C Metal-Enclosed Switchgear is available in two types-modular and custom. S&C System II Modular Metal-Enclosed Switchgear consists of pre-engineered single-bay modules assembled into configurations that fit most application requirements. Drawing preparation and approval time is minimized, and you gain all the economies of repetitive manufacture. For those requirements that cannot be fully satisfied with modules, S&C's experienced team of specialists will custom design switchgear for your application.

Power-System-Matched Switching and Protection

Full-load switching, plus S&C's unique one-time and two-time duty-cycle fault closing ratings. S&C Interrupter Switches carry and *interrupt* rated load currents even after being closed into available fault currents corresponding to their fault-closing ratings-you can restore power quickly without first having to repair switches inadvertently closed into a fault.

One-cycle total clearing with S&C SM and SML Power Fuses – compared to the 5 cycles or more required by circuit breakers . . . simplifies upstream coordination, minimizes short-circuit stresses on the system.

A choice of unique response curves with maintenance-free S&C Electronic Power Fuses – providing protection not available with any other protective devices, even circuit breakers with their relays and batteries.

Three-phase protection for three-phase loads. S&C electronic overcurrent relays provide isolation for three-phase loads from single phasing and other open-phase conditions.

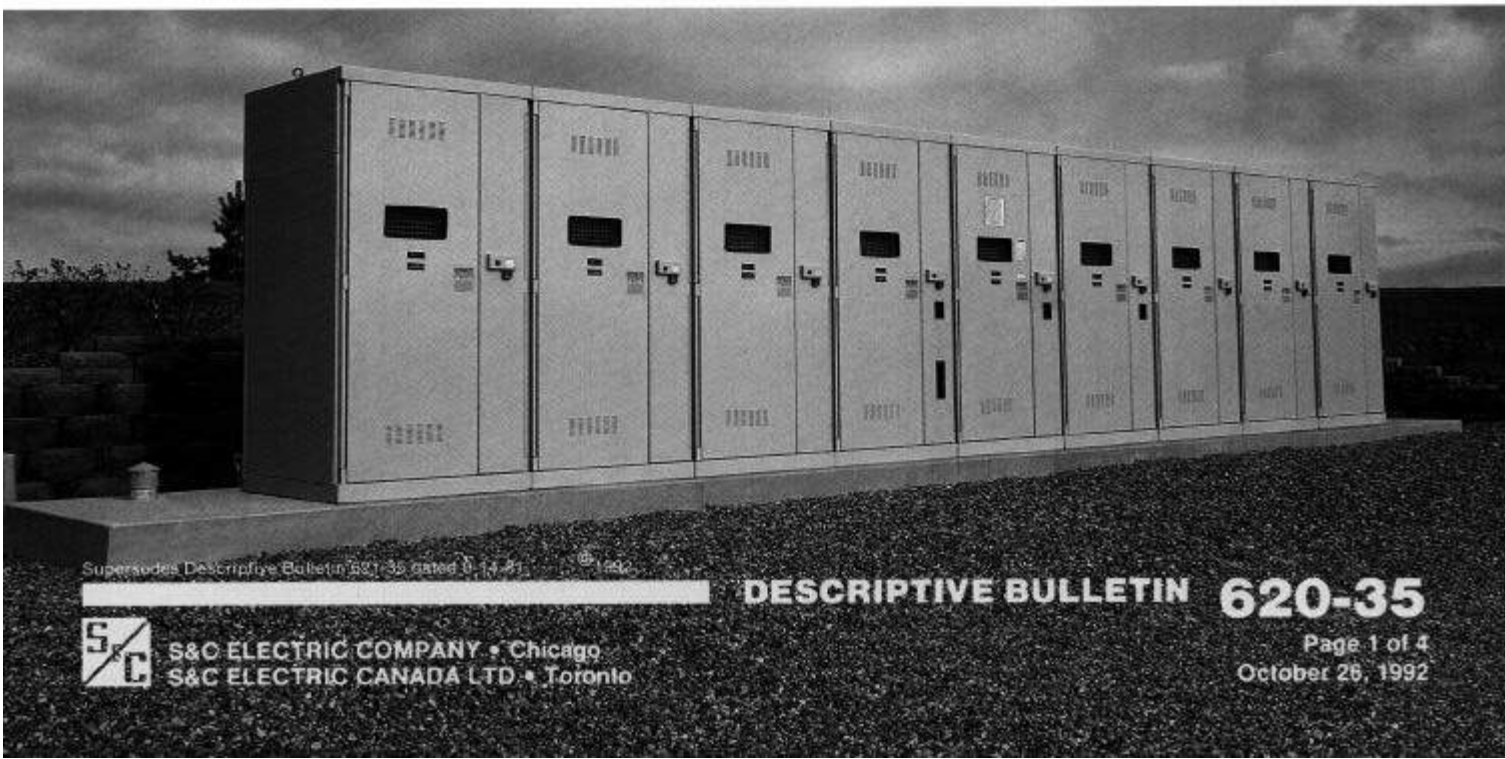
Single-phase protection for single-phase loads. Fuses . . . unlike circuit breakers . . . selectively isolate only faulted phases of feeders serving single-phase loads.

Threefold Economy

Low purchase cost – economies inherent in the interrupter switch and fuse protection concept translate into significant first-cost savings.

Low installation cost – metal-enclosed switchgear, light by comparison with breaker gear, is easy to handle and needs no foundation, no support channels . . . only a level floor or pad. Multibay lineups assemble with a minimum of interbay bolting, and inter-unit bus connections need no taping. Simple field assembly. . . with no relays to set and test. . . means less time, equipment, and manpower for installation. And future additions to a lineup are readily accomplished as your system expands.

Low maintenance cost – S&C fuses are nondamageable and do not require any maintenance or calibration to perpetuate the accuracy of their time-current characteristics. S&C Interrupter Switches are maintenance free . . . requiring only an occasional exercising. And all that's required with S&C gear is a check of the insulators and, if necessary, a simple cleaning.



CONSTRUCTION

Matchless Construction Features Assure Long Service Life.

The top-quality features of S&C's switchgear bring the superior reliability and security needed to assure service continuity on your medium-voltage distribution system. Described below are some of the many built-in reasons for specifying S&C Metal-Enclosed Switchgear . . . in both the outdoor style illustrated below and the indoor style that differs only in a finish suited to indoor requirements and omission of certain weather-proofing features.

Rugged construction. Each bay of S&C Metal-Enclosed Switchgear—fabricated from 11-gauge steel—is a monocoque unit with an integral channel base around all four sides. With this unitized design, there are always double walls between adjoining bays. Accurately formed, matching enclosures assure perfect alignment in multibay lineups.

No exposed bolts on enclosure sheets or roofs to attract the vandal. Even future bus extensions are internally secured.

Comprehensive access controls—all doors have heavy-duty latches and hinges and are padlockable; manual switch handles are padlockable in both switch-closed and switch-open positions. Access is further limited by snaplocks or interlocks.

Category A enclosures. When specified, S&C Metal-Enclosed Switchgear includes additional features—such as window covers, handle covers, and the S&C Penta-Latch™ or Penta-Lock—to provide the industry's highest standard of security for this class of equipment.

Wide bulkhead-type doors provide convenient *front* access for cable termination. There's no need for rear access . . . gear can be placed back-to-back or against a wall, using a minimum of floor space.

Inner screen doors—bolted closed—are a second barrier guarding against inadvertent entry.

S&C's unique Ultradur™ finish guards against corrosion. S&C's proven multicoat finishing system provides lasting protection that cuts enclosure maintenance costs. In addition, all hardware is galvanized, zinc-nickel plated, or of stainless steel or nonferrous materials to resist corrosion.

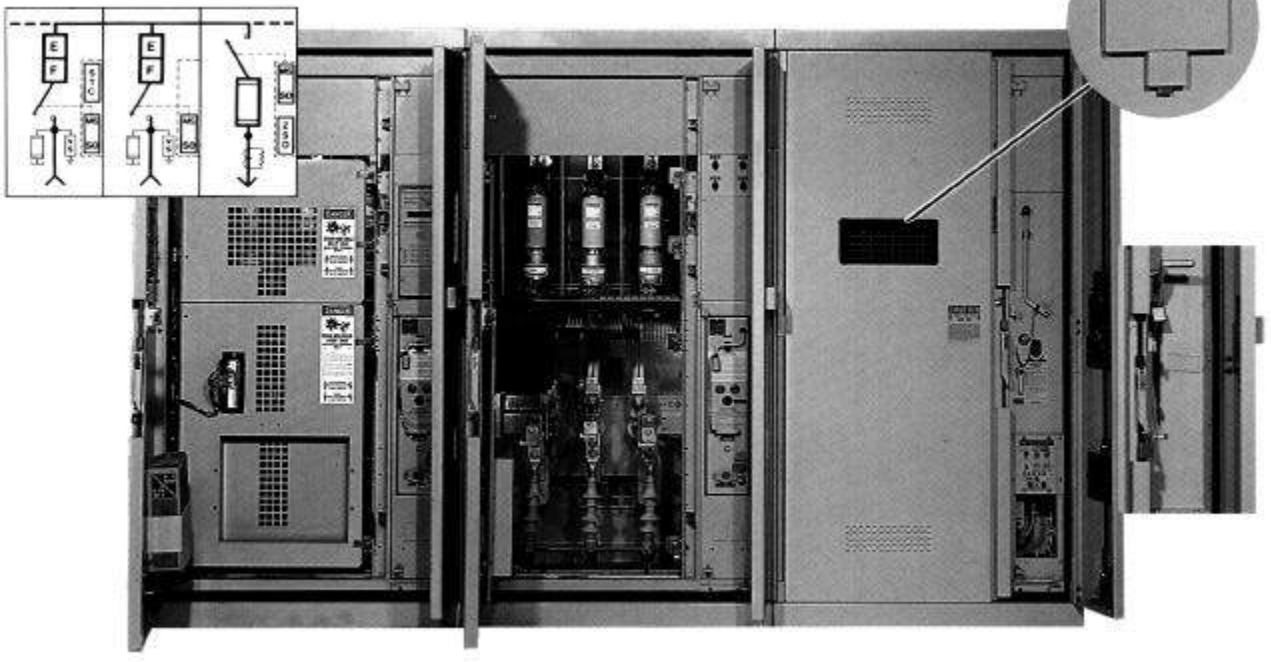
Specially designed gasketing or sealants provide weathertight seals at door openings, at top and side edges of adjoining bays and interbay bus openings, and at the roof.

Insulating "no-drip" compound on the underside of the roof checks condensation.

Cypoxy®, S&C's cycloaliphatic epoxy resin insulation system, insulates all live parts from ground—it's non-tracking, self-scouring, and nonweathering. Cypoxy Insulators have greater leakage distances . . . optional through bushings provide isolation between bays.

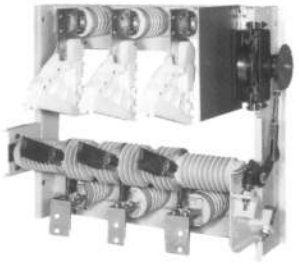
Grounding provisions—heavy-duty bails on all cable-termination points, and on the ground bus, accommodate portable grounding equipment.

Bus connections—protected by an oxide-inhibiting compound, are bolted to a uniform torque . . . special-purpose washers and bolts maintain optimum contact pressure.



A wide choice of S&C components-exhaustively tested, field proven, of unequaled performance and operational dependability--all expressly designed to solve your power distribution problems.

S&C Interrupter Switches handle all live-switching duties and feature duty-cycle fault-closing ratings—a requisite for automatic control schemes.



Mini-Rupter® Switch (pictured)—rated to 600 amperes continuous and interrupting. Aldui-Rupter® Switches rated to 1200 amperes continuous and interrupting are also available.

S&C Type MS Switch Operators provide automatic trip-open operation and a choice of manual or automatic trip-closed operation. These operators are specially designed for high-speed operation of Mini-Rupter Switches—circuit interruption in 4 cycles, automatic transfer as fast as 10 cycles.

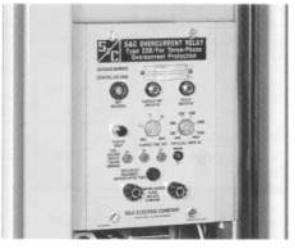
SM Power Fuses are offered in a wide variety of ampere ratings and time-current characteristics, permitting close fusing ratios for optimal coordination and maximum protection. Their time-current characteristics are precise and permanently accurate.

Type SM-40 Power Fuse (pictured)—400 amperes max continuous. Other Type SM Power Fuses are available in ratings from 200 through 720 amperes max continuous.

Fault Fiter® Electronic Power Fuses with their exceptional TCC versatility and higher continuous current ratings provide features and performance previously unavailable in any other protective device.

Fault Fiter is rated through 600 amperes max continuous.

S&C Electronic Relays, applied on individual load feeders, protect three-phase loads from single-phasing resulting from blown fuses and other open-phase conditions.

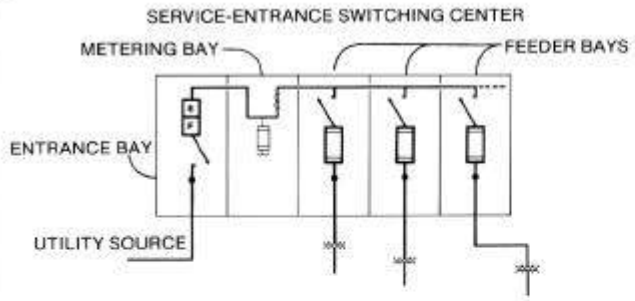


S&C Micro-AT™Source-Transfer Controls combine standardized designs . . . including a wide choice of options . . . with solid-state reliability and the power and versatility of microprocessor electronics—they're the complete control package for most automatic-transfer needs.

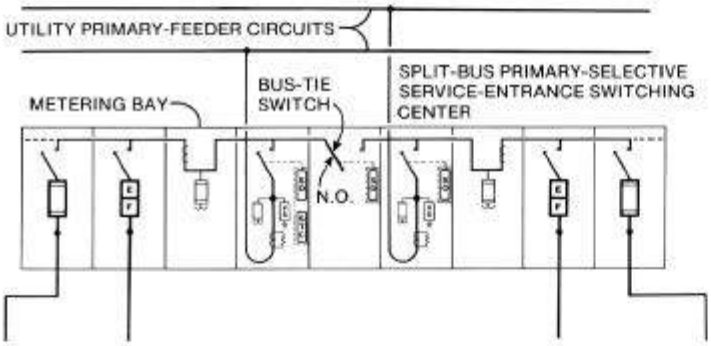
APPLICATION

Simplified Power-System Planning

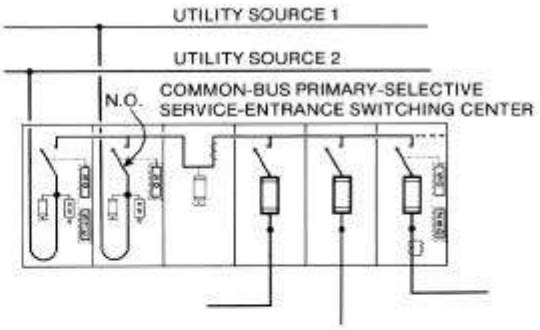
Simple, reliable, economical-S&C Metal-Enclosed Switchgear is readily configured into basic circuit arrangements that make power-system planning and design easy . . . implementation is logical and straightforward. The basic arrangements shown below are often combined to handle even the most complex distribution system need . . . assuring maximum service continuity for extremely critical loads. Illustrated here are some of the most common arrangements.



A radial system is the simplest system . . . and it is economical, permitting extensive use of dedicated radial circuits. The direct circuitry facilitates quick location and repair of faulted circuits. Segmentation of any distribution system with multiple radial circuits limits the extent of service interruption due to faults. In the above example, the service-entrance bay is provided with electronic power fuses to achieve full coordination with the upstream protective device.



Split-bus primary-selective S&C Metal-Enclosed Switchgear (as diagramed above) allows large in-plant systems to be supplied power through one switching center since both utility sources are fully utilized under normal operation with the two source interrupter switches closed and the bus-tie switch open. Each source, in effect, is the preferred source for its bus section and the alternate source for the other bus section.



Common-bus primary selective S&C Metal-Enclosed Switchgear assures a higher level of service continuity when two utility primary-feeder circuits—one source *preferred*, the other *alternate*—supply power to metal-enclosed switchgear applied as the service-entrance switching center, as diagramed above. A power-operated interrupter switch for each source plus a source-transfer control effect automatic two-way transfer in the primary-selective switchgear. Interrupter switches with power fuses switch and protect the load circuits—two are manually operated the third is power operated, with an electronic overcurrent relay and switch operator providing automatic three-phase isolation when a fuse operates.

MAXIMUM SHORT-CIRCUIT RATINGS AND THREE-PHASE LOAD CAPABILITY

Switchgear Ratings	Voltage, Kv	Nominal	4.16		4.8		13.8	25	34.5
		Max	4.8		5.5		17.0	29	38
		BIL	60		60		95	125 or 150	150 or 200
	Main Bus, Continuous Amperes		600, 1200, or 2000						
	Short-Circuit, and Duty-Cycle Fault-Closing	Amperes, Rms, Sym.	37,500	40,000	25,000	40,000	25,000	40,000	25,000	17,500
		Mva, 3-Phase Sym. at Nom. Voltage	270	290	210	330	600	960	1080	1050
Max 3-Phase Load per Fused Feeder (at nominal voltage)	Continuous Load, Kva		5200	4300	6000	5000	17,200	14,300	25,900	17,900
	Permissible Peak Load, Kva		5700	5800	6600	6700	18,900	19,100	34,500	22,400

Application Guide

for Metal-Enclosed Switchgear in Industrial, Commercial, and Institutional Installations (4.16 kv through 34.5 kv)

Supersedes Data Bulletin 620-55 dated 7-15-91

DATA BULLETIN 620-55

S&C ELECTRIC COMPANY • Chicago
S&C ELECTRIC CANADA LTD. • Toronto

October 19, 1992

GENERAL

Metal-enclosed switchgear brings simplicity, reliability, flexibility, and economy to circuit switching and fault-protection functions on medium-voltage power circuits.

Metal-enclosed switchgear, consisting of interrupter switches and fuses plus control and sensing devices all housed within rugged monocoque enclosures, permits tailoring of reliable, economical switching and protection packages matched to virtually any in-plant power distribution system need. Interrupter switches are specially designed to handle all load-switching duties, including full-load, transformer-magnetizing, and cable-charging currents . . . plus fault-closing duties. And, interrupter switches can be furnished for manual, automatic, or remote operation, extending their use over the full range of operating modes. Power fuses provide precisely coordinated protection over the full spectrum of fault currents. A broad range of power fuses is available permitting close fusing to achieve maximum protection and optimum coordination.

The combination of interrupter switches for switching and power fuses for protection eliminates the need for expensive circuit-breaker gear (metal-clad switchgear), particularly on cable distribution systems where the rare and permanent nature of the faults makes the automatic reclosing feature of circuit breakers an unnecessary extravagance. Unlike circuit-breaker gear, metal-enclosed switchgear is virtually maintenance free. The interrupter switches never need adjusting, setting, dielectric testing, or lubrication. Only an occasional inspection and exercising is required. And power fuses, unlike relays, never need setting, testing, or maintenance. In addition, metal-enclosed switchgear can be equipped to selectively protect both single-phase and three-phase loads, as opposed to circuit-breaker gear which operates only on a three-phase basis. Also, in comparison to circuit-breaker gear, metal-enclosed switchgear is more economical, permitting increased load segmentation to limit the extent of any power-service outage.

Metal-enclosed switchgear needs no foundation or support channels for installation . . . only a level pad is required. Light by comparison to circuit-breaker gear, metal-enclosed switchgear installs anywhere, even on balconies and rooftops. And, in outdoor installations, there is no need for an additional housing or walk-in shelter which is required with metal-clad gear. Metal-enclosed switchgear can be placed against a wall or back-to-back to minimize floor-space requirements.

There are a variety of power distribution systems in use today, ranging from the simplest to the most complex. In designing these systems, planners generally use the four basic circuit arrangements that are described in this publication. Each circuit arrangement offers a particular level of service continuity, so the system can be matched to the criticality of the load served. In fact, the four fundamental circuit arrangements can be used in unlimited combinations to distribute power to all loads at a facility. The extensive selection of switching and protection equipment available in metal-enclosed switchgear permits you to implement these systems easily, reliably, and economically. This publication illustrates how the four basic circuit arrangements are implemented with metal-enclosed switchgear and diagrams a few of the virtually limitless power-distribution-system designs possible. With metal-enclosed switchgear, you will be able to take advantage of its many benefits to solve your power distribution problems and to achieve the desired reliability, flexibility, and economy.

In selecting metal-enclosed switchgear for your medium-voltage power distribution system, it is important to select components with ratings and capabilities equal to the duty, and to examine the enclosure construction to make certain it matches the environmental and security requirements at the installation. This is particularly critical recognizing the importance of metal-enclosed switchgear in maintaining continuity of power service to any facility. S&C Metal-Enclosed Switchgear is unsurpassed in the quality and durability of its enclosure and components, reflecting nearly 50 years of design and experience in this field. For more information on S&C Metal-Enclosed Switchgear, refer to S&C Descriptive Bulletins 621-30 and 622-30.

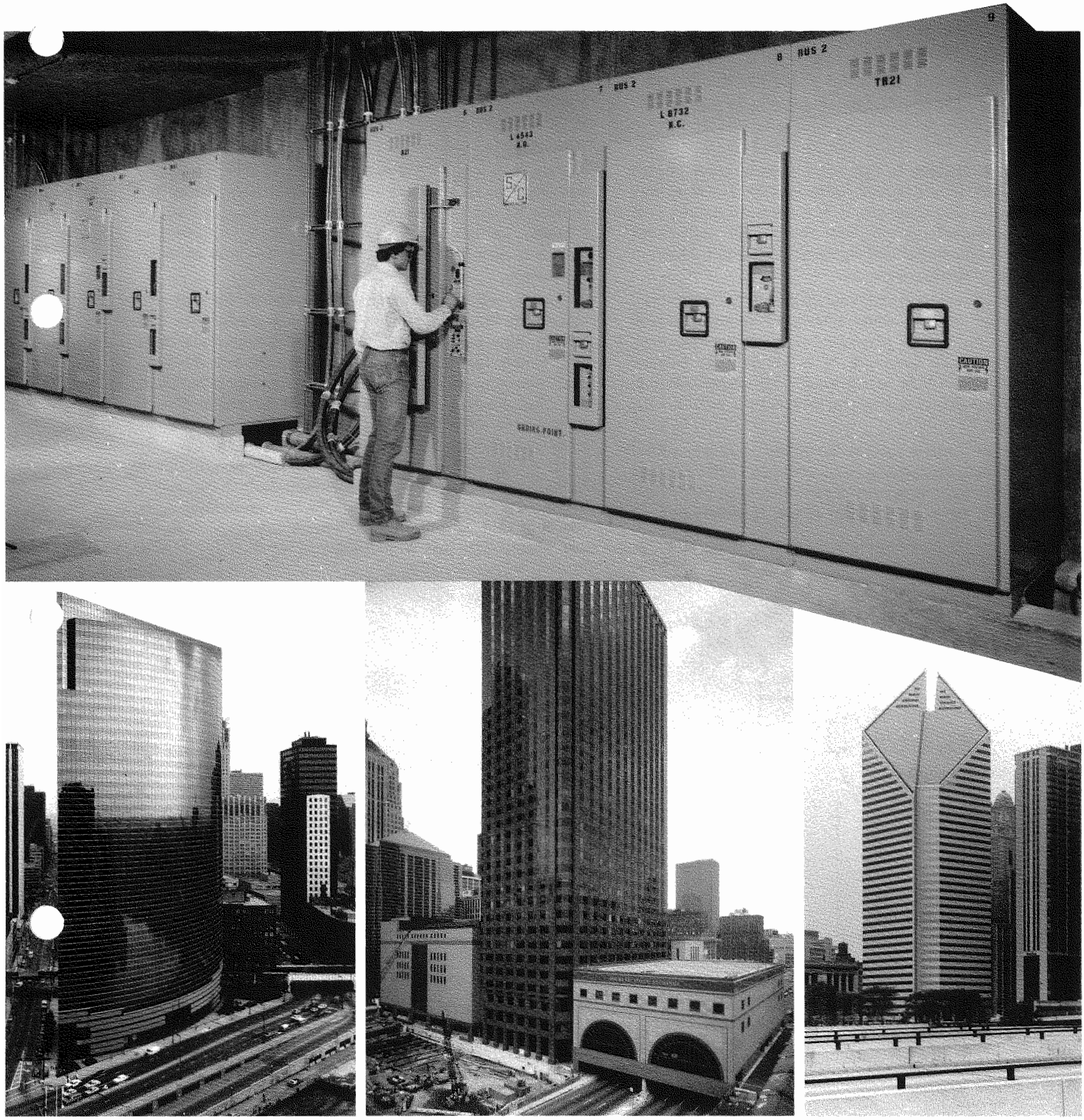


Figure 1. Metal-enclosed switchgear assures the integrity of medium-voltage power circuits serving modern high-rise commercial installations. The switchgear pictured above is installed in the electrical vault of the building at lower center and is representative of the switchgear installed in the other high rises.

APPLICATION

To solve your power distribution problems, implement the four fundamental circuit arrangements—radial, looped-primary, common-bus primary-selective, and split-bus primary-selective—with metal-enclosed switchgear.

The Radial System is the most widely used circuit arrangement in industrial, commercial, institutional, and high-rise installations. It is a simple system . . . it is an economical system. And the simple and direct circuitry of the radial system facilitates quick location and repair of faulted circuits.

Figure 2 illustrates an extremely simple radial system. Diagrammed is a two-bay lineup of metal-enclosed switchgear, commonly identified as a service entrance, which serves the primary of a single transformer supplying a relatively small load. The transformer is switched and protected by the interrupter switch with power fuses.

A more extensive system involving multiple radial circuits serving segmented blocks of load, each switched and protected by interrupter switches with electronic power fuses or other power fuses, is illustrated in Figure 3. Here the service-entrance switching center employs an interrupter switch to connect the utility source to the bus serving three bays that feed radial circuits. These radial circuits demonstrate a variety of metal-enclosed switchgear that can be used to serve the loads.

Use of multiradial circuits segmented in this way permits individual protection for each transformer. The power fuse protecting a given transformer will clear and isolate any faults associated with the transformer, thus allowing continuous service to the remaining loads on the system. The low cost of metal-enclosed switchgear, as compared to circuit-breaker gear (metal-clad switchgear), is the key to the design of a system with a high degree of segmentation. The economics of circuit-breaker gear would normally dictate the use of fewer points of segmentation with the result that more loads would be affected by an outage due to faults associated with any transformer or cable.

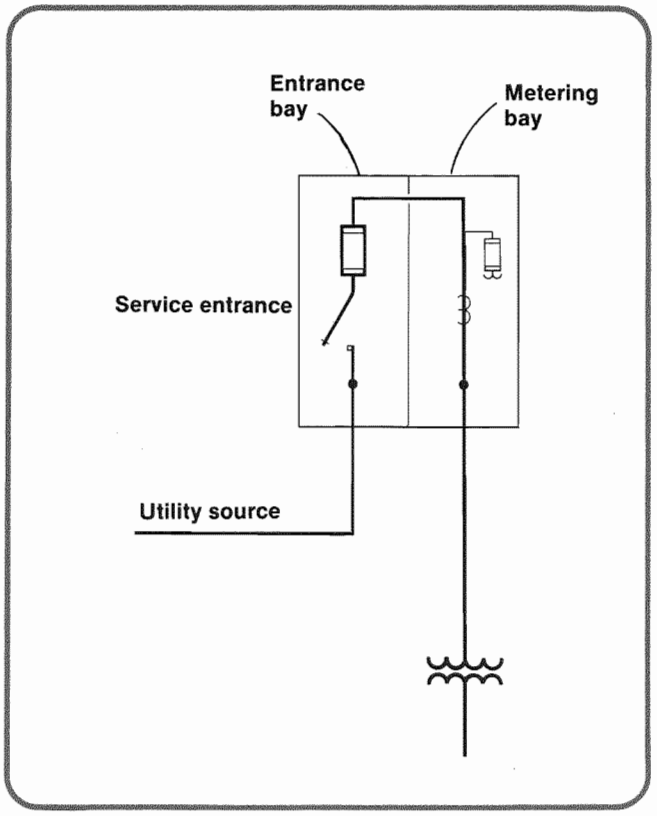


Figure 2. Metal-enclosed switchgear applied as a service entrance on a simple radial system.

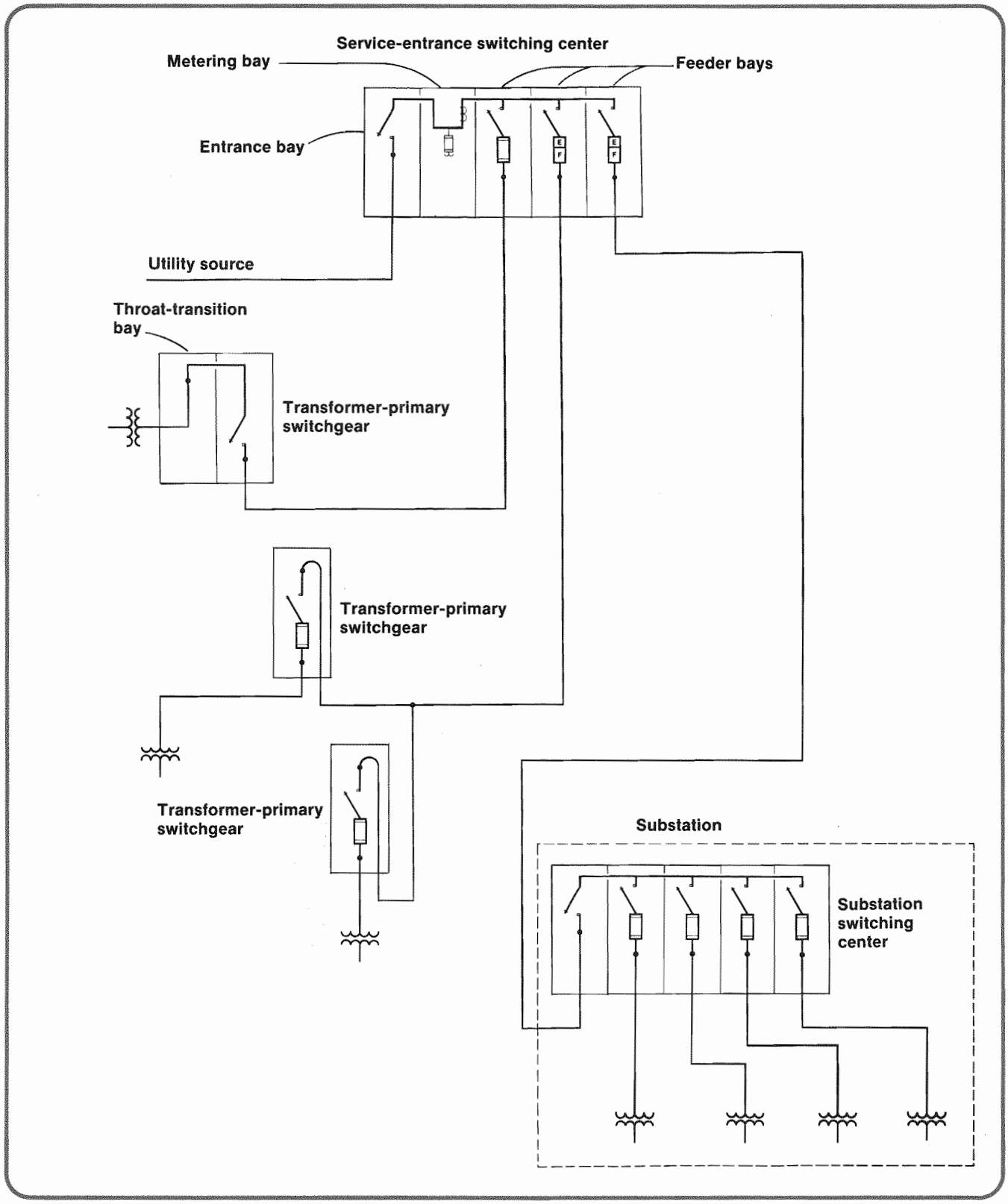


Figure 3. Multiple radial circuits are best switched and protected with metal-enclosed switchgear.

APPLICATION — Continued

The Looped-Primary System is more suitable than the multiradial system for installations which have widely dispersed loads and which require a higher level of power availability. It does not reduce the frequency of interruptions compared to a radial system, but does permit quick restoration of service to the loads on the looped-primary feeder cable (see Figure 4) following a fault on the cable. Typically, both ends of the looped-primary circuit are connected to a single utility source, and provisions are made for sectionalizing the loop so that power can be supplied to each load from either end of the circuit. (A loop could be effected by connecting each end to a separate utility source. The application of such a loop is similar to that of a primary-selective system as described on page 10.)

Figure 4 shows a small, simple loop implemented totally with metal-enclosed switchgear. The four-bay service-entrance switching center consists of an entrance bay, a utility metering bay, and two feeder bays. Each of the feeder bays provides switching and, using electronic power fuses, protection for its associated end of the looped-primary feeder cable. The loop is sectionalized with interrupter switches located in the entrance bays at each end of the multibay metal-enclosed switchgear lineups which are applied as switching centers within the loop. Interrupter switches with power fuses in the feeder bays of these switching centers provide switching and protection for cable-connected loads, one of which is a medium-voltage motor. Under normal operating conditions, one interrupter switch near the center of the loop is open as indicated in the one-line diagram. Should a fault occur on a section of the looped-primary feeder cable, the electronic power fuse in the service-entrance switching-center feeder bay serving that section of the loop

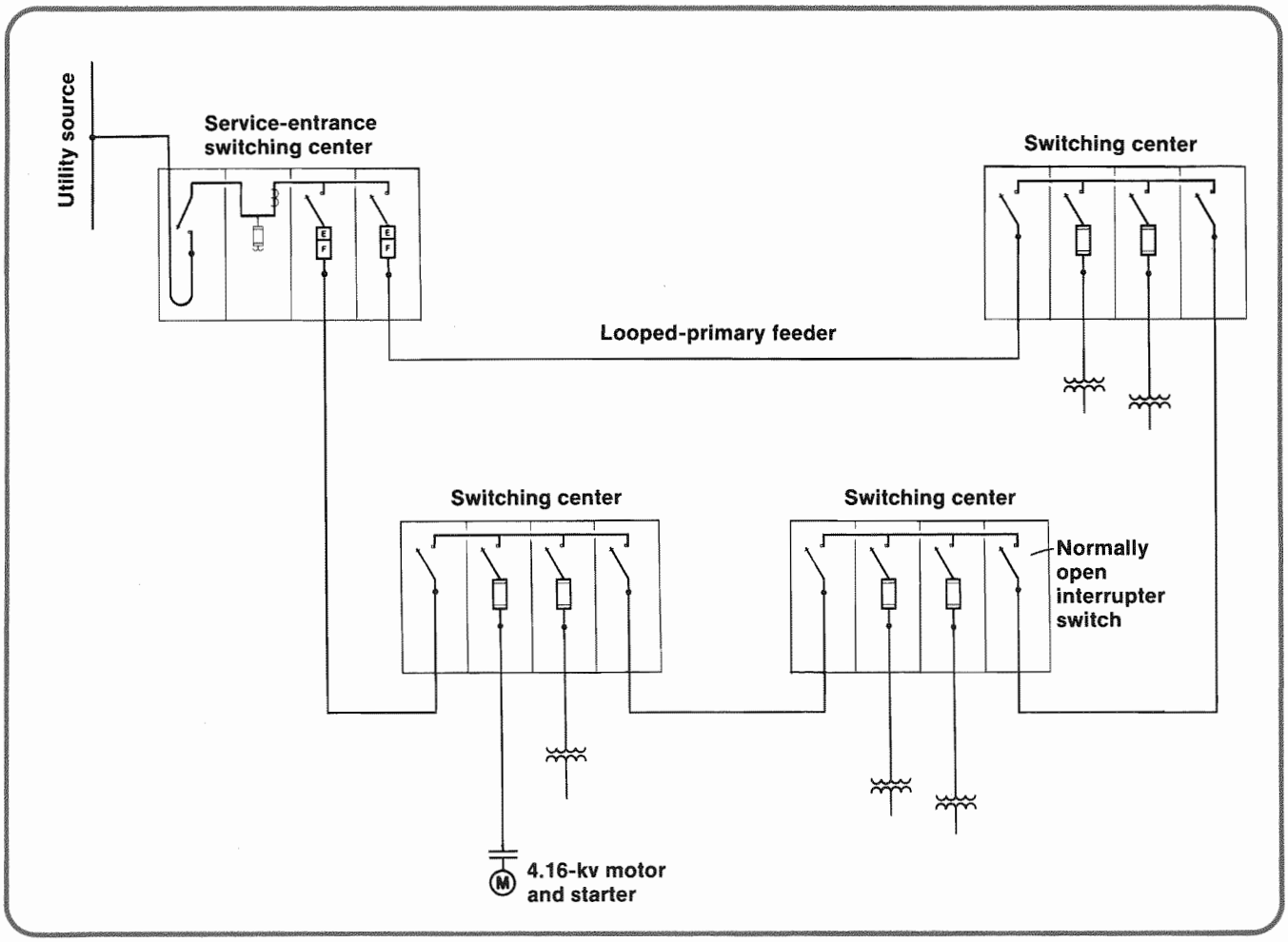


Figure 4. A simple looped-primary system implemented totally with metal-enclosed switchgear employing interrupter switches and power fuses, including electronic power fuses.

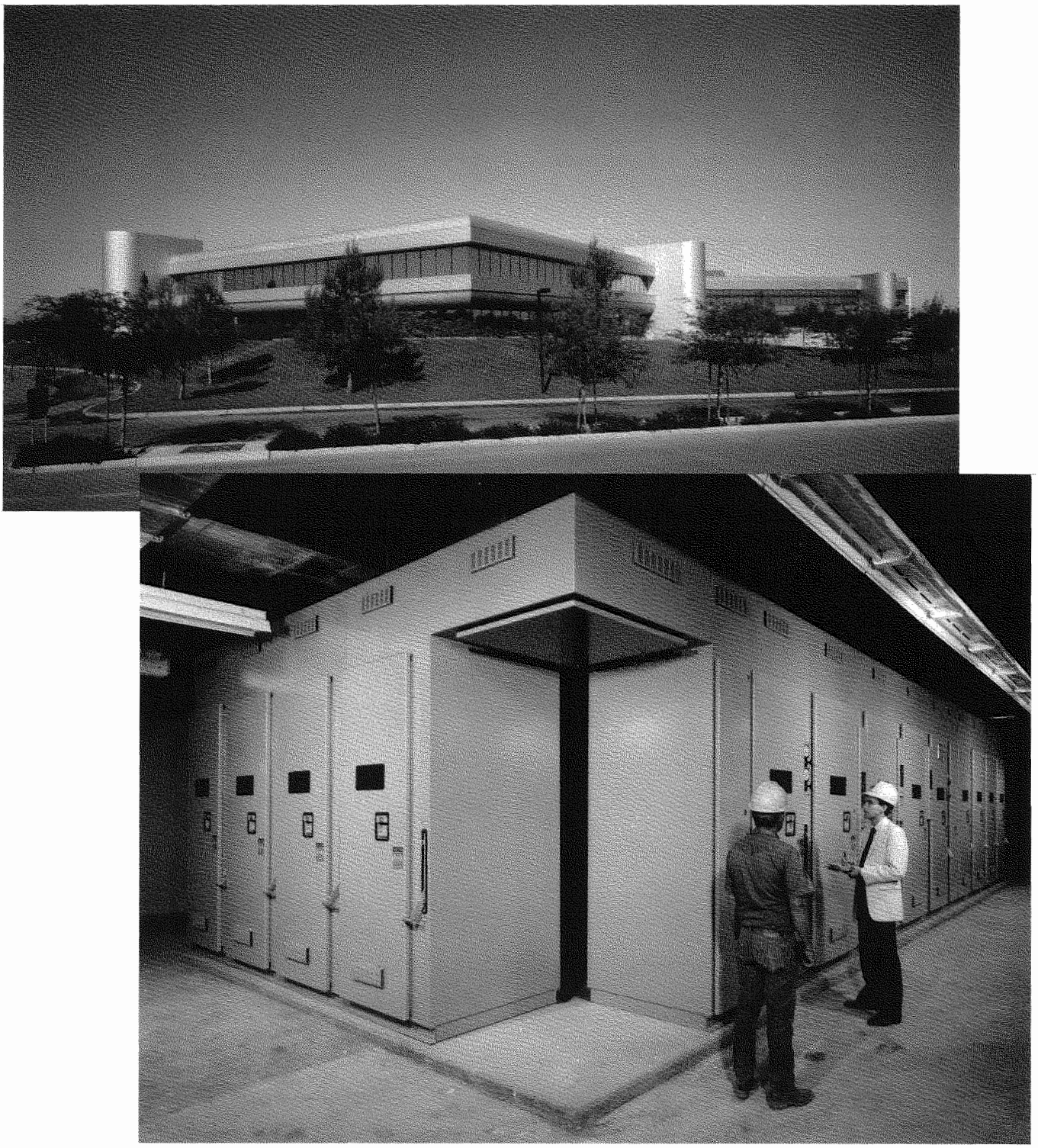


Figure 5. The fifteen bays of medium-voltage metal-enclosed switchgear provide switching and protection for circuits supplying power to a large industrial complex.

APPLICATION — Continued

operates to clear the fault. Selective manual switching operations can then be performed to isolate the faulted section of cable and permit restoration of medium-voltage power to all loads.

In installations where load currents are high, the looped-primary system may be implemented as shown in Figure 7. In the system depicted, the loop continuous currents exceed those that can be carried by fuses, so circuit-breaker gear, which has higher continuous-current ratings, is used for switching and protection at the ends of the loop. Metal-enclosed switchgear is used for all of the switching centers within the loop. Interrupter switches, rated up to 1200 amperes continuous and interrupting, permit sectionalizing of the loop, and interrupter switches with power fuses, including electronic power fuses, provide for switching and protection of the loads. Although circuit breakers and complex relaying could have been used throughout the loop to expedite the restoration of service to all loads following a cable fault, the high cost would not normally be justifiable, considering the infrequency of cable faults and the relative ease of restoring service

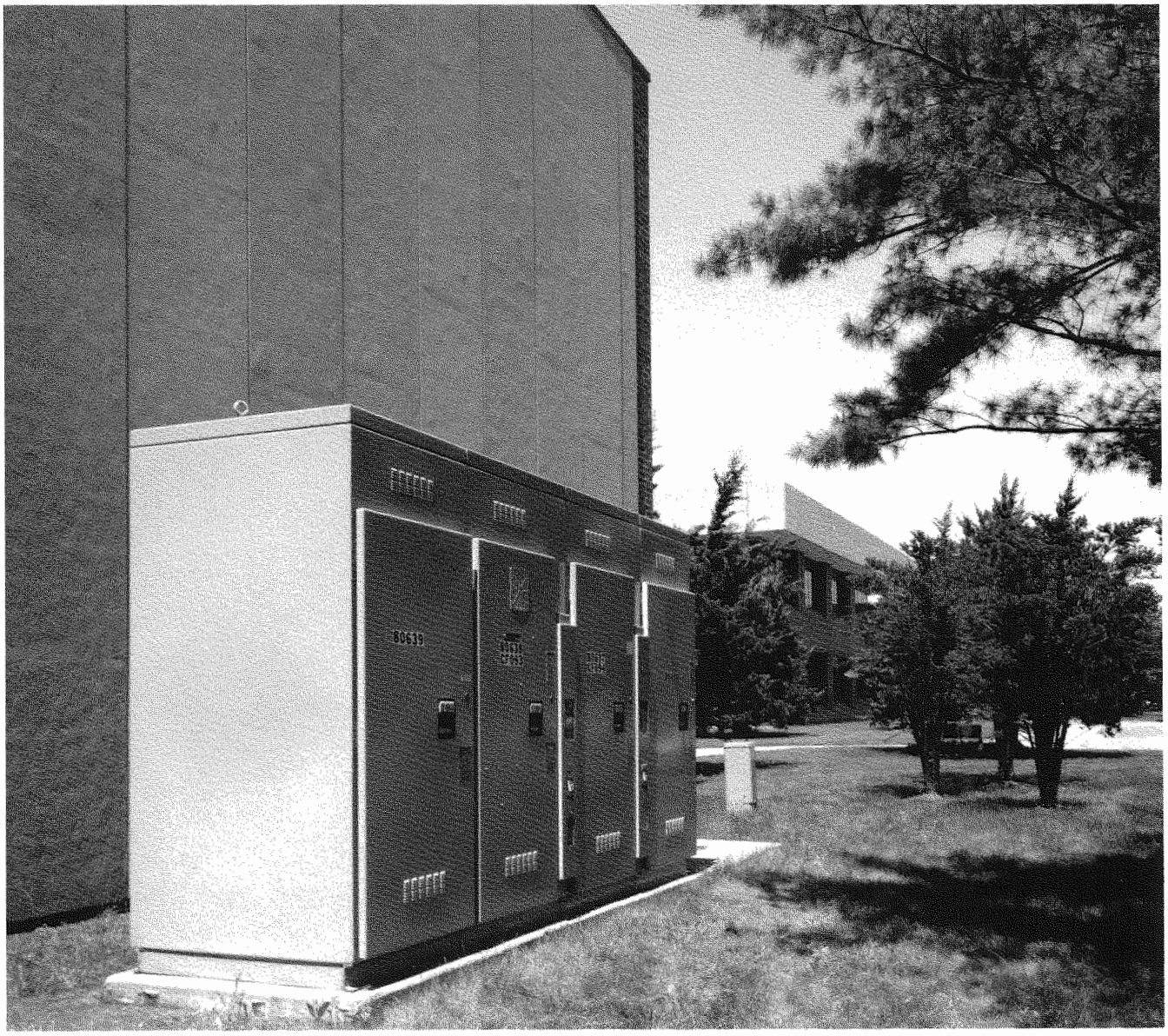


Figure 6. As illustrated at this corporate complex, metal-enclosed switchgear can be applied outdoors without requiring an additional housing or walk-in shelter, which is required with circuit-breaker gear.

with metal-enclosed switchgear. In addition, the use of power fuses (with their inherent fast response characteristics) instead of circuit breakers for protecting the loads permits more rapid interruption and isolation of faults on the lateral cables and transformers feeding the loads. This, in turn, allows faster relay settings to be used for the loop terminal breakers—a big advantage in that the resulting coordination greatly reduces cable fault interrupting times, minimizing short-circuit stresses on the system.

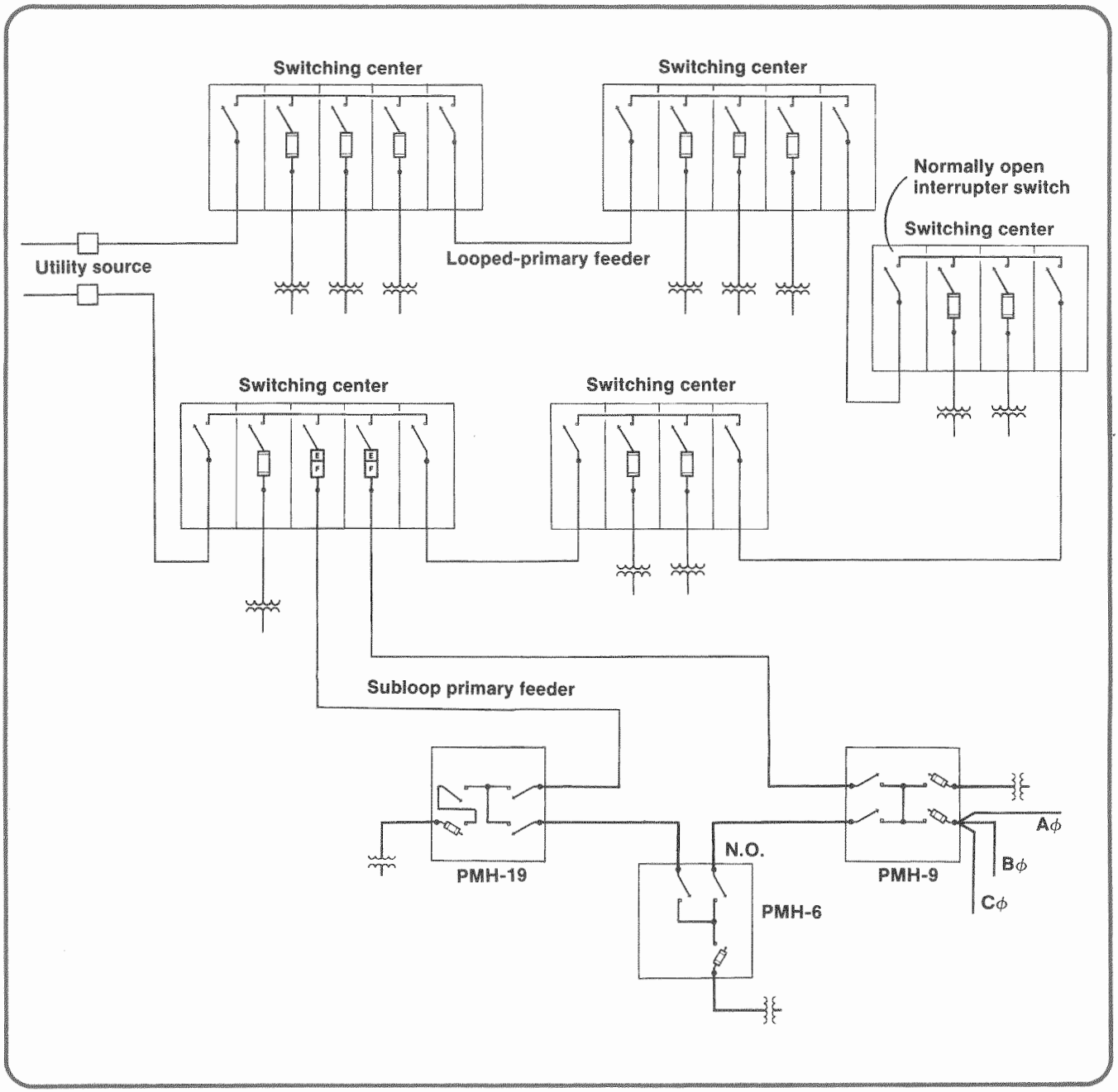


Figure 7. The ends of this looped-primary system are connected to the utility source with circuit-breaker gear. Metal-enclosed switchgear provides for switching and protection within the loop and a subloop is shown implemented with pad-mounted gear.

APPLICATION — Continued

The Primary-Selective System, unlike the two systems previously described, provides a high degree of service continuity for critical loads by minimizing interruptions resulting from utility source failure. The utility source, due to its extensive exposure to such phenomena as lightning, wind, and ice, and to equipment failure, is the most vulnerable link in the power-supply chain. In recognition of this, system planners with critical loads to serve should first provide a primary-selective system to assure continuity of the medium-voltage supply from the utility before considering other systems that minimize interruptions due to in-plant transformer or transformer-secondary equipment failures. The primary-selective system may be implemented as either a common-bus or a split-bus scheme, with manual, automatic, or remote-controlled switching.

Common-Bus Primary-Selective System. Figure 8 illustrates a six-bay service-entrance switching center with provisions for utility metering. A source-transfer control and switch-operator-driven interrupter switches with electronic power fuses provide automatic two-way source transfer with the ability to connect either of the two utility sources to the switchgear's common bus. The electronic power fuses in the entrance bays provide protection for the switchgear's main bus and coordinate with feeder fuses. As described previously, segmenting the load into small blocks supplied by multiple radial circuits, or serving the load with looped-primary circuits, will augment the service continuity and operating flexibility provided by the common-bus primary-selective system.

Under normal operating conditions in switchgear with automatic two-way source transfer, one switch (for the preferred source) is closed; the other switch (for the alternate source) is open with its associated circuit available as standby. The source-transfer control monitors the condition of both power sources and initiates automatic switching when preferred-source voltage has been lost (or reduced to a predetermined level) for a period of time sufficient to confirm that

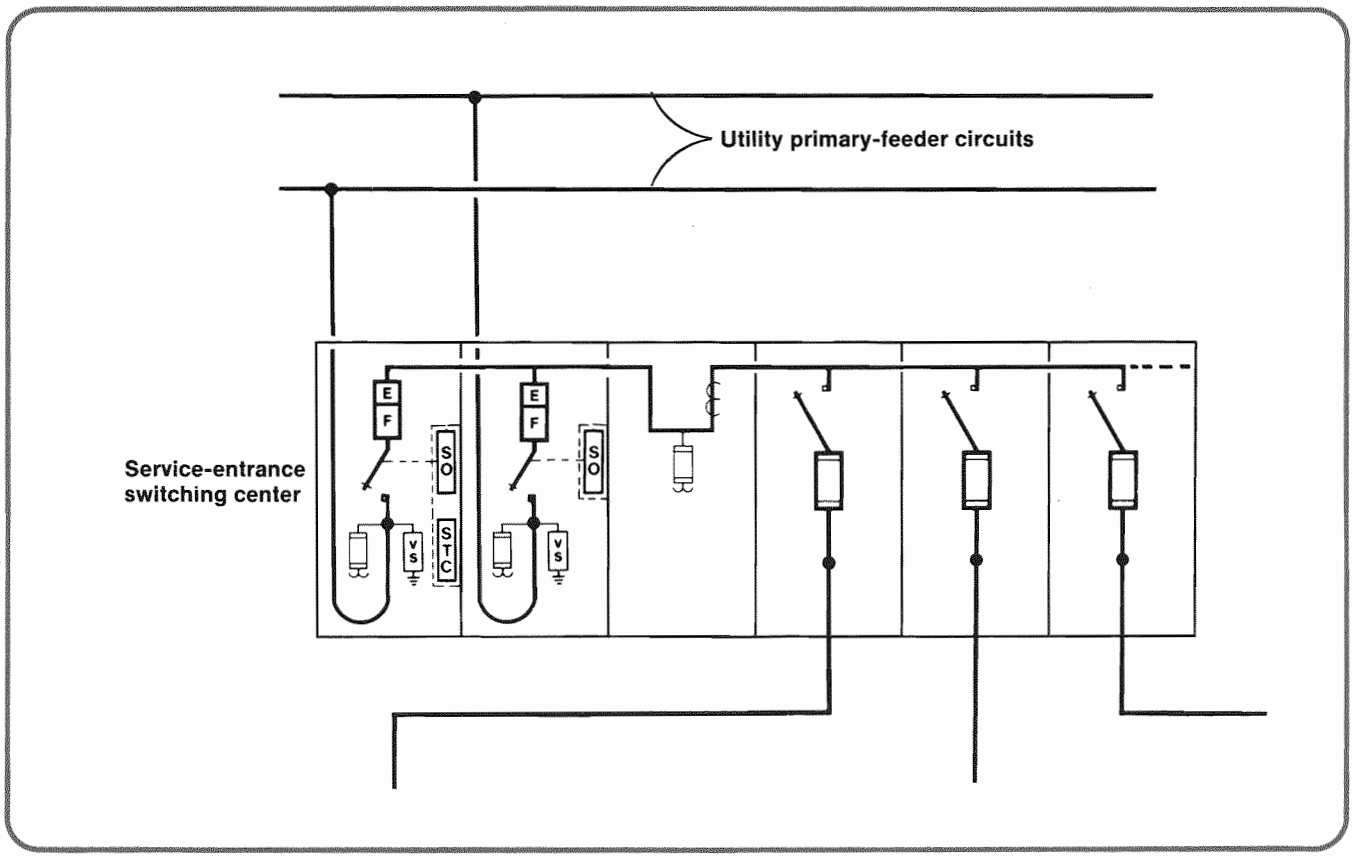


Figure 8. Metal-enclosed switchgear is available with switch operators and source-transfer controls to effect two-way source transfer in common-bus primary-selective switchgear lineups such as diagrammed above. Either of the two sources may be the preferred source, the other source then serving as the alternate source. Manually operated interrupter switches with power fuses switch and protect the load feeders.

the loss is not a transient condition. The switch associated with the preferred source is automatically opened and the alternate-source switch is then automatically closed, restoring power to the load.

Two-way source transfer provides for either automatic retransfer to the preferred source when normal voltage returns for a preset time (*automatic return* mode) or manual retransfer to the preferred source at a convenient time (*hold return* mode). In the *hold return* mode, if the alternate source fails and if the preferred source has been restored, the switchgear will automatically retransfer to the preferred source.

In the *automatic return* mode, two-way source transfer provides for selection of either *open transition* or *closed transition* for retransfer to the preferred source. In *open transition*—which prevents paralleling the power sources—the alternate-source switch opens prior to closing of the preferred-source switch . . . there is only a momentary interruption of service to the load. With *closed transition* retransfer—selected when it is permissible to parallel the two sources so that there will be no interruption of service to the load—the alternate-source switch opens after the preferred-source switch has closed.

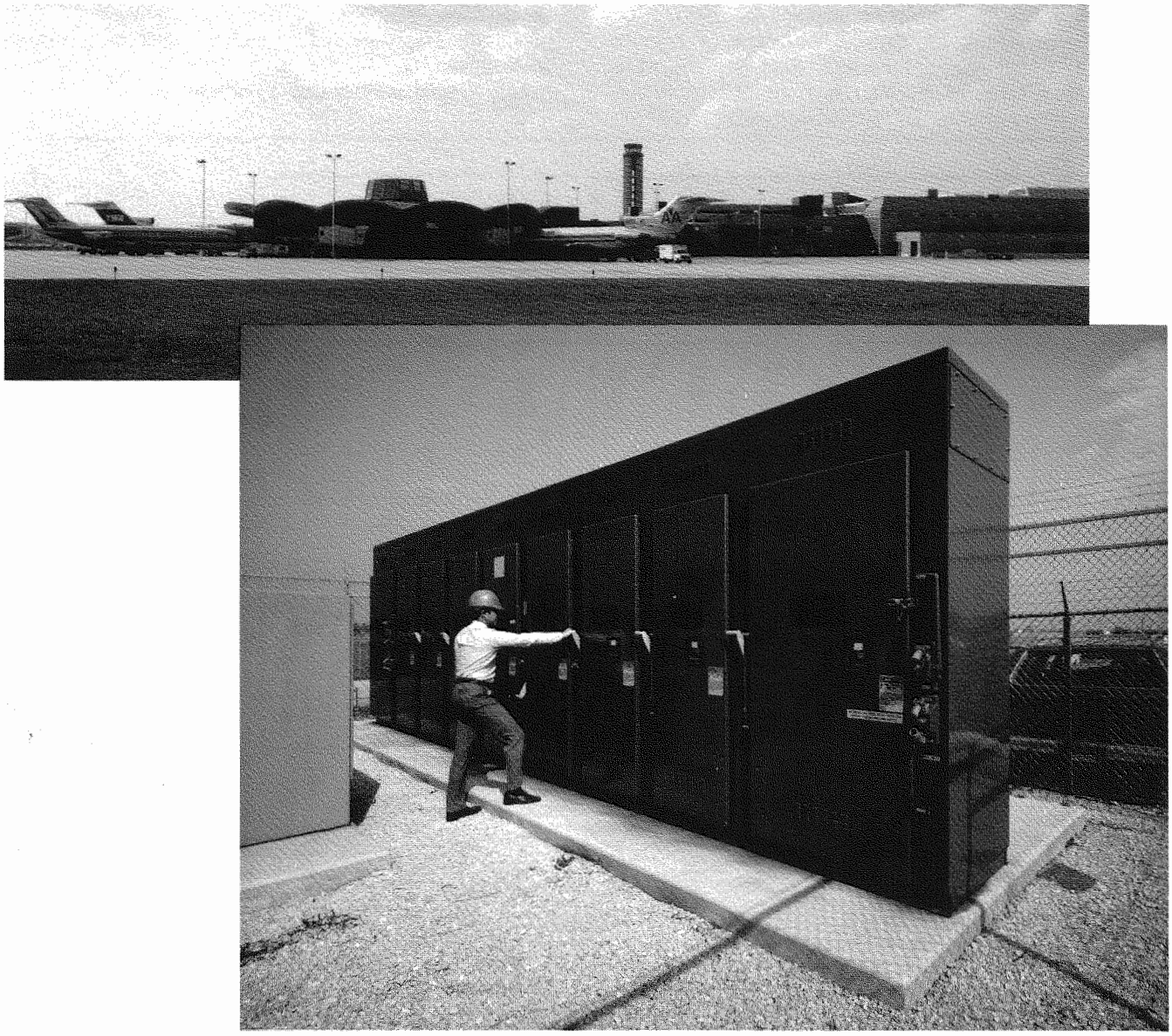


Figure 9. Manual, primary-selective metal-enclosed switchgear pictured above enhances continuity of service on circuits serving facilities at an airport installation.

APPLICATION — Continued

Split-Bus Primary-Selective System. In the basic split-bus primary-selective system, the switchgear bus is divided into two sections by a bus-tie switch, as illustrated in Figure 10. The diagram depicts a nine-bay metal-enclosed switchgear lineup, with automatic operation of the two source interrupter switches and the bus-tie switch provided by switch operators and a source-transfer control. Again, segmenting the load with multiple radial circuits or serving it with looped-primary circuits complements service continuity and operating flexibility. In the switchgear lineup diagrammed, each section of the split bus serves two feeder bays that provide switching and protection for the loads. A secondary-selective system (described on page 15) provides an added measure of service continuity to the especially critical loads connected to the two transformers as shown in Figure 10.

Switchgear of this configuration normally operates with the two source interrupter switches closed and the bus-tie switch open, so that each bus section receives power from its associated, separate source. Typically each source cable is sized for normal operating conditions—and is loaded to rated capacity—since under emergency conditions most installations have some loads which can be shed, making it unnecessary for either source to carry the switchgear's total load over an extended period of time. The switchgear provides the same high degree of service continuity as the common-bus primary-selective switchgear described above, and, by simultaneously using both sources, can supply larger concentrated loads, thereby often obviating the need for multiple switching centers. In addition, the serving utility benefits from a more evenly loaded system that precludes the need for idle

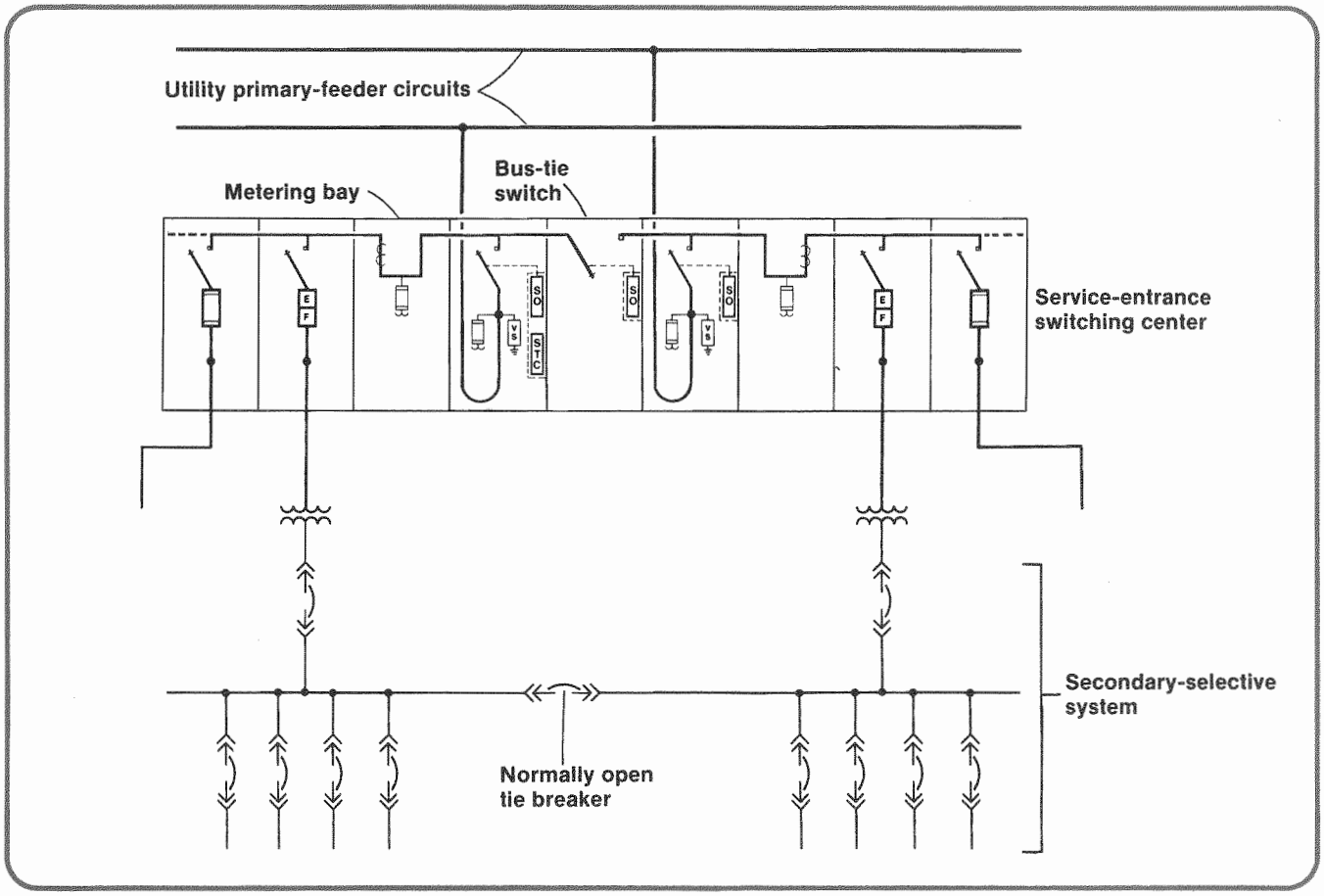


Figure 10. Split-bus primary-selective metal-enclosed switchgear, in addition to providing a high degree of service continuity, permits supplying large loads with one switching center through full utilization of both utility sources. Under normal operating conditions, each bus section receives power from its associated, separate source. The bus-tie switch and the two source interrupter switches are driven by switch operators that both open and close the switches, either automatically or manually, depending upon the operating mode selected. The source-transfer control monitors source voltages and switch operation, keeping power interruption to a minimum. Load feeders are switched and protected by manually operated interrupter switches with power fuses.

substation and feeder capacity, and that reduces the likelihood of intolerable system disturbances occurring when a source transfer involving the entire load takes place.

Each source, in effect, is the preferred source for its section of the bus and the alternate source for the other section of the bus. Upon loss of voltage from one source, the interrupter switch associated with that source opens and the bus-tie switch closes so that all of the load is served from the remaining source. Retransfer to the normal circuit configuration—bus-tie switch open and both source interrupter switches closed—may be performed on restoration of normal voltage with the same selection of programming modes as described for the common-bus primary-selective system.

Even greater operating flexibility—and an unusually high degree of service continuity—may be achieved by sectionalizing the switchgear bus into more than two sections with multiple bus-tie switches and employing additional sources of power (each source supplying one of the bus sections). Extension of the split-bus primary-selective system in this way permits the design of very sophisticated primary-selective switching schemes.

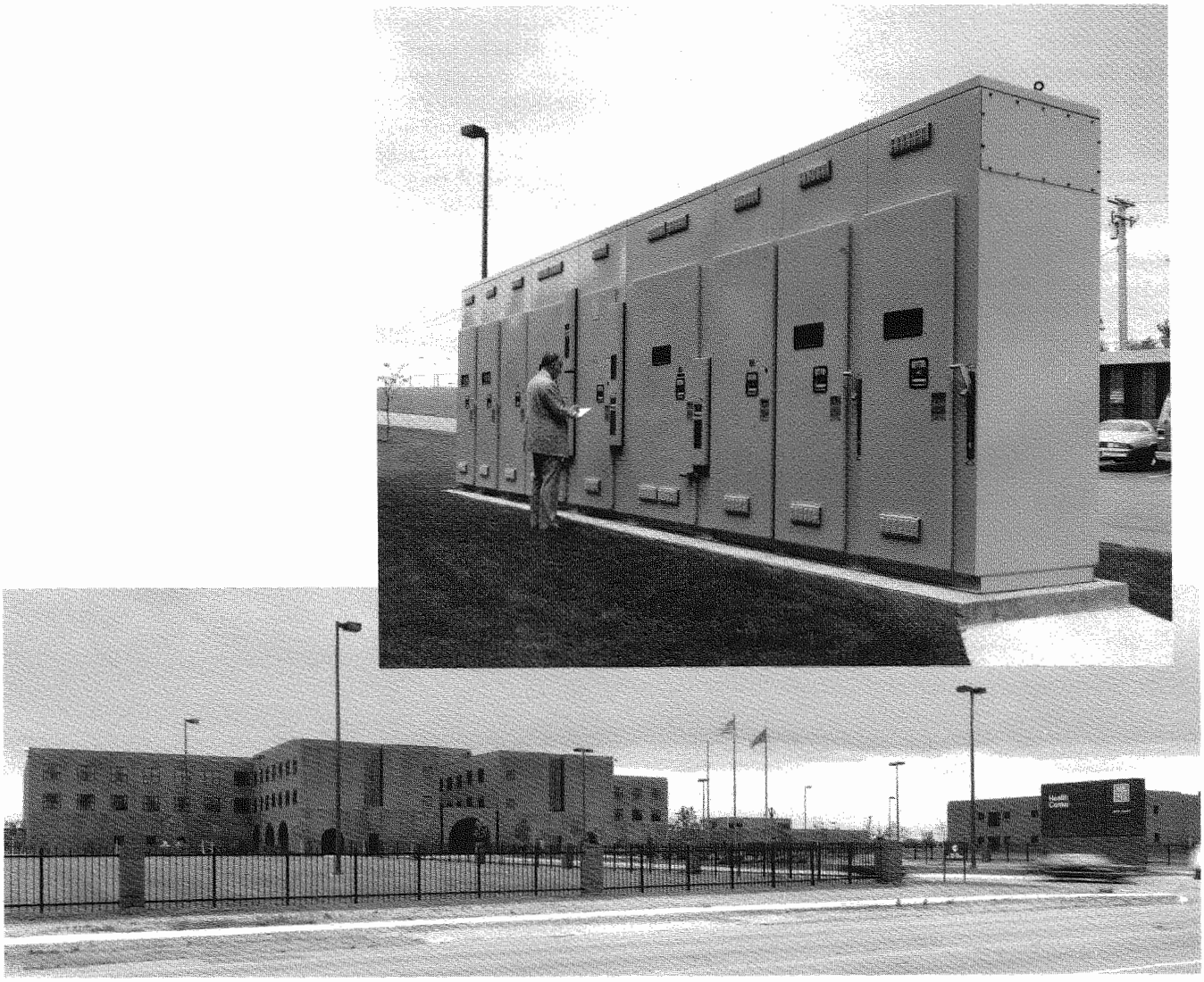


Figure 11. These nine bays of outdoor-style metal-enclosed switchgear serve as the switching and protection center for a modern medical center. The split-bus primary-selective switchgear features automatic two-way source transfer with bus-tie switch.

APPLICATION — Continued

Other considerations for primary-selective systems:

Unbalance Detection. This feature, which may be incorporated in source-transfer controls to protect three-phase loads from voltage unbalance, initiates automatic transfer in response to any source-side open-phase condition at the same system voltage as the metal-enclosed switchgear—whether caused by utility-line burn-down, broken conductors, single-pole switching, equipment malfunctions, or single-phasing resulting from blown source-side fuses. Such a feature, to be effective, must detect the open-phase condition, even if backfeed results in normal-magnitude voltage appearing on the opened phases. One method that has proved successful develops and monitors the phasor sum of the line-to-ground voltages of each source and can, therefore, detect three-phase voltage unbalance which exists under virtually all open-phase conditions.

Overcurrent Lockout. This feature may be included in source-transfer controls to prevent a transfer operation that would close a source switch or bus-tie switch into a fault, thereby avoiding utility system disturbances. To implement this scheme, three-phase current sensing is required in the metal-enclosed switchgear. When this sensing scheme detects an overcurrent due to a fault that is cleared by the source-side protective device, the prolonged loss of voltage causes the associated source interrupter switch to open. At the same time, a lockout mode is set up in the source-transfer control so that the alternate-source switch operator (bus-tie switch operator in the case of two-way source transfer with bus-tie switch) will not automatically close its switch into the fault. (When the overcurrent is due to a fault that is cleared by feeder fuses, there is no prolonged loss of voltage and, hence, the source-transfer control does not initiate any switching operations.)

High-Speed Source Transfer is particularly useful on systems supplying power for airport runway lighting; to critical loads in power plants and process industries; for life-safety loads in hospitals; and to stadiums, auditoriums, schools, shopping centers . . . any public gathering place.

In certain modes of operation, high-speed source transfer can be effected with an extremely short interruption of service to the load—similar to, or shorter than, that caused by automatic circuit reclosing on the serving utility's system. Application of high-speed transfer need not jeopardize in-plant synchronous motors and large induction motors that can be damaged if they are re-energized at an instant when the motor's regenerative voltage is considerably different in magnitude and phase from the source voltage. Source-transfer controls should be coordinated with the protection that motor controls provide against such damage—or the controls should be configured to provide it independently.

Can other circuit arrangements improve further upon service continuity?

Primary-selective systems of the types just described generally can be designed to provide the desired degree of protection against source failure—the most common cause of service disruption in a medium-voltage power system. To further improve service continuity for extremely critical loads, consideration is sometimes also given to the addition of secondary-selective systems or secondary-network systems to provide protection against transformer failure.

The Secondary-Selective System consists of circuits joined on the secondary sides of transformers by normally open tie breakers. A critical load divided into two parts and served by two transformers connected to the primary distribution system is illustrated in Figure 10. Should a transformer failure occur, the load served by that transformer is automatically transferred to the secondary of the other transformer. This system clearly requires considerable additional expense, and is usually not justifiable unless the criticality of the load requires more reliability than can be achieved with the primary-selective system alone.

The Secondary-Network System is sometimes used for concentrated critical loads. However, the very substantial added cost for network protectors and special oversized transformers makes this system economically prohibitive for most applications. And, protection from faults in the network secondary bus depends on such faults burning clear and self-extinguishing, without de-energizing the system. Consideration must be given to the hazards if such faults do not burn clear—a problem which is eliminated with radial or primary-selective systems that have been properly fused.

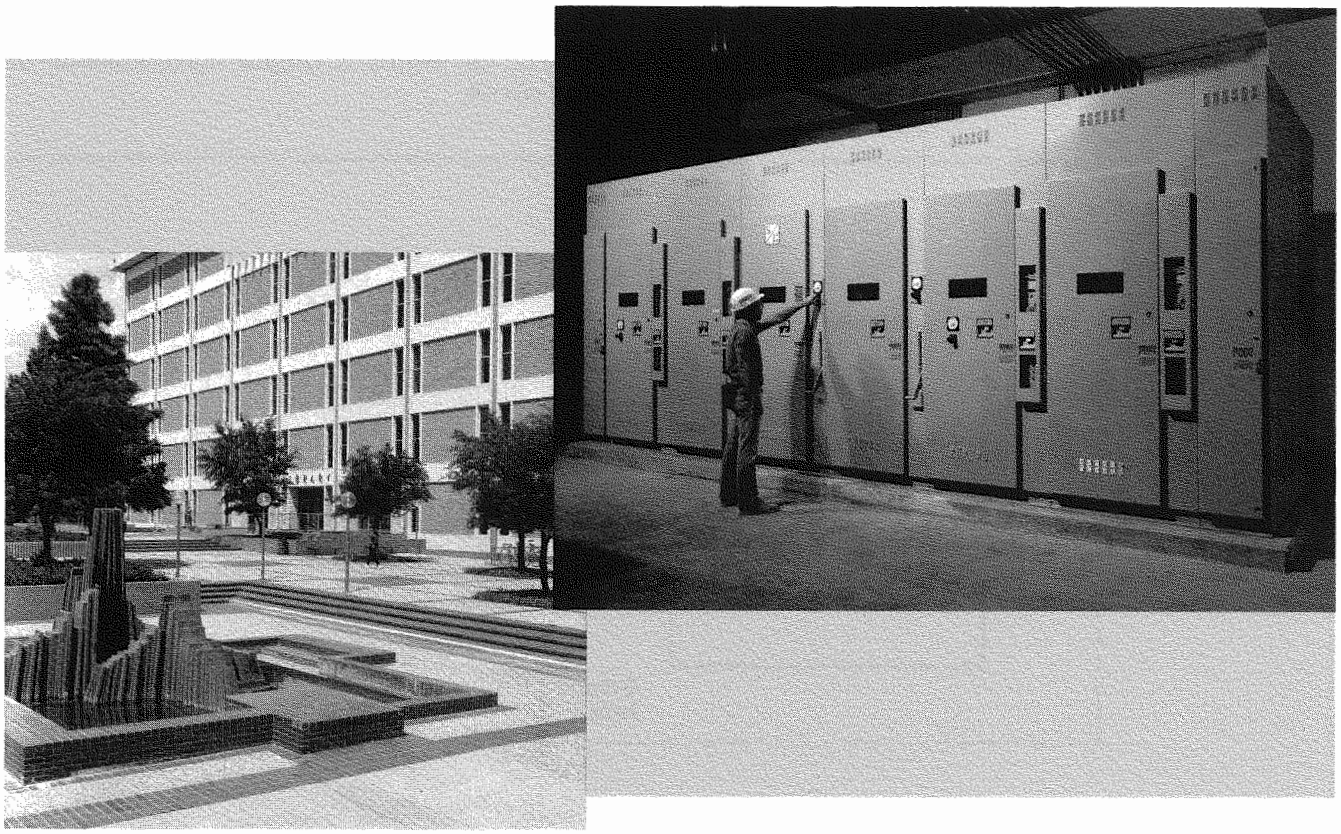


Figure 12. The main bus of the metal-enclosed switchgear pictured above is configured into a ring with multiple sections. The assembly incorporates a sophisticated power-operated primary-selective scheme and includes source-transfer controls with both unbalance detection and overcurrent lockout. This arrangement provides a high level of operating flexibility and service continuity for the critical loads at the institutional installation served.

APPLICATION — Continued

The Resistance-Grounded System is a special type of system that can employ any of the basic circuit arrangements and is often utilized on medium-voltage industrial power systems to reduce equipment damage due to ground faults and from transient overvoltages caused by restriking ground faults. The system shown below is a low-resistance-grounded system with the resistor—connected between the secondary neutral of the source-side transformer and ground—selected to limit single-phase-to-ground fault currents to less than 800 amperes. The resistor does not limit the fault current for phase-to-phase-to-ground or three-phase-to-ground faults or for other faults not involving ground.

High-speed automatic switching of resistance-limited ground faults is effected on each feeder circuit of the switching center with interrupter switches power operated by switch operators. On each feeder circuit, a window-type current transformer (CT) provides sensing for a latching-type ground-overcurrent relay, and a timer provides coordination with overcurrent-blocking relays. Sensing for these blocking relays is provided by other window-type CTs in the entrance bay. The combination of the ground-overcurrent relay with timer and the blocking relays assures that the feeder switch operates only on single-phase-to-ground faults . . . the fuses clear all other faults before the interrupter switch opens.

In the system diagrammed, consider a phase-to-ground fault occurring at the point indicated. Such faults are sensed by the CT on the affected feeder circuit, and the associated overcurrent relay and timer are then actuated. The fault current is limited by the resistance and, when the timer times out, the switch is tripped open. Operating time with high-speed switches is typically 10 cycles—a 6-cycle delay for the timer plus a 4-cycle operating time for the switch. Blocking relays in the entrance bay are set so that the magnitude of the current sensed by the associated CTs on single-phase-to-ground faults is not sufficient to actuate the blocking relays.

For multi-phase faults involving ground, the fault current is sensed by all the CTs and will exceed the setting of the blocking relays. The blocking contacts are actuated instantly, blocking control power to the timer. However, the relay associated with the CT on the faulted circuit is also actuated. After the fuse clears the fault, the blocking relays drop out. Then, since a latching relay is used in conjunction with the CT in the feeder bays, the timer is energized. After the timer times out, the switch is tripped open, isolating the faulted circuit.

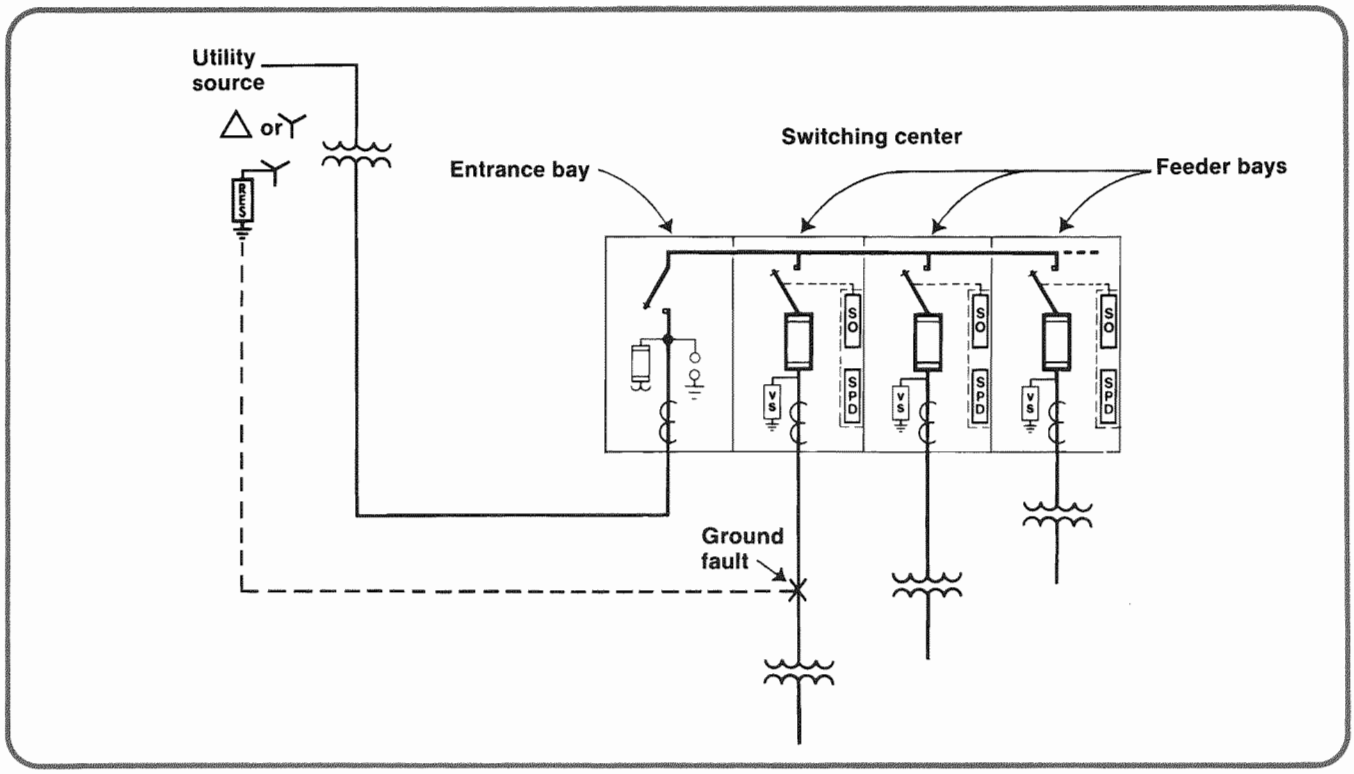


Figure 13. Resistance-grounded system has resistor connected between secondary neutral of source transformer and ground.

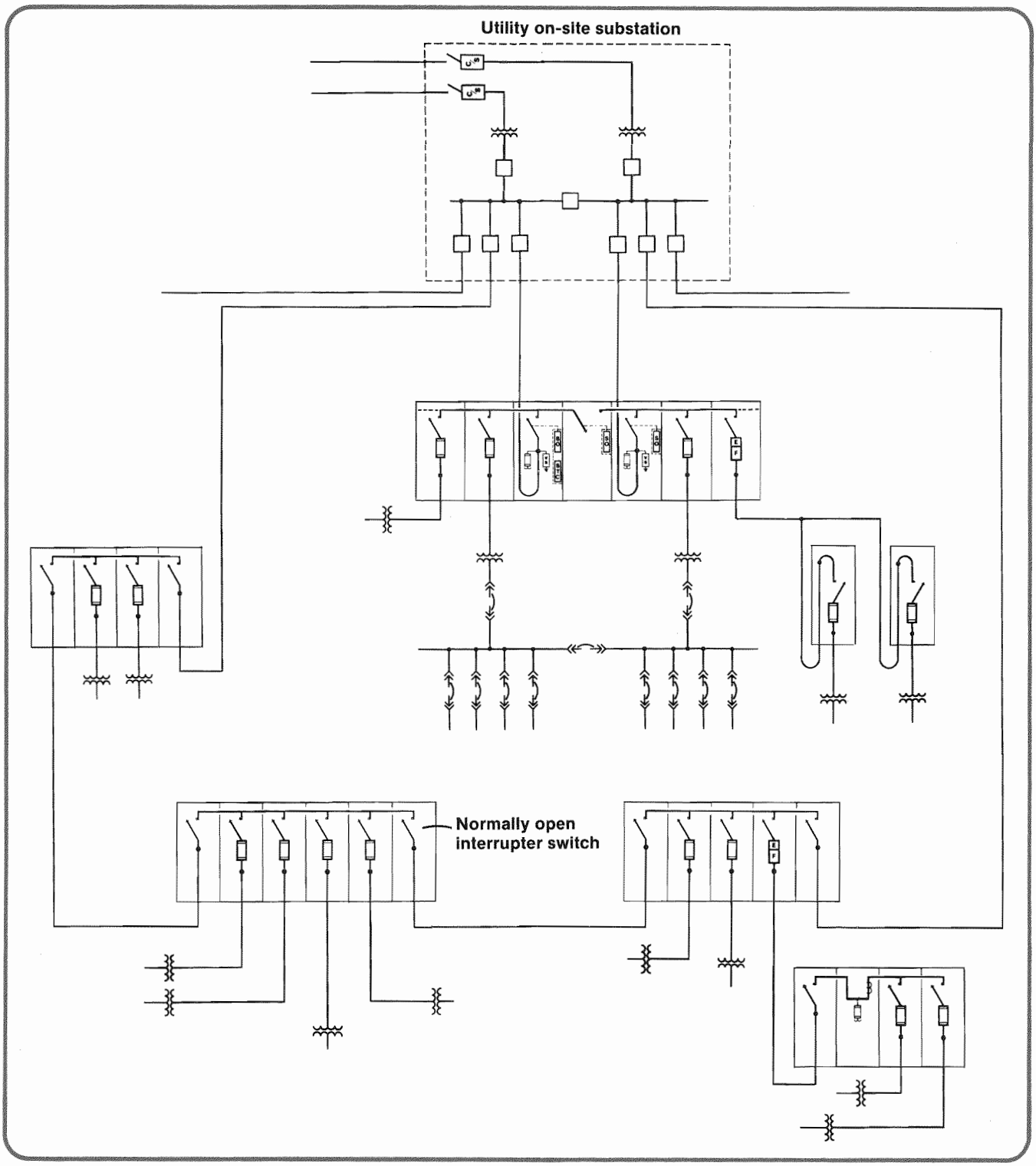


Figure 14. To serve widely dispersed loads in a large plant, the four fundamental circuit arrangements are often combined in a complex distribution system. Illustrated here is an in-plant medium-voltage power distribution system that employs a split-bus primary-selective circuit, a looped-primary circuit, and radial circuits. To assure maximum service continuity for extremely critical loads, a secondary-selective system has been added to two of the transformers served by the switching center of the split-bus primary-selective circuit.

APPLICATION — Continued

Power fuses provide protection for your transformers and feeder cables . . . with load capabilities and fault ratings to suit almost any application.

Power fuses used in metal-enclosed switchgear should provide *full-fault-spectrum protection* for individual medium-to-large power transformers and for feeder circuits serving multiple loads. S&C Power Fuses offer such protection and offer many other benefits as well. In protecting individual transformers with S&C Power Fuses, *full-fault-spectrum protection* means that the fuse will detect and interrupt all faults—large, medium, and small (even down to minimum melting or tripping current); whether the fault is on the primary or secondary side; with line-to-line or line-to-ground voltage across the fuse; whether the transformer is adjacent to the switchgear or cable-connected to it from a remote location; and regardless of transformer winding connections. S&C Power Fuses are capable of handling the full range of transient-recovery voltages associated with these conditions. Also, they allow you to fuse closer to the transformer full-load current than is possible with ordinary current-limiting fuses, providing the maximum degree of protection against secondary faults. S&C Power Fuses thus furnish protection against faults in the secondary buswork ahead of the secondary-side protective devices and, furthermore, supply backup protection in the event of incorrect functioning of the secondary-side protective devices . . . even in the lower ranges of faults, where the current may be as low as 230% of the transformer full-load rating. Fault Fiter® Electronic Power Fuses and SM Power Fuses have surge capacities more than adequate to withstand transformer magnetizing-current inrush, as well as the combined transient inrush of magnetizing and load currents following a momentary interruption of source voltage—a performance characteristic not generally found in other makes of fuses.

When protecting feeders serving multiple loads, S&C Power Fuses provide source-side continuity in the event of feeder-cable faults. And they develop a positive

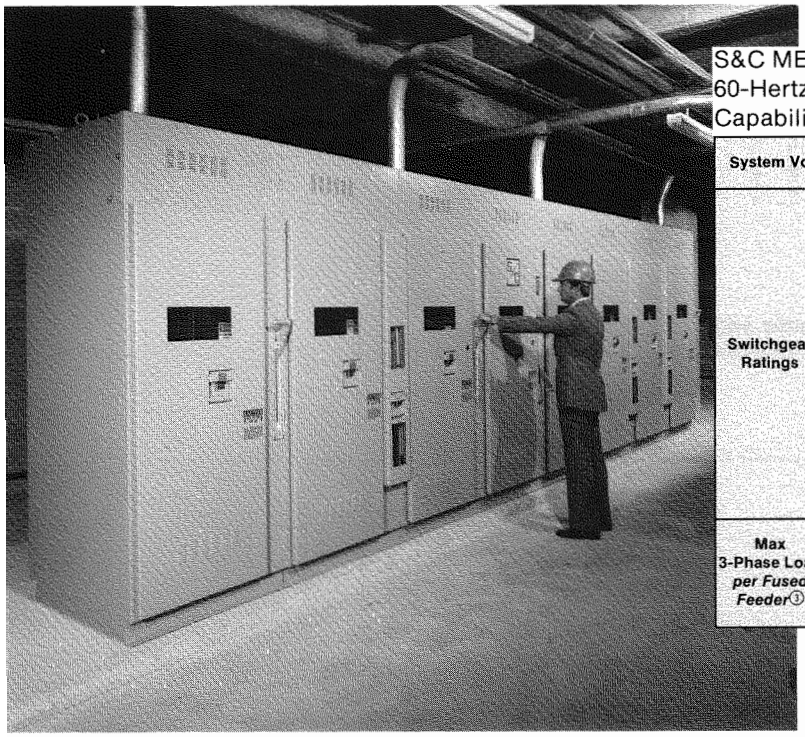


Figure 15. Restoration of power service following a fault is relatively easy with metal-enclosed switchgear, requiring the switch on the affected load circuit to be opened and the appropriate power fuse to be replaced while the fault is located and repaired.

S&C METAL-ENCLOSED SWITCHGEAR—Maximum 60-Hertz① Short-Circuit Ratings and Three-Phase Load Capability②

System Voltage, Kv →			2.4	4.16 2.4/4.16Y	4.8
Switchgear Ratings	Voltage, Kv	Nominal	4.16		4.8
		Max	4.8		5.5
		BIL	60		60
	Main Bus, Continuous Amperes		600, 1200, or 2000		600, 1200, or 2000
	Short-Circuit, and Two-Time Duty-Cycle Fault-Closing,④ as applicable	Amperes, Rms, Sym.⑤	37,500	37,500 (40,000)	25,000 (40,000)
		Mva, 3-Phase Sym. at Nom. System Voltage	155	270 (290)	210 (330)
Max 3-Phase Load *per Fused Feeder*③	Continuous Load, Kva		3000	5200 (4300)	6000 (5000)
	Permissible Peak Load, Kva		3300	5700 (5800)	6600 (6700)

internal gap of high dielectric strength after circuit interruption, thus precluding destructive reignitions when exposed to full system voltage—such as is experienced with current-limiting fuses after clearing under low recovery-voltage conditions. A wide selection of ampere ratings and speeds of S&C Power Fuses and variety of types and TCC curve parameters of S&C Fault Fiter Electronic Power Fuses permit precise coordination with protective relays and other fuses in both the load-side and the source-side circuits. Comprehensive fuse application data is available from the fusing specialist at the nearest S&C Sales Office.

To help in your initial planning, the table below shows, for typical system voltages between 2.4 kv and 34.5 kv, the maximum short-circuit ratings of S&C Metal-Enclosed Switchgear (fuse interrupting ratings equal or exceed these values) and the maximum three-phase loading (in kva) that may be carried per fused feeder bay. Two loading levels are given: one is the maximum continuous load in terms of total connected transformer kva; and the other indicates the peak loading that can be accommodated during emergency conditions. S&C Power Fuses will (1) withstand magnetizing-inrush currents associated with the total connected transformer kva listed; (2) carry load currents associated with the kva values listed as "Permissible Peak Load"; and (3) withstand the combined transient inrush of magnetizing and load currents associated with energizing transformers loaded to the values listed under "Permissible Peak Load," following a momentary interruption of source voltage. The switchgear short-circuit ratings and loading capabilities shown in the table are based, in the case of each entry, on the S&C Power Fuse which offers the maximum loading and interrupting values at the given system voltage.

Your nearest S&C Sales Office will assist you in selecting the most economical power fuse for your application, and help you choose the specific fuse rating and response characteristics that will provide the maximum protection and optimal coordination.

	7.2	4.8/8.32Y	12	7.2/12.47Y	13.2 7.62/13.2Y	13.8	14.4	16.5	16.5	23	14.4/24.9Y	27.6	27.6	34.5 20/34.5Y
	13.8								25				34.5	
	17.0								29				38	
	95								125 or 150■				150 or 200	
	600, 1200, or 2000								600, 1200, or 2000				600, 1200, or 2000	
	25,000 (34,600)	25,000 (34,600)	25,000 (40,000)	25,000 (40,000)	25,000 (40,000)	25,000 (40,000)	25,000 (40,000)	25,000 (40,000)	20,000	(25,000)	(25,000)	(25,000)	17,500	17,500
	310 (430)	360 (500)	520 (830)	540 (860)	570 (915)	600 (960)	620 (1000)	715 (1140)	570	(1,000)	(1,080)	(1200)	835	1050
	9000 (5000)	10,400 (5800)	15,000 (12,500)	15,500 (13,000)	16,500 (13,700)	17,200 (14,300)	18,000 (15,000)	20,600 (17,100)	11,400	(23,900)	(25,900)	(28,700)	14,300	17,900
	9900 (5500)	11,400 (6300)	16,500 (16,600)	17,100 (17,300)	18,100 (18,300)	18,900 (19,100)	20,000 (20,000)	22,600 (22,900)	12,000	(31,900)	(34,500)	(38,200)	17,900	22,400

① For 50-hertz ratings, consult the nearest S&C Sales Office.

② For each column that contains two sets of values, the set of values in parentheses provides a higher short-circuit rating hut a lower continuous load capability than the set of values *not* in parentheses.

③ Three-phase load capabilities are hased on an ambient temperature of 30°C inside the switchgear enclosure. Furthermore, "Permissible Peak Load" values are based on the ½-hour daily emergency peak-load capabilities for the applicable power fuse. For three-phase load capabilities based on ambient temperatures greater than 30°C or for "Permissihle Peak Load" values based on daily emergency peak-loads longer than ½ hour, consult the nearest S&C Sales Office.

④ The duty-cycle fault-closing ratings listed in parentheses are *one-time* ratings. The associated two-time duty-cycle fault-closing ratings are 25,000 amperes symmetrical, 40,000 amperes asymmetrical, except for switchgear rated 25 kv nominal where tbe two-time duty-cycle fault-closing ratings are 20,000 amperes symmetrical, 32,000 amperes asymmetrical.

⑤ The short-circuit interrupting ratings and the duty-cycle fault-closing ratings expressed in amperes rms asymmetrical are 1.6 times the symmetrical ratings listed. An exception applies to the 40,000 amperes symmetrical ratings where the corresponding asymmetrical value is 61,000 amperes.

■ For 150-kv BIL applications, consult the nearest S&C Sales Office.

APPLICATION — Continued

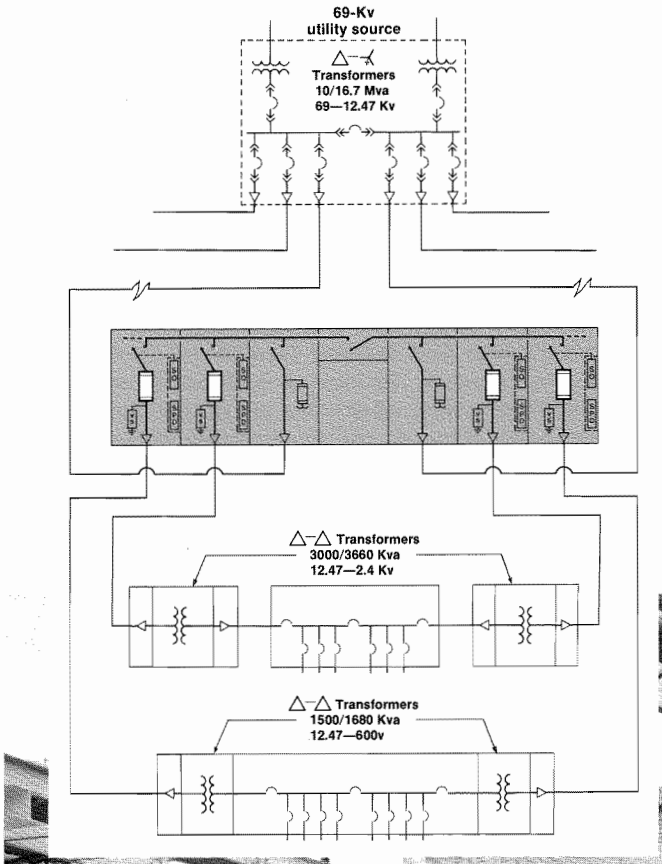


Figure 16. Seven bays of metal-enclosed switchgear were combined as a switching center for two double-ended unit substations at this midwestern refinery. Two incoming-source switches and a tie switch provide split-bus primary-selective service for the two unit substations. Transformers are protected by power fuses that easily handle available fault levels, clearing high-current faults within one cycle. So, upstream coordination is simplified; short-circuit stresses on the power system and motors are greatly reduced; and cable protection is significantly improved. Open-phase detection applied on feeders with power-operated interrupter switches protects critical three-phase loads from single-phasing.

Printed in U.S.A.

The tables in this data sheet provide approximate dimensions and shipping weights for typical bays of S&C Custom Metal-Enclosed Switchgear. The dimensions are provided for reference only, as an aid in the preliminary planning of installations. The exact dimensions for a specific switchgear line-up will be provided in the final-design engineering drawings, and depend on the features and components specified for the bays of the line-up.

TABLE I: CUSTOM BAY—Heights, Depths, and Shipping Weights

Voltage (kV)	Compact Bays			Universal Bays			Approximate Shipping Weight (lbs.) per Bay for Estimating Concrete Loading
	Height (in.)		Depth (in.)	Height (in.)		Depth (in.)	
	Indoor	Outdoor		Indoor	Outdoor		
4.16	90	93	36	104	107	36	2000
13.8	90	93	44	120	123	44	3000

TABLE II: 4.16 kV, 60 kV BIL CUSTOM BAYS—Typical Widths and Available Cable Space

Main Bus Continuous Rating (Amps)	Bay Function	Basic Component Description		Compact Bays①			Universal Bays①		
				Width (in.)		Cable Termination Height (in.)	Width (in.)		Cable Termination Height (in.)
				Manual	Power Operated		Manual	Power Operated	
600	Entrance	Mini-Rupter Switch	Main Contact at Top	36	38	50	36	38	64
			Main Contact at Bottom	36	38	41	36	38	55
		Mini-Rupter Switch with	SM-40	36	38	34	36	38	48
			SM-5S	NA	NA	—	36	38	27
			Fault Fiter	42	44	26	42	44	40
	Feeder	Mini-Rupter Switch		36	38	50	36	38	64
		Mini-Rupter Switch with	SM-4Z	36	38	35	36	38	49
			SM-40	36	38	34	36	38	48
			SM-5S	36	38	33	36	38	47
			Fault Fiter	42	44	27	42	44	41
	Auxiliary	Bus-Tie Switch—Mini-Rupter		36	38	—	36	38	—
		Bus Tap		30	NA	76	30	NA	90
		Bus Transition		18	NA	—	18	NA	—
	Metering	Through Bus		36	NA	—	36	NA	—
		Bus Tap		36	NA	▲	36	NA	▲
1200	Entrance	Alduti-Rupter Switch	Main Contact at Top	36	41	50	36	41	64
			Main Contact at Bottom	36	41	50	36	41	64
		Mini-Rupter Switch with Fault Fiter		42	44	26	42	44	40
	Feeder	Mini-Rupter Switch with	SM-4Z	36	38	35	36	38	49
			SM-40	36	38	34	36	38	48
			SM-5S	36	38	33	36	38	47
			Fault Fiter	42	44	27	42	44	41
	Auxiliary	Bus-Tie Switch—Alduti-Rupter		36	41	—	36	41	—
		Bus Tap		30	NA	76	30	NA	90
		Bus Transition		18	NA	—	18	NA	—
	Metering	Through Bus		41	NA	—	41	NA	—
		Bus Tap		41	NA	▲	41	NA	▲

① These dimensions are approximate and final dimensions will be shown on the drawings.

▲ Cable-termination height depends upon options selected and mounting arrangement required. Consult nearest S&C Sales Office.

TABLE III: 13.8 kV, 95 kV BIL CUSTOM BAYS—Typical Widths and Available Cable Space

Main Bus Continuous Rating (Amps)	Bay Function	Basic Component Description		Compact Bays①			Universal Bays①		
				Width (in.)		Cable Termination Height (in.)	Width (in.)		Cable Termination Height (in.)
				Manual	Power Operated		Manual	Power Operated	
600	Entrance	Mini-Rupter Switch	Main Contact at Top	42	44	46	42	44	76
			Main Contact at Bottom	42	44	37	42	44	67
		Mini-Rupter Switch with	SM-40	42	44	25	42	44	55
			SM-5S	NA	NA	—	42	44	34
			Fault Fiter	42	44	26	42	44	56
	Feeder	Mini-Rupter Switch		42	44	46	42	44	76
		Mini-Rupter Switch with	SM-4Z	42	44	27	42	44	57
			SM-20	42	44	27	42	44	57
			SM-40	42	44	25	42	44	55
			SM-5S	42	44	25	42	44	55
			Fault Fiter	42	44	23	42	44	53
	Auxiliary	Bus-Tie Switch—Mini-Rupter		46	46	—	46	46	—
		Bus Tap		30	NA	75	30	NA	105
		Bus Transition		18	NA	—	18	NA	—
	Metering	Through Bus		42	NA	—	42	NA	—
		Bus Tap		42	NA	▲	42	NA	▲
1200	Entrance	Alduti-Rupter Switch	Main Contact at Top	46	50	42	46	50	72
			Main Contact at Bottom	46	50	42	46	50	72
		Mini-Rupter Switch with Fault Fiter		42	44	26	42	44	56
	Feeder	Mini-Rupter Switch		42	44	46	42	44	76
		Alduti-Rupter Switch		46	50	42	46	50	72
		Mini-Rupter Switch with	SM-4Z	42	44	27	42	44	57
			SM-20	42	44	27	42	44	57
			SM-40	42	44	25	42	44	55
			SM-5S	42	44	25	42	44	55
			SM-5SS	42	44	18	42	44	48
			Fault Fiter	42	44	23	42	44	53
	Auxiliary	Bus-Tie Switch—Alduti-Rupter		46	50	—	46	50	—
		Bus Tap		30	NA	75	30	NA	105
		Bus Transition		18	NA	—	18	NA	—
	Metering	Through Bus		46	NA	—	46	NA	—
		Bus Tap		46	NA	▲	46	NA	▲

① These dimensions are approximate and final dimensions will be shown on the drawings.

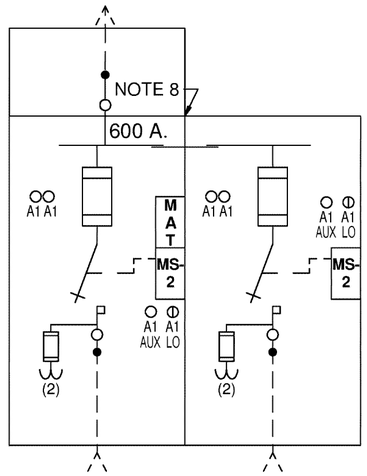
▲ Cable-termination height depends upon options selected and mounting arrangement required. Consult nearest S&C Sales Office.

NOTES:

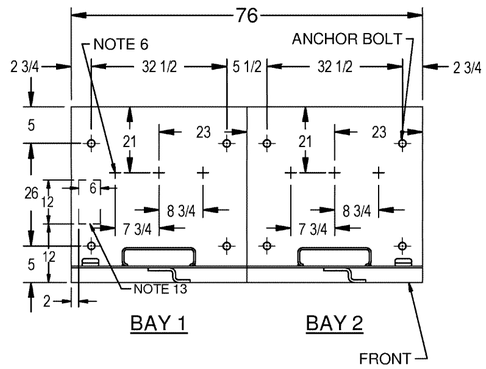
1. DIMENSIONS SHOWN ARE FOR CUSTOMER INFORMATION AND ARE NOT SUBJECT TO CHANGE.
2. WHEN MAKING CONNECTIONS, CAUTION SHOULD BE USED TO AVOID PLACING ANY INTENTIONAL STRAIN UPON ANY TERMINAL PAD, INCLUDING A SWITCH OR FUSE TERMINAL PAD. IT IS IMPORTANT THAT EACH CABLE-TERMINATOR CONNECTION BE FLAT AGAINST THE CORRESPONDING TERMINAL PAD, WITH THE BOLT HOLES IN ALIGNMENT. DO NOT USE THE CONNECTING BOLTS TO PULL THE CABLES INTO ALIGNMENT. SECURE CABLE FIRMLY TO CABLE SUPPORT ANGLE WHERE FURNISHED.
3. ALL HANDLES AND DOORS HAVE PROVISIONS FOR PADLOCKING, 3/8-INCH MAX. DIAMETER SHACKLE.
4. ALL CABLE CONNECTORS EXCEPT STATION GROUND CONNECTORS TO BE FURNISHED BY OTHERS. S&C TO FURNISH TWO-HOLE NEMA DRILLING.
6. APPROXIMATE PROJECTION OF CABLE CENTERLINES. ALL BAYS HAVE A CONTINUOUS 2-INCH FLANGE AROUND THE BOTTOM EDGE.
7. APPROXIMATE WEIGHT PER BAY IS 2000 LBS.
8. EACH BAY SHIPPED SEPARATELY.
9. BAY ENCLOSURE MATERIAL: 11 GAGE REINFORCED MILD STEEL SHEET.
10. BUS MATERIAL: MAIN & GROUND BUS ALUMINUM.
11. FINISH: S&C ULTRADUR OUTDOOR FINISH - LIGHT GRAY MEETING THE REQUIREMENTS OF ANSI STANDARD Z55.1 FOR #70.
12. CUSTOMER TO DETERMINE THAT CABLE-TRAINING SPACE IS ADEQUATE.
13. APPROXIMATE CONDUIT LOCATION FOR CUSTOMER CONNECTION TO LOW-VOLTAGE CIRCUITS.
14. INSTRUCTION BOOK IS LOCATED IN BAY 1.
15. KEY INTERLOCKS GUARD AGAINST CLOSING MORE THAN 1 OF THE INTERRUPTER SWITCHES IN BAYS 1 AND 2 AT THE SAME TIME. (MANUAL NONPARALLELING).
16. KEY INTERLOCKS GUARD AGAINST OPENING THE DOOR TO BAY 1 UNTIL BOTH INTERRUPTER SWITCHES IN BAYS 1 AND 2 ARE LOCKED OPEN.
17. KEY INTERLOCKS GUARD AGAINST OPENING THE DOOR TO BAY 2 UNTIL BOTH INTERRUPTER SWITCHES IN BAYS 1 AND 2 ARE LOCKED OPEN.
18. THIS SWITCHGEAR ASSEMBLY IS UL LISTED. ALL ENCLOSURES ARE CATEGORY B PER ANSI/IEEE C37.20.3.
19. LOW-VOLTAGE DEVICES INCLUDING SWITCH OPERATORS, MICRO-AT, VT'S, AND HEATERS WIRED PER:

QCDR-16001	SYSTEM DIAGRAM
QCDR-16001-1	INTERCONNECTION WIRING DIAGRAM
CDR-3166	MS-2 SWITCH OPERATOR SCHEMATIC WIRING DIAGRAM
CDR-3166-1	MS-2 SWITCH OPERATOR DETAIL WIRING DIAGRAM
515-500	MICRO-AT INSTRUCTION SHEET
515-500.1	ADDENDUM TO MICRO-AT INSTRUCTION SHEET 515-500
515-506	MICRO-AT COMMUNICATION CARD INSTRUCTION SHEET
515-520	MICRO-AT TROUBLESHOOTING GUIDE
629-510	MS-2 SWITCH OPERATOR INSTRUCTION SHEET

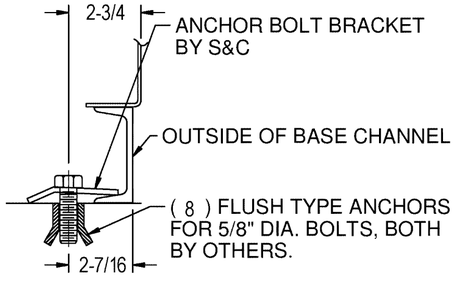
20. THIS SWITCHGEAR REPLACES EXISTING SWITCHGEAR LINE-UP.



ONELINE DIAGRAM



ANCHOR BOLT PLAN VIEW



METHOD USED TO ANCHOR BAY

NAMEPLATE DATA	
VOLTAGE RATINGS:	
KV, NOMINAL	4.16
KV, MAX	4.8
KV, POWER FREQUENCY WITHSTAND	19
KV, LIGHTNING IMPULSE WITHSTAND (BIL)	60
MAIN BUS, AMPERES CONTINUOUS	600
SHORT-CIRCUIT RATINGS:	
AMPERES, RMS, SYMMETRICAL	25,000
MVA THREE-PHASE SYM. AT RATED NOMINAL VOLTAGE	180
DUTY-CYCLE FAULT-CLOSING AMPERES, RMS, ASYMMETRICAL	40,000
FREQUENCY, HZ	60
PEAK WITHSTAND (MOMENTARY) PEAK AMPERES	65,000
SHORT-TIME WITHSTAND, AMPERES, RMS, SYMMETRICAL	25,000
SHORT-TIME WITHSTAND, DURATION, SECONDS	1

SOLD TO: BUTLER SUPPLY
P.O. NUMBER: 4510289395
USER/PROJECT: ST. LOUIS PSYCHIATRIC HOSPITAL
S&C S.O. NUMBER: 445291

REVISIONS

NO.	NOTICE NO.	DATE	REV BY	DESCRIPTION
000	SC570865	7/26/2014	MC	INITIAL RELEASE.
001	SC573125	11/4/2014	MC	ADDED (1) C-752, (1) CD-2418 & (2) C-1098.ADDED GRD. BUS.

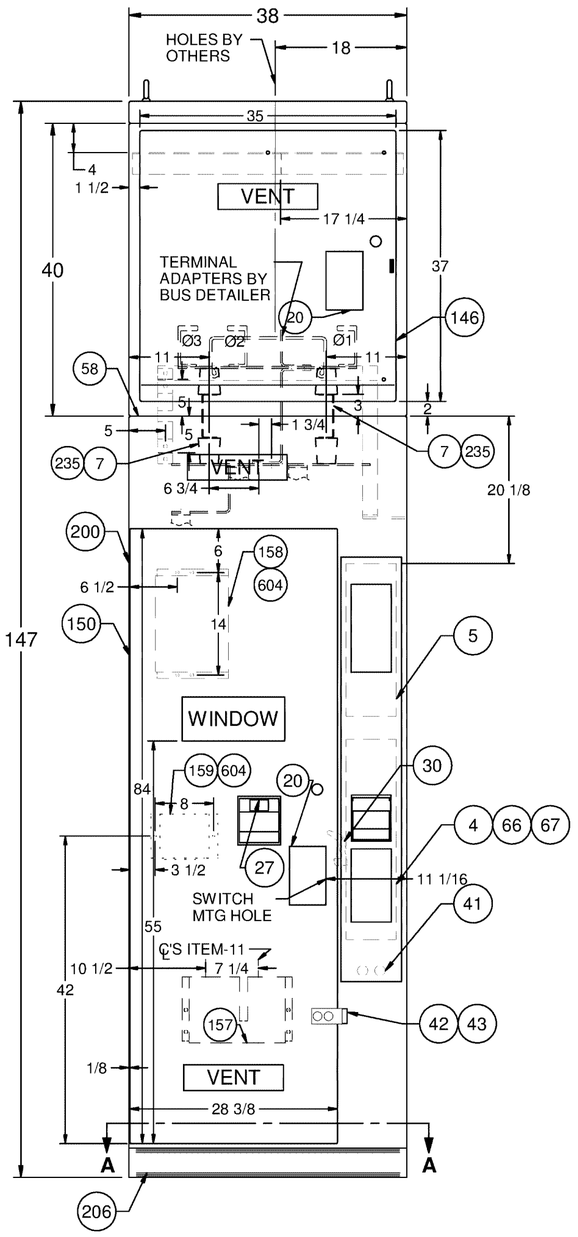
DRAWING SIZE: C	DRAWN BY: CABAELM
SCALE: NONE	ORIGINATION DATE: 7/26/2014
PROJECTION	UNITS
NEXT ASSEMBLY	
PRODUCT DESCRIPTION: CUSTOM	

S&C ELECTRIC COMPANY
Excellence Through Innovation

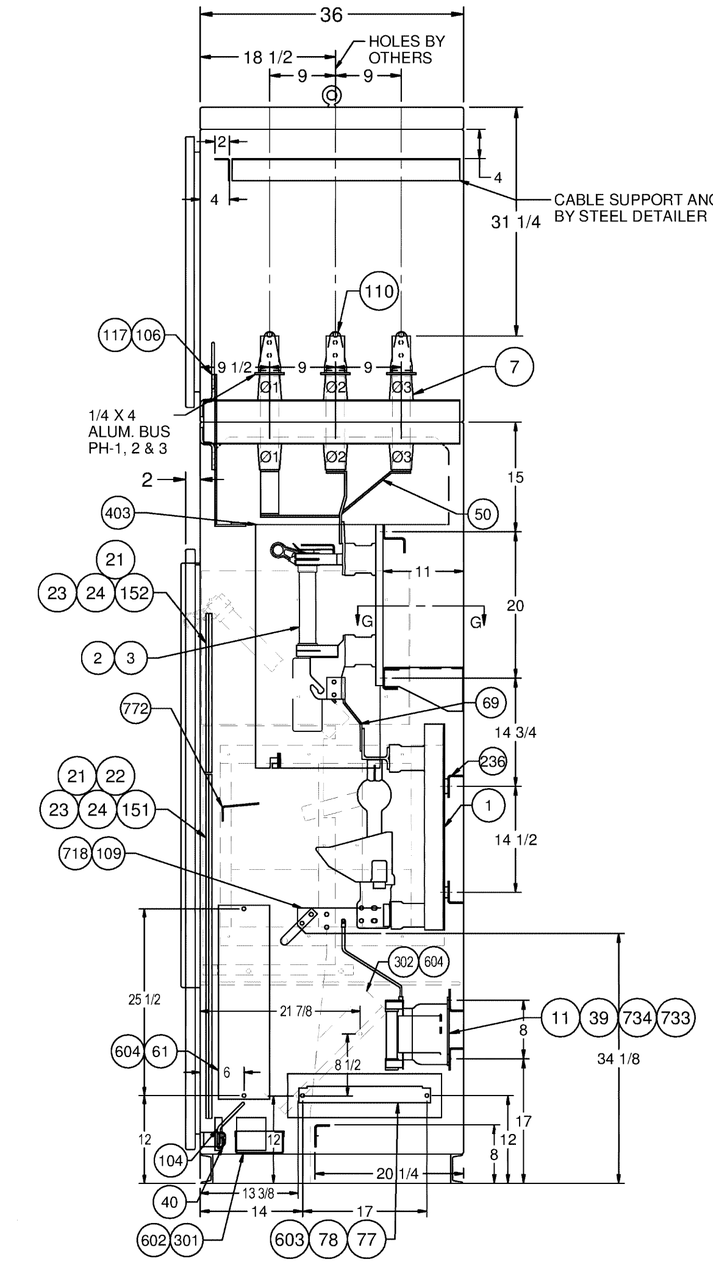
DESCRIPTION
S&C CUSTOM METAL-ENCLOSED SWITCHGEAR
4.16 KV 2 BAYS OUTDOOR

DRAWING NO. SE
CDA-843610

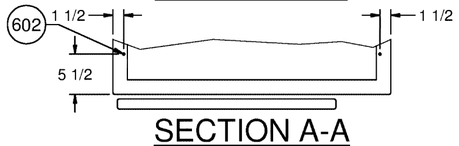
SOFTWARE VERSION: 5.18 DRAWN: 11/4/14



FRONT VIEW



OPEN SIDE VIEW



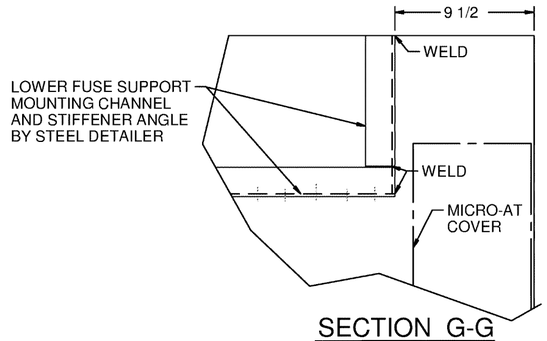
SECTION A-A

NOTES:

1. VOLTAGE TRANSFORMERS SUPPLIED, INSTALLED, AND WIRED BY S&C.
2. DOOR CANNOT BE OPENED WHEN INTERRUPTER SWITCH IS CLOSED, AND INTERRUPTER SWITCH CANNOT BE CLOSED WHEN DOOR IS OPEN.
3. KEY INTERLOCK MOUNTED WITH NO EXPOSED HARDWARE.
4. ITEMS 56, 57, AND 58 TO BE SHIPPED LOOSE FOR ASSEMBLING SWITCHGEAR IN THE FIELD.

OPTIONAL FEATURES IN THIS BAY:

A1	OUTDOOR CONSTRUCTION -PNT102: LIGHT GRAY FINISH
A33AD	SHIPPING SPLIT ON RIGHT SIDE OF BAY - ALUMINUM BUS SPLICES
A34H	INSTRUCTION BOOK HOLDER
A36	TERMINAL BLOCK MOUNTING PLATE - LARGE
A38L	GROUND CONNECTOR FOR ALUMINUM BUS
MPBTA	PULL BOX ON TOP OF BAY FOR TOP CABLE ENTRANCE OR EXIT
CD31	KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL PARALLELING
C5	DOUBLE CYLINDER SUPERIOR KEY INTERLOCK ON DOOR
CA1	SWITCH OPERATOR TYPE MS-2, 115 VAC CONTROL VOLTAGE
CD2	KEY INTERLOCK, LOCKS SWITCH OPEN, PREVENTS MANUAL PARALLELING
CD3	KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL PARALLELING
CD4	EXTRA AUXILIARY SWITCH, COUPLED TO INTERRUPTER SWITCH
CD5	EXTRA AUXILIARY SWITCH, COUPLED TO SWITCH OPERATOR
XH1	2 FUSED VT'S PH-PH WITH AUX. XFMR - FOR L.H. ENTRANCE BAY
XE3	MICRO-AT SOURCE-TRANSFER CONTROL
Y4	REMOTE INDICATION FOR MICRO-AT
Y8	COMMUNICATIONS CARD FOR MICRO-AT



SECTION G-G

ROTATED 90°

BILL OF MATERIAL

	ITEM	QTY.	PART NUMBER	DESCRIPTION
	1	1	255712R1	MINI-RUPTER SWITCH, 14.4KV 600A
	2	3	86641R2	SM-5S POWER FUSE HOLDER, 4.8KV
	3	3	SA-37005-1	SM-5S POWER FUSE MOUNTING, 4.8KV 400E
	4	1	38754-DQUW	MS-2 SWITCH OPERATOR, 115 VAC PER ED-291R1-1X1Y8Z1
	5	1	39050-V1Y4Y8	MICRO-AT SOURCE TRANSFER CONTROL
	7	12	PA-7164	BUS SUPPORT INSULATOR, 4.16KV
SEE NOTE 1	11	2	0611-664	7525A60G02 ABB TYPE VIY-60 V.T. - 4200/120, DOUBLE FUSE
	20	2	G-4900R2	SIGN: CAUTION - HIGH VOLTAGE
	21	2	G-4959R1	SIGN: DANGER - HIGH VOLTAGE
	22	1	G-4901R1	WARNING SIGN
	23	2	G-4608R1	SIGN: SWITCH BLADES MAY BE ENERGIZED
	24	2	G-4609R1	SIGN: FUSES MAY BE ENERGIZED
	27	1	G-6259	UL LISTED BAY NUMBER NAMEPLATE
SEE NOTE 2	30	1	CA-609-1	MECHANICAL DOOR INTERLOCK - MS-2
	39	3	3611-118	9F60BDE001 FERRAZ SHAWMUT CL FUSE, 8.25KV MAX 1E
	40	1	4745	CABLE CONNECTOR, #2-500 KCMIL, FOR ALUMINUM BUS
SEE NOTE 3	41	1	38462	KEY INTERLOCK ASSEMBLY - PREVENTS PARALLELING, MS-2
	42	1	0611-473	S105814Y SUPERIOR KEY INTERLOCK TYPE B-5003-2
	43	1	CVU-1590-4-PNT102	KEY INTERLOCK MOUNTING ASSEMBLY - SUPERIOR BRAND
	50	1	AS SHOWN	600A MAIN & GROUND BUS ASSEMBLY, ALUMINUM
SEE NOTE 4	56	1	CWA-6136-2	BAY-TO-BAY BOLTING KIT, 4.16KV OUTDOOR
SEE NOTE 4	57	1	CWA-5052-2	SPLICE PLATE KIT - 4.16KV 600A, ALUMINUM
SEE NOTE 4	58	1	CWA-6143-1	SPECIAL BAY-TO-BAY BOLTING KIT, 4.8KV
	59	1	CW-1084	600A GROUND BUS - 38" WIDE BAY, ALUMINUM
	61	1	C-2662	TERMINAL BLOCK MOUNTING PLATE, LARGE
	64	4	CD-1720	ANCHOR BRACKET
	65	1	QCMA-14860	WIRING COMPONENT LIST
	66	1	5297-A-PNT102	EXTERNAL COVER - MS-2 UNDER MICRO-AT, OUTDOOR
	67	1	CMA-1132-2	INTERNAL COVERS - MICRO-AT OVER MS-2, 4.16KV 104 HIGH
	69	1	CWA-6121	4.16KV SM-5S TO MINI-RUPTER CONNECTING BUS ASSEMBLY
	71	1	C-3998	V.T. JUMPER
	72	1	CMA-1136	AUXILIARY TRANSFORMER ASSEMBLY
	77	1	CA-871-4	HEATER & GUARD, 125V, 500W
	78	1	CD-6339-1	HEATER DEFLECTOR PLATE
	86	1	5500-003	SNAP LOCK CAPLUG
	104	1	C-947	GROUND BAIL
	106	1	C-752	GROUND BAIL
	109	3	S-86000	GROUNDING STUD
	110	3	S-86004	GROUNDING STUD
	117	1	CWA-6013-1	GROUND SPLICE FOR FABRICATION SPLIT, 600A ALUMINUM
	127	1	G-4616	LABEL: INSTRUCTION MANUAL INSIDE THIS BAY
	146	1	QCMA-12757-PNT102	HINGED BOLTED PANEL, WITH DOOR HOLDER - STEEL BY STEEL DETAILING
	150	1	CMA-1153-17-PNT102	SPECIAL DOOR ASSEMBLY, SNAPLOCK AND WINDOW
	151	1	CA-876-2	SCREEN DOOR ASSEMBLY, A = 23-1/4 , B = 47
	152	1	CA-876-2	SCREEN DOOR ASSEMBLY, A = 23-1/4 , B = 21-7/8
	156	6	CA-1320	VENT BACKING ASSEMBLY
	157	1	C-9107	FUSE STORAGE CONTAINER
	158	1	CM-1119	INSTRUCTION BOOK HOLDER
	159	1	CD-1416	FUSE STORAGE CONTAINER, SMALL
	200	1	AS SHOWN	STEEL ENCLOSURE: LIGHT GRAY FINISH
	201	2	CA-1269	EYE BOLT ASSEMBLY, WELDED INTO ROOF
	206	1	CWA-5071-5	BASE ASSEMBLY, 38" WIDE X 36" DEEP
	235	2	CD-2418	BUS SUPPORT ANGLE, 36" DEEP 4.16KV BAY
	236	2	C-1682	MINI-RUPTER SUPPORT ANGLE, 38" WIDE 4.18KV BAY, WELDED INTO BAY
	301	1	CMA-1422-2	WIRE DUCT & COVER ASSEMBLY, 38" BAY - 3" X 6-1/2"
	302	1	C-775	WIRE DUCT - CUT TO LENGTH IN FINAL ASSEMBLY
	403	1	QCMA-14064	BARRIER ASSEMBLY, 4.16KV 600A INVERTED MINI-RUPTER
	460	2	S-58150-7	BARRIER BRACKET
	602	4	1323-192	5/16-18 X 3/4 WELD STUD, WELDED INTO BAY
	603	2	0825-559	1/4-20 COLLARED WELD STUD, WELDED INTO BAY
	604	6	0825-190	1/4-20 X 3/4 WELD STUD, WELDED INTO BAY
	718	1	CWA-6047-1	CONNECTOR ADAPTER BUS, 1 CONNECTOR PER PHASE, ALUMINUM
	733	1	RD-1402-89-1	MOUNTING DETAIL, 2 VT'S PHASE TO PHASE
	734	2	RD-1402-247A	MOUNTING DETAIL, ABB VIY-60 VT, STUDS
	764	1	RD-3641 EAS	CONSTRUCTION DETAILS - MS-2 BELOW MICRO-AT
	772	1	CRD-1074	SEPARATE SWITCH & FUSE MOUNTING SEE UP-1119
	801	1	CW-2073	1/4" DIAMETER COPPER ROD

REVISIONS

NO.	NOTICE NO.	DATE	REV BY	DESCRIPTION
000	SC570865	7/26/2014	MC	INITIAL RELEASE.
001	SC573125	11/4/2014	MC	ADDED (1) C-752, (1) CD-2418 & (2) C-1098.ADDED GRD. BUS.

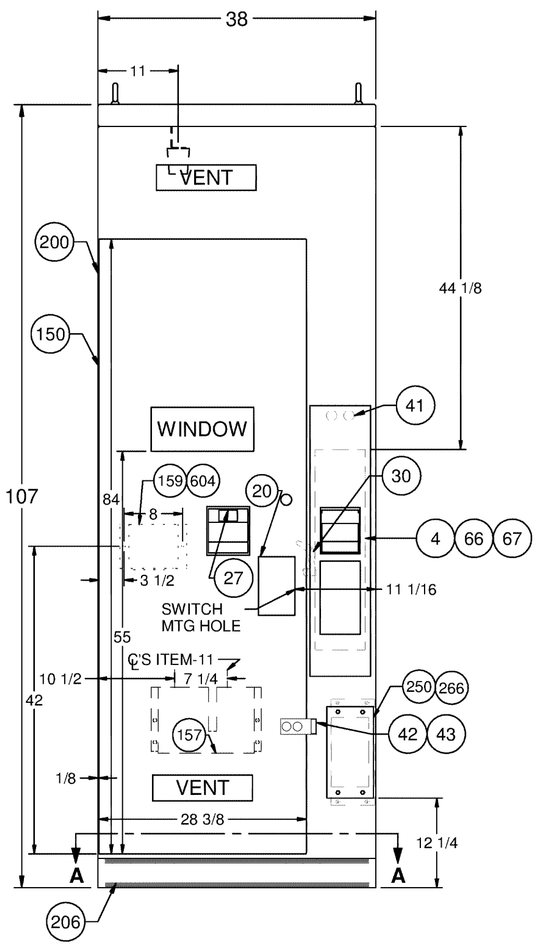
DRAWING SIZE	C
DRAWN BY	CABAELM
SCALE	NONE
ORIGINATION DATE	7/26/2014
PROJECTION	
UNITS	-
NEXT ASSEMBLY	
PRODUCT DESCRIPTION	CUSTOM

S&C ELECTRIC COMPANY
Excellence Through Innovation

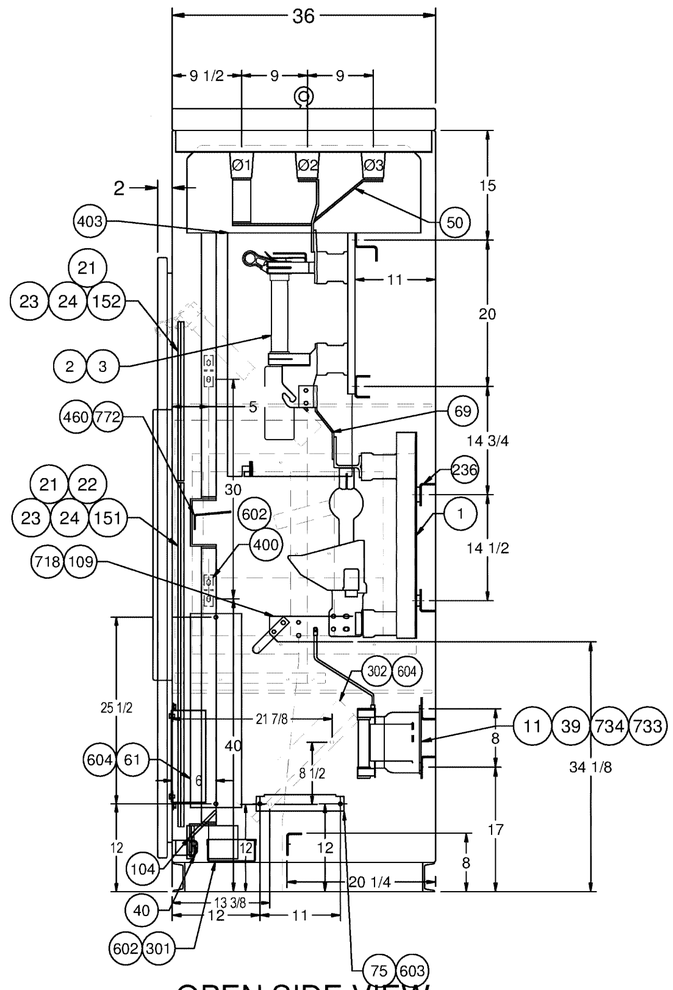
DESCRIPTION
BAY 1

MODULE: UP-11019
OPTIONS: A1,A33AD,A34H,A36,A38L,MPBTA,CD31,C5,CA1,CD2,CD3,CD4,CD5,XH1,XE3,Y4,Y8

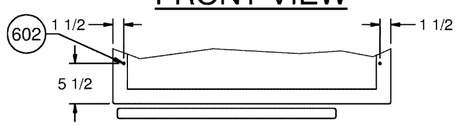
DRAWING NO. SE
CDA-843610



FRONT VIEW



OPEN SIDE VIEW



SECTION A-A

NOTES:

1. VOLTAGE TRANSFORMERS SUPPLIED, INSTALLED, AND WIRED BY S&C.
2. DOOR CANNOT BE OPENED WHEN INTERRUPTER SWITCH IS CLOSED, AND INTERRUPTER SWITCH CANNOT BE CLOSED WHEN DOOR IS OPEN.
3. KEY INTERLOCK MOUNTED WITH NO EXPOSED HARDWARE.
4. SEE DRAWING OCA-5184 FOR CONSTRUCTION DETAILS.

OPTIONAL FEATURES IN THIS BAY:

A1	OUTDOOR CONSTRUCTION -PNT102: LIGHT GRAY FINISH
A36	TERMINAL BLOCK MOUNTING PLATE - LARGE
A37	LOW-VOLTAGE COMPARTMENT IN STILE
A38R	GROUND CONNECTOR FOR ALUMINUM BUS
CD3	KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL PARALLELING
C5	DOUBLE CYLINDER SUPERIOR KEY INTERLOCK ON DOOR
CA1	SWITCH OPERATOR TYPE MS-2, 115 VAC CONTROL VOLTAGE
CD1	KEY INTERLOCK, LOCKS SWITCH OPERATOR OPEN
CD2	KEY INTERLOCK, LOCKS SWITCH OPEN, PREVENTS MANUAL PARALLELING
CD3	KEY INTERLOCKS, LOCK SWITCH OPEN, PREVENTS MANUAL PARALLELING
CD4	EXTRA AUXILIARY SWITCH, COUPLED TO INTERRUPTER SWITCH
CD5	EXTRA AUXILIARY SWITCH, COUPLED TO SWITCH OPERATOR
XH1	2 FUSED VT'S PH-PH WITH AUX. XFMR - FOR L.H. ENTRANCE BAY

BILL OF MATERIAL

	ITEM	QTY.	PART NUMBER	DESCRIPTION
	1	1	255712R1	MINI-RUPTER SWITCH, 14.4KV 600A
	2	3	86641R2	SM-5S POWER FUSE HOLDER, 4.8KV
	3	3	SA-37005-1	SM-5S POWER FUSE MOUNTING, 4.8KV 400E
	4	1	38754-DQUW	MS-2 SWITCH OPERATOR, 115 VAC PER ED-291R1-1X1Y8Z1
SEE NOTE 1	11	2	0611-664	7525A60G02 ABB TYPE VIY-60 V.T. - 4200/120, DOUBLE FUSE
	20	1	G-4900R2	SIGN: CAUTION - HIGH VOLTAGE
	21	2	G-4959R1	SIGN: DANGER - HIGH VOLTAGE
	22	1	G-4901R1	WARNING SIGN
	23	2	G-4608R1	SIGN: SWITCH BLADES MAY BE ENERGIZED
	24	2	G-4609R1	SIGN: FUSES MAY BE ENERGIZED
	27	1	G-6259	UL LISTED BAY NUMBER NAMEPLATE
SEE NOTE 2	30	1	CA-609-1	MECHANICAL DOOR INTERLOCK - MS-2
	39	3	3611-118	9F60BDE001 FERRAZ SHAWMUT CL FUSE, 8.25KV MAX 1E
	40	1	4745	CABLE CONNECTOR, #2-500 KCMIL, FOR ALUMINUM BUS
SEE NOTE 3	41	1	38462	KEY INTERLOCK ASSEMBLY - PREVENTS PARALLELING, MS-2
	42	1	0611-473	S105814Y SUPERIOR KEY INTERLOCK TYPE B-5003-2
	43	1	CVU-1590-4-PNT102	KEY INTERLOCK MOUNTING ASSEMBLY - SUPERIOR BRAND
	50	1	CWA-6120-1	4.16KV 600A MAIN & GROUND BUS ASSEMBLY, ALUMINUM
	61	1	C-2662	TERMINAL BLOCK MOUNTING PLATE, LARGE
	64	4	CD-1720	ANCHOR BRACKET
	66	1	5295-A-PNT102	EXTERNAL COVER - MS-2 OR MS-10, OUTDOOR
	67	1	CA-721-1	INTERNAL COVERS - MS-2, 4.16KV
	69	1	CWA-6121	4.16KV SM-5S TO MINI-RUPTER CONNECTING BUS ASSEMBLY
	71	1	C-3998	V.T. JUMPER
	75	1	CA-871-1	HEATER & GUARD, 125V, 250W
	86	1	5500-003	SNAP LOCK CAPLUG
	104	1	C-947	GROUND BAIL
	109	3	S-86000	GROUNDING STUD
	150	1	CMA-1153-17-PNT102	SPECIAL DOOR ASSEMBLY, SNAPLOCK AND WINDOW
	151	1	CA-876-2	SCREEN DOOR ASSEMBLY, A = 23-1/4 , B = 47
	152	1	CA-876-2	SCREEN DOOR ASSEMBLY, A = 23-1/4 , B = 21-7/8
	156	4	CA-1320	VENT BACKING ASSEMBLY
	157	1	C-9107	FUSE STORAGE CONTAINER
	159	1	CD-1416	FUSE STORAGE CONTAINER, SMALL
	200	1	AS SHOWN	STEEL ENCLOSURE: LIGHT GRAY FINISH
	201	2	CA-1269	EYE BOLT ASSEMBLY, WELDED INTO ROOF
	206	1	CWA-5071-5	BASE ASSEMBLY, 38" WIDE X 36" DEEP
	236	2	C-1682	MINI-RUPTER SUPPORT ANGLE, 38" WIDE 4.18KV BAY, WELDED INTO BAY
SEE NOTE 4	250	1	QCA-5184-PNT102	LOW VOLTAGE COMPARTMENT
	266	2	1611-709	700-CF220D ALLEN-BRADLEY RELAY
	301	1	CMA-1422-2	WIRE DUCT & COVER ASSEMBLY, 38" BAY - 3" X 6-1/2"
	302	1	C-775	WIRE DUCT - CUT TO LENGTH IN FINAL ASSEMBLY
	400	2	C-1098	GROUND BUS SUPPORT BRACKET
	403	1	QCMA-14064	BARRIER ASSEMBLY, 4.16KV 600A INVERTED MINI-RUPTER
	460	2	S-58150-7	BARRIER BRACKET
	602	6	1323-192	5/16-18 X 3/4 WELD STUD, WELDED INTO BAY
	603	2	0825-559	1/4-20 COLLARED WELD STUD, WELDED INTO BAY
	604	4	0825-190	1/4-20 X 3/4 WELD STUD, WELDED INTO BAY
	718	1	CWA-6047-1	CONNECTOR ADAPTER BUS, 1 CONNECTOR PER PHASE, ALUMINUM
	733	1	RD-1402-89-1	MOUNTING DETAIL, 2 VT'S PHASE TO PHASE
	734	2	RD-1402-247A	MOUNTING DETAIL, ABB VIY-60 VT, STUDS
	764	1	RD-7331	CONSTRUCTION DETAILS - MS-2 FOR 4.16KV INVERTED MINI-RUPTER UNDER SM-5S FUSES
	772	1	CRD-1074	SEPARATE SWITCH & FUSE MOUNTING SEE UP-1119
	801	1	CW-2073	1/4" DIAMETER COPPER ROD

REVISIONS

NO.	NOTICE NO.	DATE	REV BY	DESCRIPTION
000	SC570865	7/26/2014	MC	INITIAL RELEASE.
001	SC573125	11/4/2014	MC	ADDED (1) C-752, (1) CD-2418 & (2) C-1098.ADDED GRD. BUS.

DRAWING SIZE	C
DRAWN BY	CABAELM
SCALE	NONE
ORIGINATION DATE	7/26/2014
PROJECTION	
UNITS	
NEXT ASSEMBLY	
PRODUCT DESCRIPTION	CUSTOM

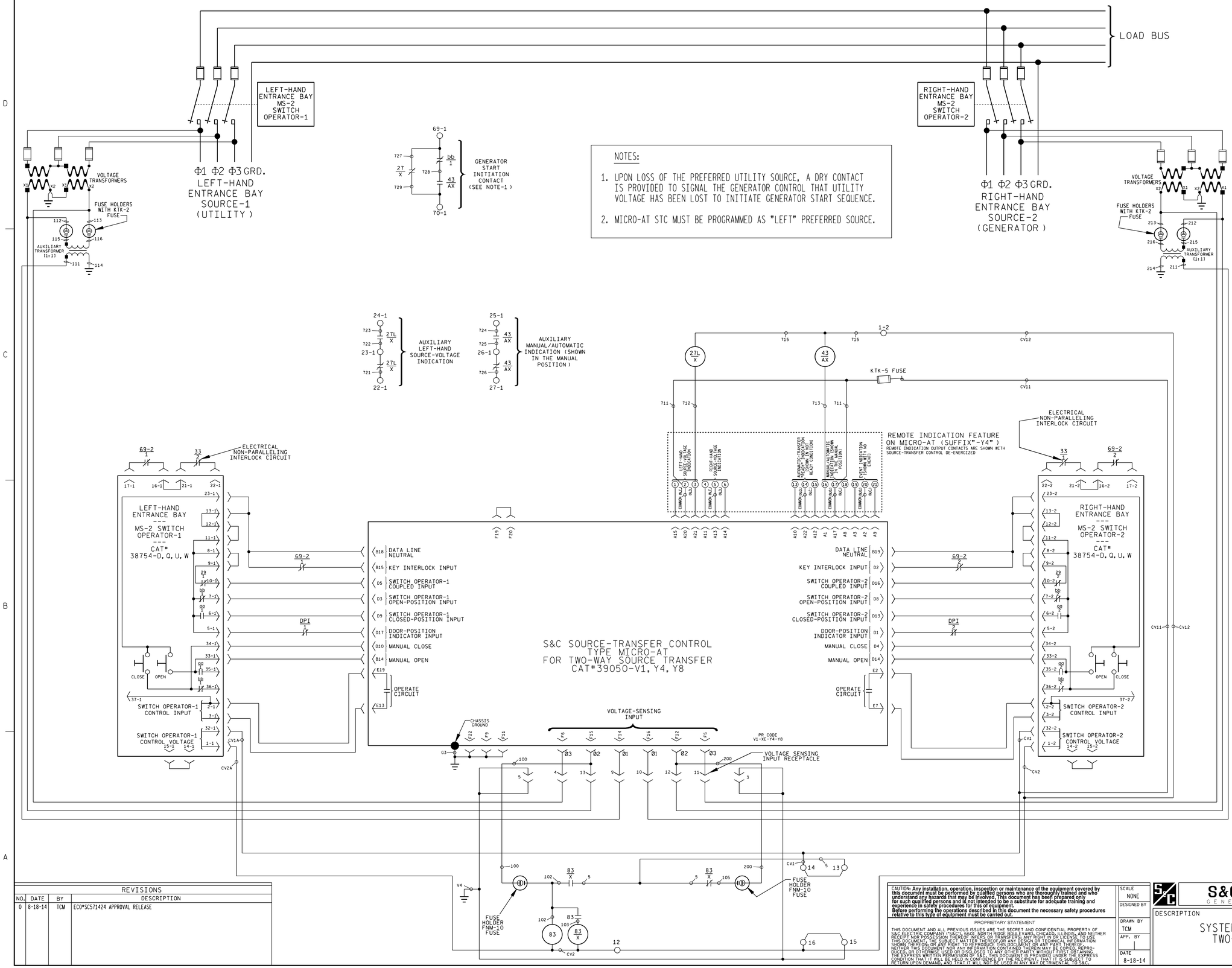
S&C ELECTRIC COMPANY
Excellence Through Innovation

DESCRIPTION
BAY 2

MODULE: UP-11019
OPTIONS: A1,A36,A37,A38R,CD3,C5,CA1,CD1,CD2,CD3,CD4,CD5,XH1

SHEET 3 OF 3

DRAWING NO. SE
CDA-843610



EXPLANATION OF DEVICE DESIGNATION

CONNECTOR INFORMATION:

32-2 — CONNECTOR PLUG; CONNECTOR RECEPTACLE; DESIGNATION NUMBER FOR SWITCH OPERATOR; LOCATION POINT IN CONNECTOR

THE FOLLOWING ITEMS ARE ASSOCIATED WITH SWITCH OPERATORS:

29/1,2	SWITCH-OPERATOR COUPLED-POSITION SWITCH (SHOWN WITH SWITCH OPERATOR COUPLED TO HIGH-VOLTAGE SWITCH)
aa/1,2 bb/1,2	SWITCH OPERATOR AUXILIARY POSITION SWITCH (SHOWN WITH OPERATOR IN THE OPEN POSITION)
	SWITCH OPERATOR OPEN/CLOSE PUSHBUTTONS
DPI/1,2	DOOR-POSITION INDICATOR SWITCH (SHOWN WITH ENCLOSURE DOOR CLOSED AND LATCHED)
33/1,2	EXTRA-AUXILIARY-SWITCH CONTACTS - SHOWN WITH THE HIGH-VOLTAGE SWITCH IN THE OPEN POSITION (SUFFIX "-W")
69-2/1,2	KEY-INTERLOCK SWITCH-BLOCKS THE CLOSING CIRCUIT. INCLUDED IN SUFFIX "-U" ON SWITCH OPERATOR. (KEY-INTERLOCK SWITCH SHOWN IN THE UNLOCKED POSITION)

THE FOLLOWING ARE LOCATED IN LOW-VOLTAGE AREA IN BAY-1:

83	VOLTAGE TRANSFER RELAY (P&B CAT.#CSJ38-71010) WITH FIXED PICK-UP POINT OF 105V-AC AND ADJUSTABLE DROP-OUT RANGE OF 90-103V-AC
83/X	AUXILIARY TRANSFER RELAY (LOVATO CAT.# BF18 T2A120 60 AND (2) AUXILIARY BLOCKS BFX1211)

THE FOLLOWING ARE LOCATED IN LOW-VOLTAGE AREA IN BAY-2:

27L/X	AUXILIARY SOURCE VOLTAGE RELAY (ALLEN BRADLEY CAT.#700-CF-220D)
43/AX	AUXILIARY AUTOMATIC OPERATION INDICATION RELAY (ALLEN BRADLEY CAT. #700-CF-220D)

REFERENCE DRAWINGS:

QCDR-16001-1	INTERCONNECTION WIRING DIAGRAM
CDR-3166	MS-2 SWITCH-OPERATOR SCHEMATIC WIRING DIAGRAM
CDR-3166-1	MS-2 SWITCH-OPERATOR DETAIL WIRING DIAGRAM
515-500	MICRO-AT INSTRUCTION SHEET (FOR FIELD PROGRAMMING AND OPERATION)
515-500.1	ADDENDUM TO INSTRUCTION SHEET 515-500
515-506	COMMUNICATION CARD INSTRUCTION SHEET

REVISIONS			
NO.	DATE	BY	DESCRIPTION
0	8-18-14	TCM	ECO#SC571424 APPROVAL RELEASE

SCALE	NONE
DESIGNED BY	
DRAWN BY	TCM
APP. BY	
DATE	8-18-14

S&C ELECTRIC COMPANY — GENERAL OFFICES • CHICAGO — Specialists in High Voltage Switching and Protection

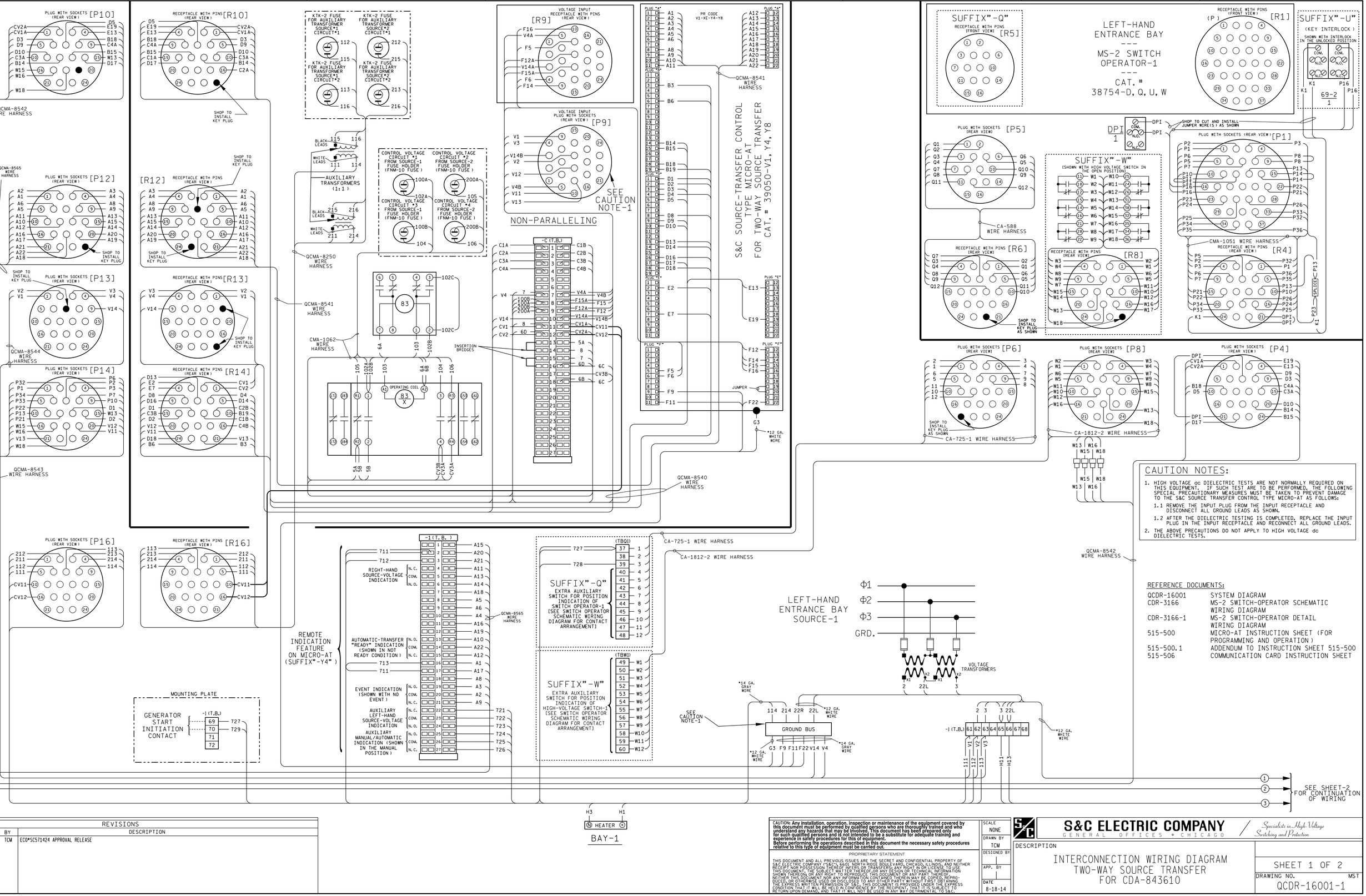
DESCRIPTION

SYSTEM DIAGRAM FOR MICRO-AT TWO-WAY SOURCE TRANSFER FOR CDA-843610

DRAWING NO. MST

QCDR-16001

qcdr-16001.dgn 8/27/2014 10:07:33 AM



CAUTION NOTES:

1. HIGH VOLTAGE ac DIELECTRIC TESTS ARE NOT NORMALLY REQUIRED ON THIS EQUIPMENT. IF SUCH TEST ARE TO BE PERFORMED, THE FOLLOWING SPECIAL PRECAUTIONARY MEASURES MUST BE TAKEN TO PREVENT DAMAGE TO THE S&C SOURCE TRANSFER CONTROL TYPE MICRO-AT AS FOLLOWS:
   - 1.1 REMOVE THE INPUT PLUG FROM THE INPUT RECEPTACLE AND DISCONNECT ALL GROUND LEADS AS SHOWN.
   - 1.2 AFTER THE DIELECTRIC TESTING IS COMPLETED, REPLACE THE INPUT PLUG IN THE INPUT RECEPTACLE AND RECONNECT ALL GROUND LEADS.
2. THE ABOVE PRECAUTIONS DO NOT APPLY TO HIGH VOLTAGE dc DIELECTRIC TESTS.

REFERENCE DOCUMENTS:

QCDR-16001	SYSTEM DIAGRAM
CDR-3166	MS-2 SWITCH-OPERATOR SCHEMATIC WIRING DIAGRAM
CDR-3166-1	MS-2 SWITCH-OPERATOR DETAIL WIRING DIAGRAM
515-500	MICRO-AT INSTRUCTION SHEET (FOR PROGRAMMING AND OPERATION)
515-500.1	ADDENDUM TO INSTRUCTION SHEET 515-500
515-506	COMMUNICATION CARD INSTRUCTION SHEET

REVISIONS

NO.	DATE	BY	DESCRIPTION
0	8-18-14	TCM	ECO*SC571424 APPROVAL RELEASE

SCALE	NONE
DRAWN BY	TCM
DESIGNED BY	
APP. BY	
DATE	8-18-14

S&C ELECTRIC COMPANY — GENERAL OFFICES • CHICAGO — *Specialists in High Voltage Switching and Protection*

DESCRIPTION

INTERCONNECTION WIRING DIAGRAM TWO-WAY SOURCE TRANSFER FOR CDA-843610

SHEET 1 OF 2

DRAWING NO. MST

QCDR-16001-1

qcdr-16001-1.dgn 8/20/2014 12:02:44 PM

RIGHT-HAND ENTRANCE BAY

MS-2 SWITCH OPERATOR-2

CAT# 38754-D, Q, U, W

SUFFIX"-Q"
RECEPTACLE WITH PINS (FRONT VIEW) [R22]

SUFFIX"-U"
(KEY INTERLOCK)
SHOWN WITH INTERLOCK IN THE UNLOCKED POSITION
K1 — 69-2/2 — P16

RECEPTACLE WITH PINS (FRONT VIEW) (P) [R2]

DPI 2

SHOP TO CUT AND INSTALL JUMPER WIRE(S) AS SHOWN

PLUG WITH SOCKETS (REAR VIEW) [P22]
Q1 Q2 Q3 Q4 Q7 Q8 Q11 — Q6 Q5 Q10 Q9 Q12

CA-588 WIRE HARNESS

RECEPTACLE WITH PINS (REAR VIEW) [R23]
Q7 Q3 Q4 Q8 Q9 Q12 — Q2 Q1 Q6 Q5 Q11 Q10

SHOP TO INSTALL KEY PLUG AS SHOWN

SUFFIX"-W"
(SHOWN WITH HIGH VOLTAGE SWITCH IN THE OPEN POSITION)
W1 W3 W4 W5 W6 W9 — W10 W11 W12 W13 W14 W15 W16 W17 W18

RECEPTACLE WITH PINS (REAR VIEW) [R25]
W3 W4 W13 — W2 W1 W6 W5 W11 W10 W12 W16 W17 W18

PLUG WITH SOCKETS (REAR VIEW) [P2]
P2 P1 P6 P5 P7 P10 P11 P12 P15 P16 P23 P24 P25 P34 P35 — P3 P8 P13 P14 P22 P21 P26 P33 P32 P36

CMA-1051 WIRE HARNESS

RECEPTACLE WITH PINS (REAR VIEW) [R21]
P5 P2 P3 P6 P7 P21 P22 P34 P33 K1 — P32 P1 P36 P35 P13 P10 P26 P24 P25 DPI DPI
P13 SPLICED P23 K1

PLUG WITH SOCKETS (REAR VIEW) [P23]
2 1 5 5 11 10 12 — 3 4 7 9 8
SHOP TO INSTALL KEY PLUG AS SHOWN
CA-725-1 WIRE HARNESS

PLUG WITH SOCKETS (REAR VIEW) [P25]
W2 W1 W5 W11 W10 W12 W16 — W3 W4 W7 W9 W8 W15 W13 W18
CA-1812-2 WIRE HARNESS

PLUG WITH SOCKETS (REAR VIEW) [P21]
DPI P32 P1 P13 P10 DPI D1 — P2 P3 P6 P7 P22 P21 P34 P33 D2

(TBQ)
SUFFIX"-Q"
EXTRA AUXILIARY SWITCH FOR POSITION INDICATION OF SWITCH OPERATOR-2 (SEE SWITCH OPERATOR SCHEMATIC WIRING DIAGRAM FOR CONTACT ARRANGEMENT)
37 38 39 40 41 42 43 44 45 46 47 48 — 1 2 3 4 5 6 7 8 9 10 11 12
CA-725-1 WIRE HARNESS

(TBW)
SUFFIX"-W"
EXTRA AUXILIARY SWITCH FOR POSITION INDICATION OF HIGH-VOLTAGE SWITCH-2
49 50 51 52 53 54 55 56 57 58 59 60 — W1 W3 W4 W5 W6 W7 W8 W9 W10 W11 W12
CA-1812-2 WIRE HARNESS

W13 W16 W15 W18 — SHOP TO CONNECT WIRES IN FINAL ASSEMBLY

QCMA-8543 WIRE HARNESS

Φ1
Φ2 RIGHT-HAND ENTRANCE BAY SOURCE-2
Φ3
GRD.

VOLTAGE TRANSFORMERS
X2 X1 X2 X1
2 22R 3
*12 GA. WHITE WIRE
22R — 2 3 3 22R
-2 (T,B,) 61 62 63 64 65 66 67 68
V11 V12 V13
211 212 213 H14 H16

[R18] RECEPTACLE WITH PINS (REAR VIEW)
212 211 712 711 CV11 721 CV12 725 728 729 — 213 H11 713 H13 723 724 722 726 H1 H3

[P18] PLUG WITH SOCKETS (REAR VIEW)
213 H11 713 H13 723 724 722 727 726 H1 H3 — 212 211 712 711 CV11 721 CV12 725 728 729

*12 GA. WHITE WIRE

SEE SHEET-1 FOR CONTINUATION OF WIRING

H6 — H4
HEATER
BAY-2

LOW-VOLTAGE COMPARTMENT

723 721 712 715 727
A2 OPERATING COIL A2
27L X
13 21 31 43 14 22 34 44
722 729
724 726 713 715 728
A2 OPERATING COIL A2
43 AX
13 21 31 43 14 22 34 44
725 729

FUSE HOLDERS
KTK-5 FUSE: CV11 — 711
FNM-10 FUSE: H11 — H1
FNM-10 FUSE: H14 — H4
-2 (T,B,)
CV12 — 1 — 715
H13 — 2 — H3
H16 — 3 — H6

REVISIONS			
NO.	DATE	BY	DESCRIPTION
0	8-18-14	TCM	ECO*SC571424 APPROVAL RELEASE

SCALE	NONE
DRAWN BY	TCM
DESIGNED BY	
APP. BY	
DATE	8-18-14

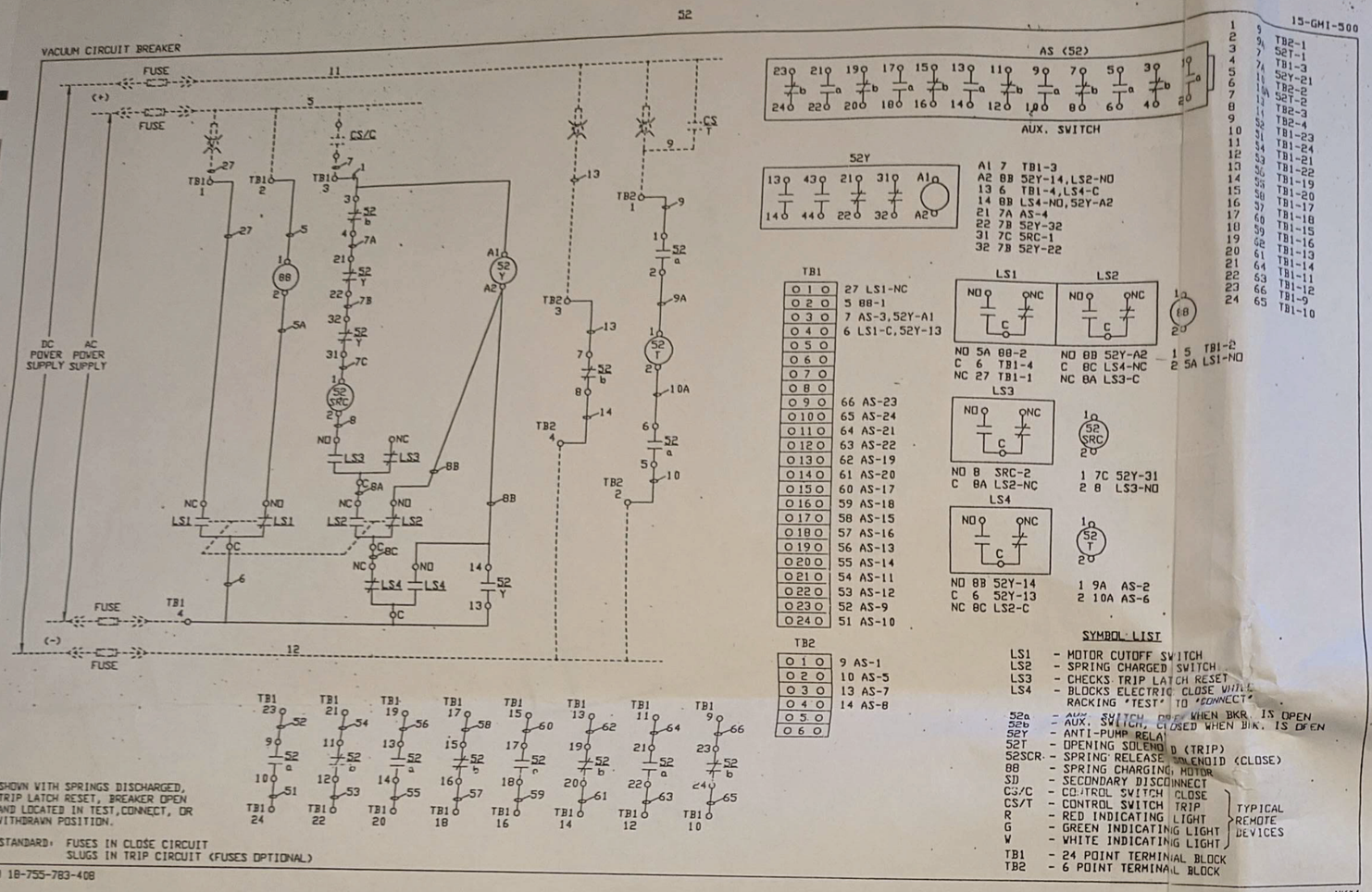
S&C ELECTRIC COMPANY
GENERAL OFFICES • CHICAGO
Specialists in High Voltage Switching and Protection

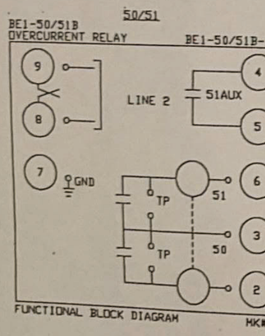
DESCRIPTION
INTERCONNECTION WIRING DIAGRAM
TWO-WAY SOURCE TRANSFER
FOR CDA-843610

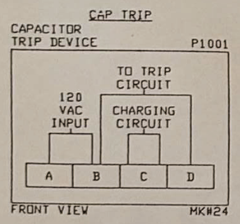
SHEET 2 OF 2
DRAWING NO. MST
QCDR-16001-1

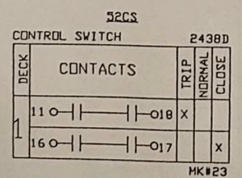
qcdr-16001-1.dgn 8/27/2014 10:08:45 AM

DEVICE DEVELOPMENT

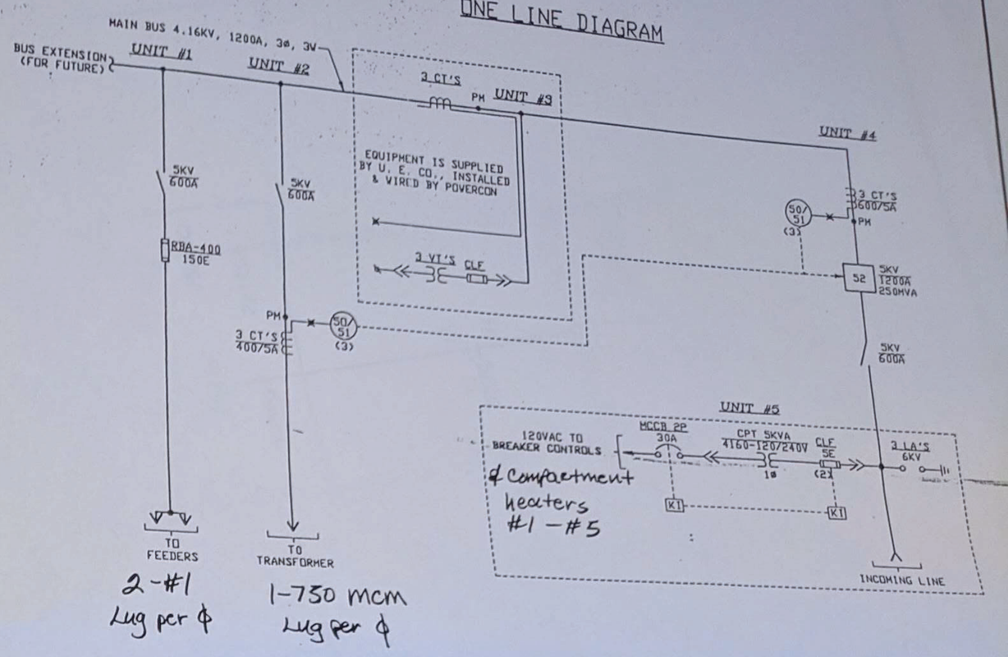








ONE LINE DIAGRAM



A/E to forward and coordinate U.E. approval

APPROVED SUBJECT TO:
- ☑ REQUIREMENTS OF JOB PLANS & SPECS
- ☑ APPROVAL BY ARCHITECT, ENGR OR OWNER
- ☑ REQUIREMENTS OF OUR PURCHASE ORDER
- ☑ NOTATIONS MADE HEREON

CHAMPION ELECTRIC CO. JOB # 1533
BY LLN DATE 9/12/95

SHEET 1 OF

REVISIONS

DESCRIPTION OF OPERATION
N/A

SUMMARY
S-12141

FRONT VIEW
D-94167

SCHEMATIC
CW-11025

WIRING DIAGRAM
LATER

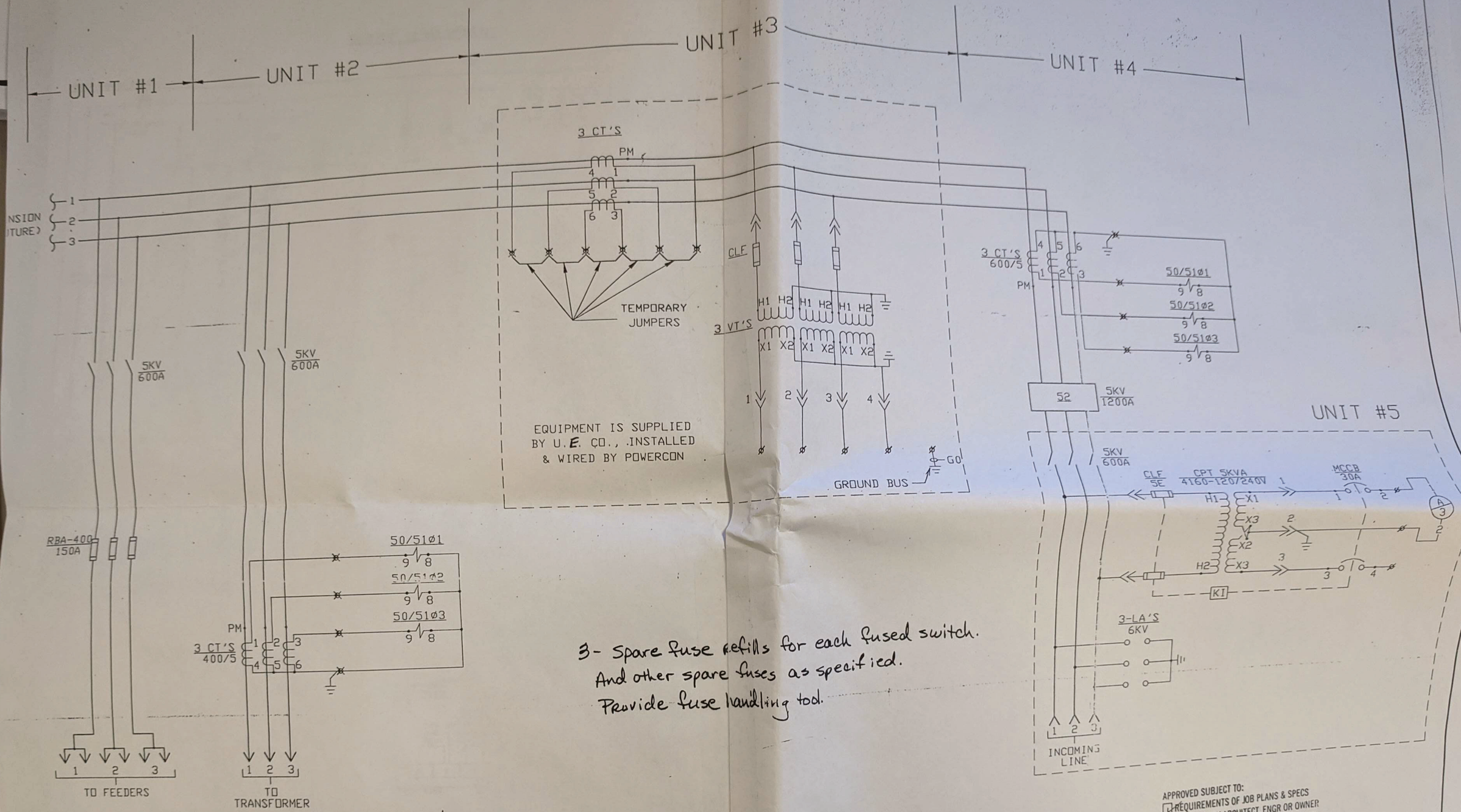
CUST. CENTREX ELECTRIC SUPPLY CORP.
P.O. NO. 04299

ENGR.	JAKOB DYNIN	DATE 09/01/95
DRWN.	JAKOB DYNIN	DATE 09/01/95
CHKD.	ALEX GELFEN	DATE 09/01/95
APPD.	A. Gelfen	DATE 9/8/95
APPD.		DATE
APPD.		DATE

Powercon Corp SEVERN, MD.

TITLE DEVICE DEVELOPMENT & ONE LINE DIAGRAM
OUTDOOR, METAL-ENCLOSED SWIRCHGEAR, RATED 5KV MAX
DESIGN, 1200A, 3PH, 3W, 60HZ, 60KV BIL
STATION PSYCHIATRIC REHABILITATION CENTER
LOCATION ST. LOUIS, MO

SO#00-72154 | CW-11025 | REV 0



Provide 2-#1 Lug per ϕ

Provide 1-750 mcm per ϕ

3- Spare fuse refills for each fused switch.
And other spare fuses as specified.
Provide fuse handling tool.

APPROVED SUBJECT TO:
- ☑ REQUIREMENTS OF JOB PLANS & SPECS
- ☑ APPROVAL BY ARCHITECT, ENGR OR OWNER
- ☑ REQUIREMENTS OF OUR PURCHASE ORDER
- ☑ NOTATIONS MADE HEREON

CHAMPION ELECTRIC CO. JOB # 1533
BY LLN DATE 9/13/95

SHEET 2 OF 3

DESCRIPTION OF OPERATION: N/A

SUMMARY: S-1214

FRONT VIEW: D-9467

SCHEMATIC: CW-11025

WIRING DIAGRAM: LATER

CUST. CENTREX ELECTRIC SUPPLY

P.O. NO. 04299

ENGR.	JAKOB DYNIN	DATE 09/01/95
DRWN.	JAKOB DYNIN	DATE 09/01/95
CHKD.	ALEX GELFEN	DATE 9/8/95
APPD.		DATE
APPD.		DATE
APPD.		DATE

Powercon Corp SEVERN MD

TITLE: THREE LINE DIAGRAM
OUTDOOR, METAL-ENCLOSED SWITCHGEAR, RATED 5KV MAX
DESIGN, 1200A, 3 PHASE, 3 WIRE, 60HZ, 60KV BIL

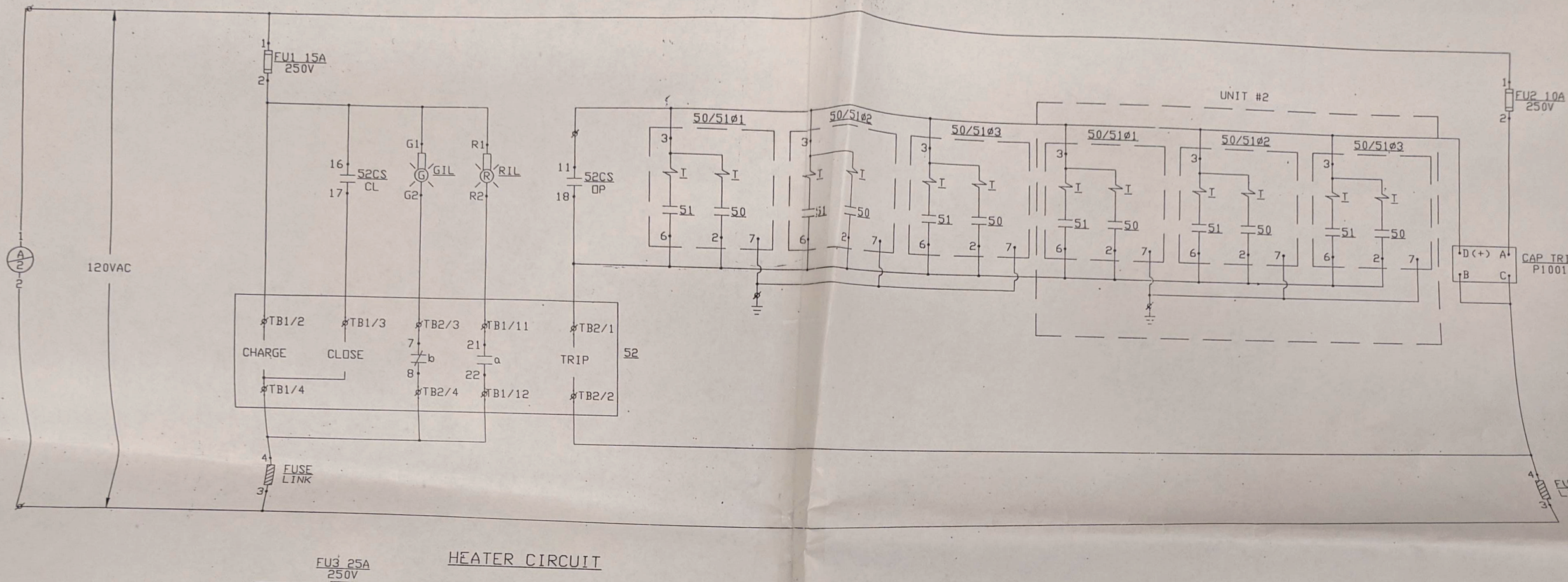
STATION: PSYCHIATRIC REHABILTATION CENTER

LOCATION: ST. LOUIS, MO

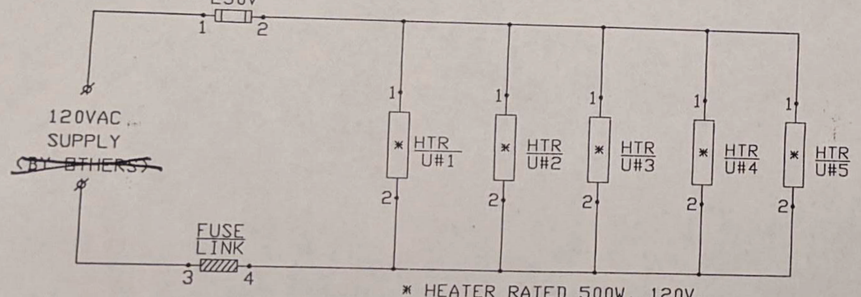
SO#00-72154 | CW-11025 | REV. 0

VACUUM CIRCUIT BREAKER CONTROL SCHEMATIC

UNIT #4



HEATER CIRCUIT



* HEATER RATED 500W, 120V, WIRING TO BE SHIELDED #12 AWG

Specifications call for power by a transformer mounted within the switchgear assembly.

APPROVED SUBJECT TO:
- [x] REQUIREMENTS OF JOB PLANS & SPECS
- [x] APPROVAL BY ARCHITECT, ENGR OR OWNER
- [x] REQUIREMENTS OF OUR PURCHASE ORDER
- [x] NOTATIONS MADE HEREON

CHAMPION ELECTRIC CO. JOB # 1533
BY LLN DATE 9/13/95

DESCRIPTION OF OPERATION: N/A

SUMMARY: S-12141

FRONT VIEW: D-9467

SCHEMATIC: CW-1025

WIRING DIAGRAM: LATER

CUST. CENTREX ELECTRICAL SUPPLY CORP.

P.O. NO. 04299

ENGR.	JAKOB DYNIN	DATE 08/3 /95
DRWN.	JAKOB DYNIN	DATE 08/3 /95
CHKD.	ALEX GELFEN	DATE 08/31/95
APPD.	A. Lee	DATE 9/8/95
APPD.		DATE
APPD.		DATE

Powercon Corp. SEVERN, MD

TITLE SCHEMATIC DIAGRAM
OUTDOOR, METAL-ENCLOSED SWITCHGEAR
DESIGN, 1200A, 3PH., 3W., 60HZ, 6
STATION PSYCHIATRIC REHABILITATION CENT
LOCATION ST. LOUIS, MO

SO#00-72154 | CW-