
CONVEX Dedicated Power Source (C3800 Series)

First Edition



CONVEX

CONVEX COMPUTER CORPORATION

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(C3800 Series)



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(C3800 Series)**

Order No. DHW-213

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Preface

Purpose and audience

This guide provides system and facility managers with technical information needed to prepare their site and install a CONVEX C3800 Series dedicated power system when using the 75 kVa isolation transformer as the dedicated power source.

When using the CONVEX Power Distribution Unit as a dedicated power source, refer to *Liebert Installation and Operation Manual*, Order No. DHW-013.

When installing a customer provided dedicated power source, obtain the minimum power requirements using this document and *CONVEX Computers Site Preparation Guide (C3800 Series)*, Order No. DHW-211. Refer to this document or *Liebert Installation and Operation Manual*, Order No. DHW-013, as a general guideline for installation.

Scope

The specifications and information contained in this manual apply to models C3800 and C3800/ES CONVEX computer dedicated power systems that use the CONVEX 75 kVa isolation transformer.

Notes and warnings

This document presents notes and warnings in the following formats.

Note

A Note highlights supplemental information.

Warning

A warning highlights information necessary to avoid injury to personnel.

Associated documents

The following is a list of other documents that provide more detail on the topics presented in this manual.

- *CONVEX COMPUTERS Site Preparation Guide (C3800 Series)*, Order No. DHW-211
- *CONVEX I/O Site Preparation Guide*, Order No. DHW-010
- *Standard for the Protection of Electronic Computer Data Processing Equipment*, (NFFPA75) National Fire Protection Association
- *EIA Standard RS-232-C*, Electronic Industries Association
- *Electrostatic Discharge Failures of Semiconductor Devices*, Unger, B.A. 1981, Bell Laboratories
- *Liebert Installation and Operations Manual*, Order No. DHW-013

Ordering documents

To order the current edition of this or any other CONVEX document, send requests to:

CONVEX Computer Corporation
Customer Service
P.O. Box 833851
Richardson TX 75083-3851 USA

Please include the order number (DSW or DHW number) or the exact title of the document.

Technical assistance

If you have questions that are not answered in this book, contact the CONVEX Technical Assistance Center (TAC) at the following locations:

- Within the continental U.S., call 1 (800) 952-0379.
- From Canada, call 1 (800) 345-2384.
- All other locations, contact the local CONVEX office.

You can also use the contact utility, if you would like to report any problems you may have with ConvexOS or its associated documentation. For more information refer to the contact(1) man page in *ConvexOS Man Pages for Users*, or the appendix "Reporting problems" in the *ConvexOS Primer* or *Managing ConvexOS: Operations Guide*.

FCC Notice

This equipment generates, uses, and can radiate radio frequency energy. And, if not installed and used in strict accordance with the instruction manual, it may cause harmful interference to radio communications.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

When the equipment is operated in a residential area, it is likely to cause interference. In this case, the interference must be corrected at the operator's expense.

Do not connect external equipment to the utility outlets in CONVEX equipment cabinets. Unauthorized connection voids all agencies' emissions certification.

Power equipment warnings

The following warnings apply to the power equipment described in this document.

Warning

Injury to personnel or damage to equipment can occur if the ac input power does not comply with the specifications on the CONVEX cabinet power label.

LETHAL VOLTAGE HAZARD—Hazardous voltages may be present in the processor cabinet if incorrectly wired into the site ac power supply. Always verify correct wiring and cabinet grounding before applying ac power to the processor cabinet. Failure to do so may result in injury to personnel and damage to equipment.

Attention

Blessures du personnel et dommages à l'équipement sont possibles si l'alimentation (courant alternatif) n'est pas conforme aux spécifications données sur l'étiquette d'avertissement de l'alimentation de CONVEX.

RISQUE de VOLTAGE MORTEL—Des voltages dangereux peuvent être présents dans le cabinet du processeur, si il n'est pas branché correctement au réseau d'alimentation du site. Toujours vérifiez les connexions au réseau et la mise-à-la-masse des cabinets avant d'appliquer le courant. Non-observation de cette règle pourrait causer blessure du personnel et dommages à l'équipement.

Warnung

Es können Verletzungen von Personen oder Beschädigungen von Geräten auftreten, falls die Eingangswchselfspannung nicht mit den Spezifikationen am Geräteschild übereinstimmt.

ACHTUNG TÖTLICHE SPANNUNGSGEFAHR—Gefährliche Spannungen können in der Zentraleinheit auftreten, falls elektrische Verbindungen zur lokalen Stromversorgung nicht korrekt ausgeführt wurden. Bevor Einschalten der Stromversorgung, immer Anschlüsse auf Korrektheit überprüfen. Nichtbeachtung kann Schaden an Personen oder Geräten zur Folge haben.

Designing your dedicated power source

1

A CONVEX C3800 Series computer requires a dedicated power source as an interface between external ac power and the computer to reduce the effects of power disturbances. This chapter establishes design criteria for your power source.

A typical dedicated power source may consist of the following components:

- Service entrance panel
- Computer dedicated power source
 - Isolation transformer
 - Power distribution panel
- Peripheral equipment dedicated power source
- Standby power systems
 - Standby power for the computer system
 - Standby power for HVAC equipment

The design and installation of the service entrance panel, the power distribution panel, the peripheral equipment dedicated power source, and the standby power systems requires specialized skills. Those responsible for these tasks must have a thorough understanding of appropriate electrical codes. The computer isolation transformer is available from CONVEX. Refer to *Liebert Installation and Operation Manual*, Part No. DHW-013, for information on the domestic dedicated power source.

The specifications, graphics, and instructions in this document apply specifically to the CONVEX 75 kVa isolation transformers.

Figure 1 illustrates the components of a typical C3800 dedicated power source.

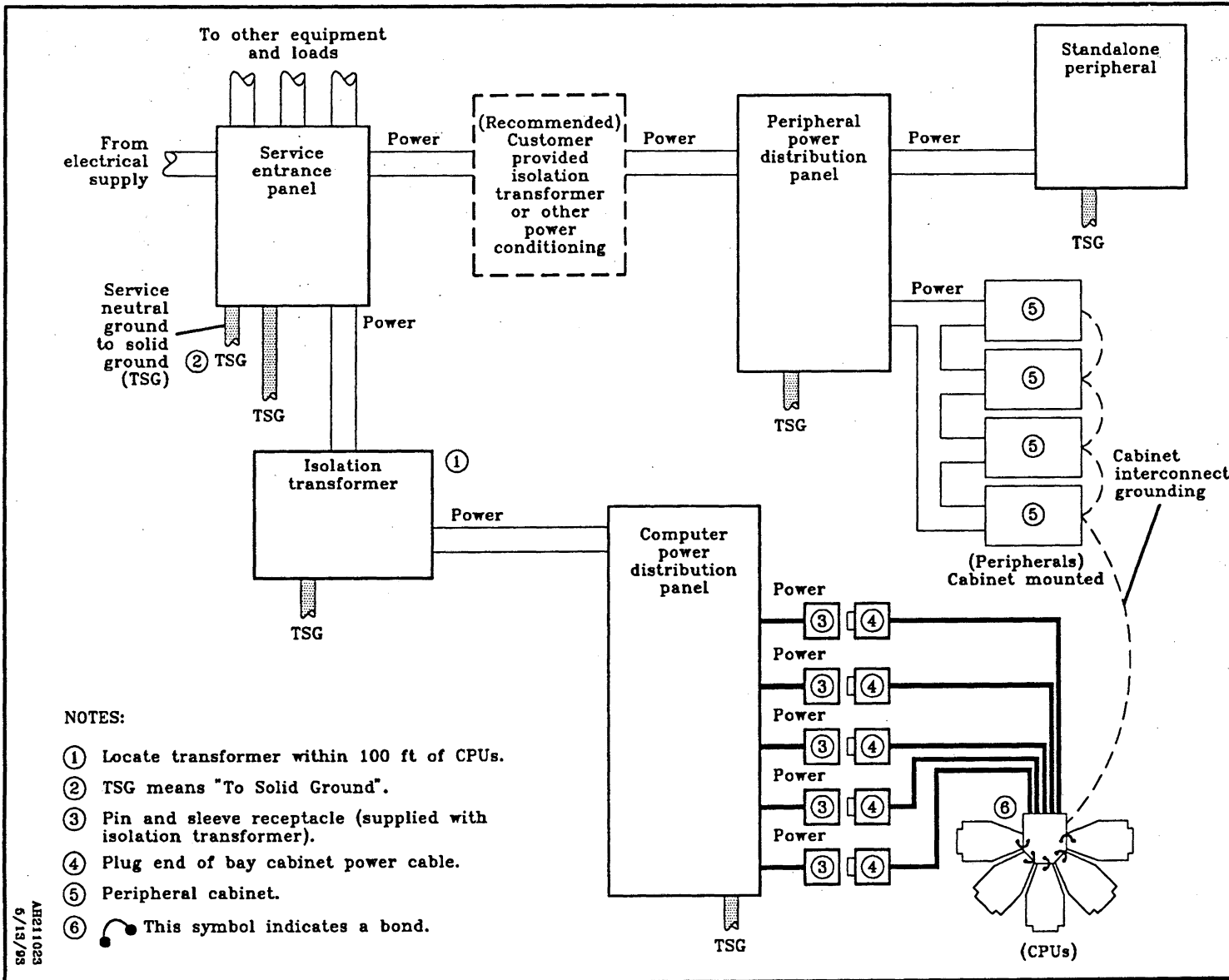


Figure 1 Typical power distribution and grounding

Load requirements

Electrical power load (kVa input) requirements for CONVEX C3800 Series computers are listed in the *CONVEX Computers Site Preparation Guide (C3800 Series)*, Order No. DHW-211.

The corresponding electrical power load requirements information for peripheral devices are listed in specification tables that are located in the *CONVEX I/O Site Preparation Guide*, Order No. DHW-010.

Additional capacity should be added for equipment upgrading or expansion.

Power distribution system design

The design specifications in this document derate or adjust power distribution system size for the following reasons:

- To avoid nuisance tripping from load shifts or power transients, circuit protection devices should never be run above 80% of their root-mean-square (RMS) current ratings.
- Safety agencies derate most power connectors to 80% of their RMS current ratings.
- Most computer or data processing equipment uses switching power supplies. The current waveform inputs to switching power supplies have high current peaks, compared to the RMS value. These current peaks (current crest ratios = Peak/RMS) are a function of the power system design and site source impedance.
 - Harmonics from the current waveforms can cause transformer heating and larger than expected neutral currents on wye loads.
 - Derating of power system components compensates for the effects of current harmonics.
 - * Derate 20% for 3-phase systems.
 - * Derate 30% for single-phase systems.
 - kVa numbers in the *CONVEX Computers Site Preparation Guide (C3800 Series)* reflect worst case harmonic content to allow for adequate sizing of power distribution. Actual kVa values should be less.

Circuit breakers

Note

The following information on circuit breaker sizes applies specifically to CONVEX 75 kVa Isolation transformers.

The dedicated power system requires the following circuit breakers at the points shown in Figure 2:

- Service entrance panel
 - One circuit breaker at entrance panel input (Figure 2, circuit breaker A), sized to customer specifications and consistent with local electrical codes.
 - One circuit breaker at entrance panel output to computer isolation transformer (Figure 2, circuit breaker B), of standard size not larger than the value shown in Table 1, but at least as large as the value shown in Table 2.
- Computer dedicated power distribution panel

Note

The selected circuit breaker size (Figure 2, circuit breaker C), must not exceed the current rating of the selected power panel.

- One circuit breaker at input (Figure 2, on page 6, circuit breaker C), of standard size not larger than the power panel capacity, but at least as large as the value for your configuration shown in the Table 2 column labeled "208 Vac @ 60 Hz."
- A 60 A circuit breaker on each bay power drop (Figure 2, circuit breakers D1 through D5)
- Peripheral equipment dedicated power source, circuit breakers sized to conform to local electrical codes

Table 1 Maximum circuit breaker sizes for 75 kVa transformer input

Transformer primary input voltages	480 Vac @ 60 Hz	208 Vac @ 60 Hz	380 Vac @ 50 Hz
Maximum circuit breaker sizes	110 A	250 A	150 A

Notes

The circuit breaker sizes in Table 2 refer to typical configurations. For other configurations, contact the CONVEX technical assistance center.

Each configuration in Table 2 is assumed to have eight channel control units.

Table 2 Minimum circuit breaker sizes for 75 kVa transformer input

System	Memory boards	Number of CPU bays	Transformer primary input voltages and minimum circuit breaker sizes		
			480 Vac @ 60 Hz	208 Vac @ 60 Hz	380 Vac @ 50 Hz
C3810	1	1	30 A	70 A	40 A
	2	1	35 A	80 A	40 A
	4	2	40 A	100 A	50 A
	8	4	60 A	150 A	70 A
C3820	2	1	40 A	90 A	50 A
	4	2	45 A	110 A	60 A
	8	4	60 A	150 A	80 A
C3830	4	2	50 A	125 A	70 A
	8	4	70 A	150 A	80 A
C3840	4	2	60 A	125 A	70 A
	8	4	70 A	175 A	90 A
C3860	8	4	80 A	175 A	100 A
C3880	8	4	90 A	200 A	110 A

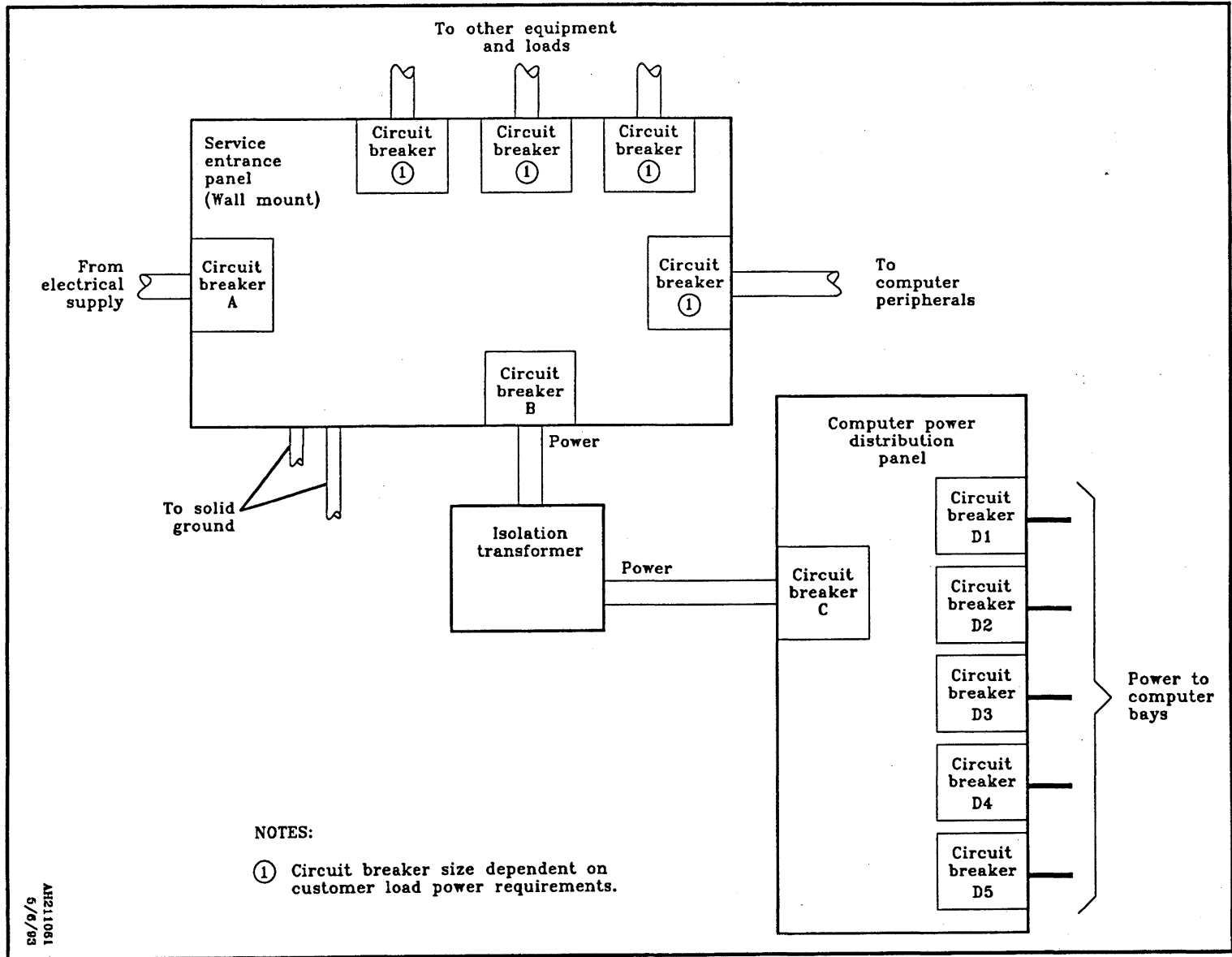


Figure 2 Dedicated power system circuit breaker locations

Heat dissipation

Transformers dissipate heat based on their efficiency. Table 3 gives heat dissipation of CONVEX 75 kVa transformers in watts for typical C3800 Series system configurations.

Table 3 Heat dissipation of CONVEX 75 kVa transformers

System	Memory boards	Number of CPU bays	Heat dissipation in watts	
			@ 60 Hz	@ 50 Hz
C3810	1	1	300	420
	2	1	330	460
	4	2	420	590
	8	4	590	840
C3820	2	1	380	540
	4	2	470	660
	8	4	640	910
C3830	4	2	520	730
	8	4	690	980
C3840	4	2	570	810
	8	4	740	1060
C3860	8	4	840	1200
C3880	8	4	950	1340

Phase load balancing

Phase load balancing includes phase current balancing, phase voltage balancing, and phase rotation.

For reliable equipment operation, balance the current load of a three-phase power system so that the individual phase loads are within $\pm 10\%$ of each other.

Balanced voltage at the output of the isolation transformer is important in keeping phase currents of the C3800 power distribution system balanced. Refer to the "Phase voltage balancing" section on page 30 for details.

Optimize phase load balancing for the cabinet blowers by rotating the phase wire connections of the five bay cabinet power drops that connect to the output of the CPU power panel. This distributes the cabinet blower load across all three phases of the input power, regardless of the cabinet configuration.

The term *rotating* means moving the phase wire one position in each adjacent power drop. Rotating phases aids in distributing the power load between the three phase legs. Refer to the "Phase rotation" section on page 49 for details.

Power quality

CONVEX C3800 Series equipment operates over a wide range of voltages and frequencies. It will withstand category B power surges (as defined by *IEEE 587* and *UL 1449*) without damage. However, damage can occur if these ranges are exceeded. Severe electrical disturbances can exceed the design specifications of C3800 Series equipment.

Sources of electrical disturbances

Electrical disturbances affect the quality of electrical power. Common sources of these disturbances follow:

- Fluctuations occurring within the facility's distribution system
- Utility service low-voltage conditions (such as sags or brownouts)
- Wide and rapid variations in input voltage levels
- Wide and rapid variations in input power frequency
- Electrical storms
- Large inductive sources (such as motors)
- Faults in the distribution system wiring (such as loose connections)
- Microwave, radar, or radio transmissions

Power system protection

A C3800 Series computer system can be protected from many electrical disturbances with the following devices:

- A dedicated power distribution system
- Power conditioning equipment
- Over- and under-voltage detection and protection circuits
- Screening to cancel out the effects of undesirable transmissions
- Lightning arresters on power cables to protect equipment against electrical storms

The following list of power devices offers the most reliable C3800 Series computer performance under a wide range of power anomalies.

- **Dedicated isolation transformer (main system complex)**—Isolates computer power distribution system from other circuits in the facility—required and available from CONVEX. You may provide your own transformer if it meets the specifications of Appendix A.
- **Dedicated isolation transformer (peripheral complex)**—Isolates the peripheral power distribution system from other circuits in the facility. (Optional, customer supplied—recommended by CONVEX.)
- **Dedicated computer power panel**—Isolates computer power distribution system from other circuits in the facility. (Optional, customer supplied—recommended by CONVEX.)
- **Dedicated peripheral power panel**—Isolates the peripheral power system from other circuits in the facility. (Optional, customer supplied—recommended by CONVEX.)
- **Missing phase and low-voltage detectors**—Shuts equipment down automatically when a severe power disruption occurs. (Optional, customer-supplied on peripheral equipment—recommended by CONVEX.)
- **Uninterruptible power supply (UPS)**—Provides back-up power and power line noise filtering. Should be considered if outages of one-half cycle or more are common. Refer to qualified contractors or consultants for each situation.

An RS-232 port on the SPU is available for C3800 system communication with a compatible UPS, to provide orderly shutdown when back-up power is about to expire (contact a CONVEX representative for implementation details).

- **Standby power for HVAC equipment**—While HVAC equipment can be connected to a UPS system, an acceptable and less expensive method is to provide an emergency generator and transfer switch serving an ac power panel.

CONVEX recommends that you protect your computer and peripheral devices with dedicated isolation transformers, power panels, missing phase detectors, and low-voltage detectors. You may, at your discretion, choose to include an uninterruptible power supply and standby power equipment at your site.

Power distribution system

CONVEX C3800 Series computers require a dedicated power distribution system to reduce the effects of power disturbances.

Distribution hardware

The paragraphs in this subsection describe wire selection and the types of raceways used in the distribution system.

Wire selection

Use copper conductors instead of aluminum. Aluminum's coefficient of expansion differs significantly from that of other metals used in power hardware. Because of this difference, aluminum conductors can cause connector hardware to loosen, overheat, and eventually fail.

Wire insulation color codes

Insulation color codes for CONVEX power cord wiring, color codes, wire functions, and wire descriptions are listed in Table 4.

Table 4 Conductor insulation colors

Color code ¹	Function	Description
Red	Phase 1	Insulated conductor
Orange	Phase 2	Insulated conductor
Black	Phase 3	Insulated conductor
Green (green/yellow)	Chassis ground	Insulated conductor
White	Neutral ²	Insulated conductor

¹For other applicable color codes, consult local electrical codes.

²This conductor must be connected to ground *only* at the isolation transformer secondary.

Cable specifications define a cable with outer diameter of 1.6 in., conductor outer diameter of 0.5 in., stranding for each conductor with 133 strands of 0.0223 in. (0.566 mm) diameter, voltage/temperature rating of 600 V / 60° C, and AWG/Cross section (sqmm/MCM) of 2 AWG/33.46 sqmm (65.9 MCM).

Raceway systems

Raceways (electrical conduits) form part of the protective ground path for personnel and equipment. Raceways protect the wiring from accidental damage and also provide a heat sink for the wires. Any of the following types may be used:

- Thin-wall electrical metallic tubing (EMT)
- Rigid (metal) conduit
- Sealtight (for humid environments)

Raceway systems for building distribution

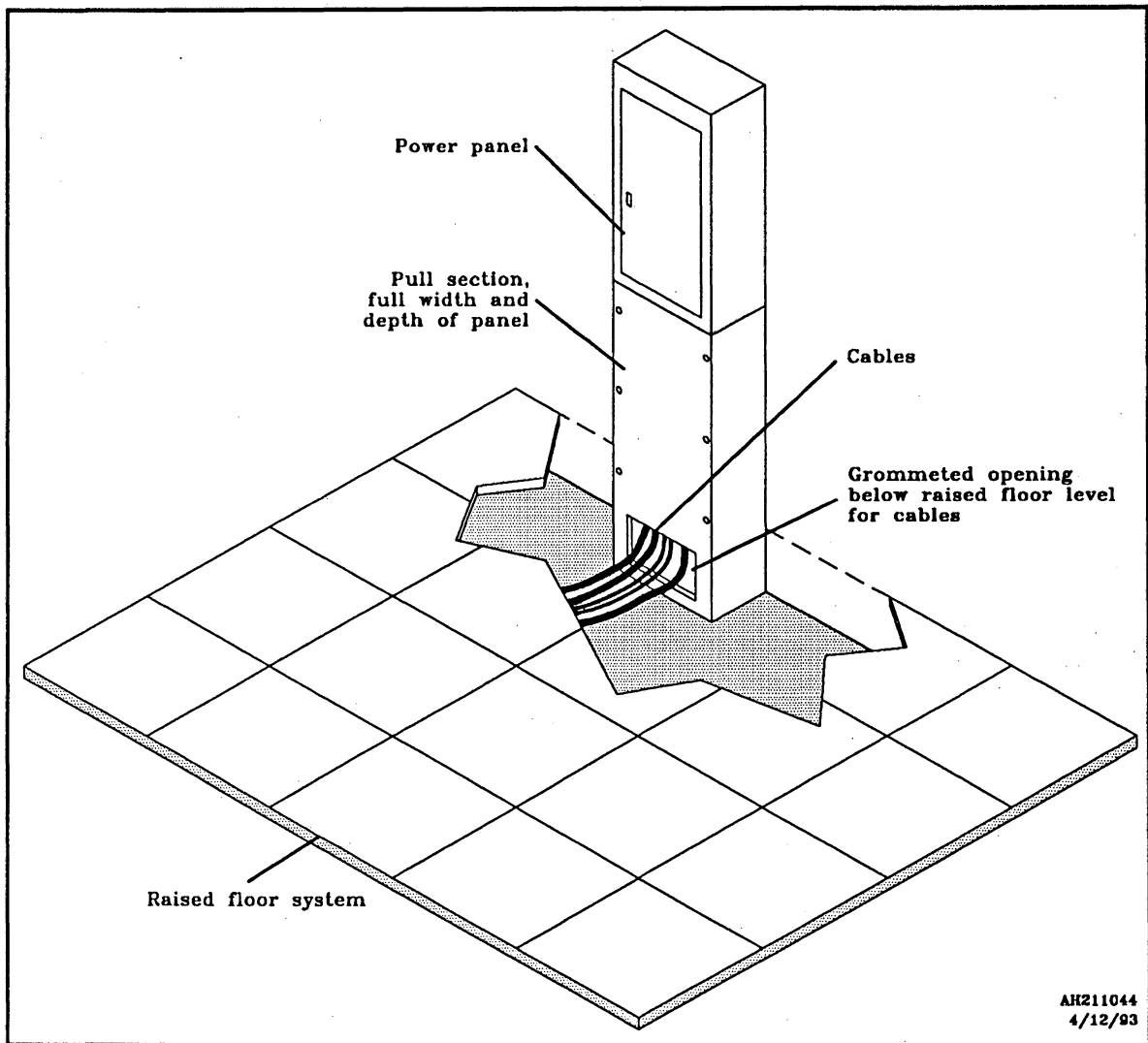
All building feeders and branch circuitry should be in rigid metallic conduit with proper connectors to provide ground continuity. Install rigid galvanized steel conduit where it is exposed and subject to damage.

Raceway systems for raised floor application

When installing a C3800 Series computer system in a room with a raised floor, route the power drops and interface cables from the CPU panel and peripheral panel as follows (see Figure 3):

- Through the panel pull section to the floor
- Through the grommet-protected opening under the floor
- Under the floor panels to the load

Figure 3 Power panel detail (raised floor)



Note

CONVEX discourages installing a C3800 Series computer system in a computer room without a raised floor, due to the difficulty of providing adequate electrical grounding, cable routing, and cooling.

Raceway systems for nonraised floor application

A cable trough is required when installing a C3800 Series computer system in a room without a raised floor. Route the power drops and interface cables from the CPU panel and peripheral panel down through the panel pull section, out through a grommet-protected opening, and into the cable trough (Figure 4).

The cable trough connects to the bottom of the power panel. It should be large enough to hold all cables and receptacles for the power drops that come from the CPU and peripheral power panels, and the power cables and plugs that come from the peripheral cabinet(s) and the outer bay cabinets in the C3800 main system complex.

While the length of the cable trough may vary from one site to the next, the width and height must be within the following ranges:

- Width
 - Minimum inside dimension 17.0 inches (43.2 cm)
 - Maximum outside dimension 25.0 inches (63.5 cm)
- Height
 - Minimum inside dimension 6.0 inches (15.3 cm)
 - Maximum outside dimension 7.12 inches (18.0 cm)
(includes cable trough cover)

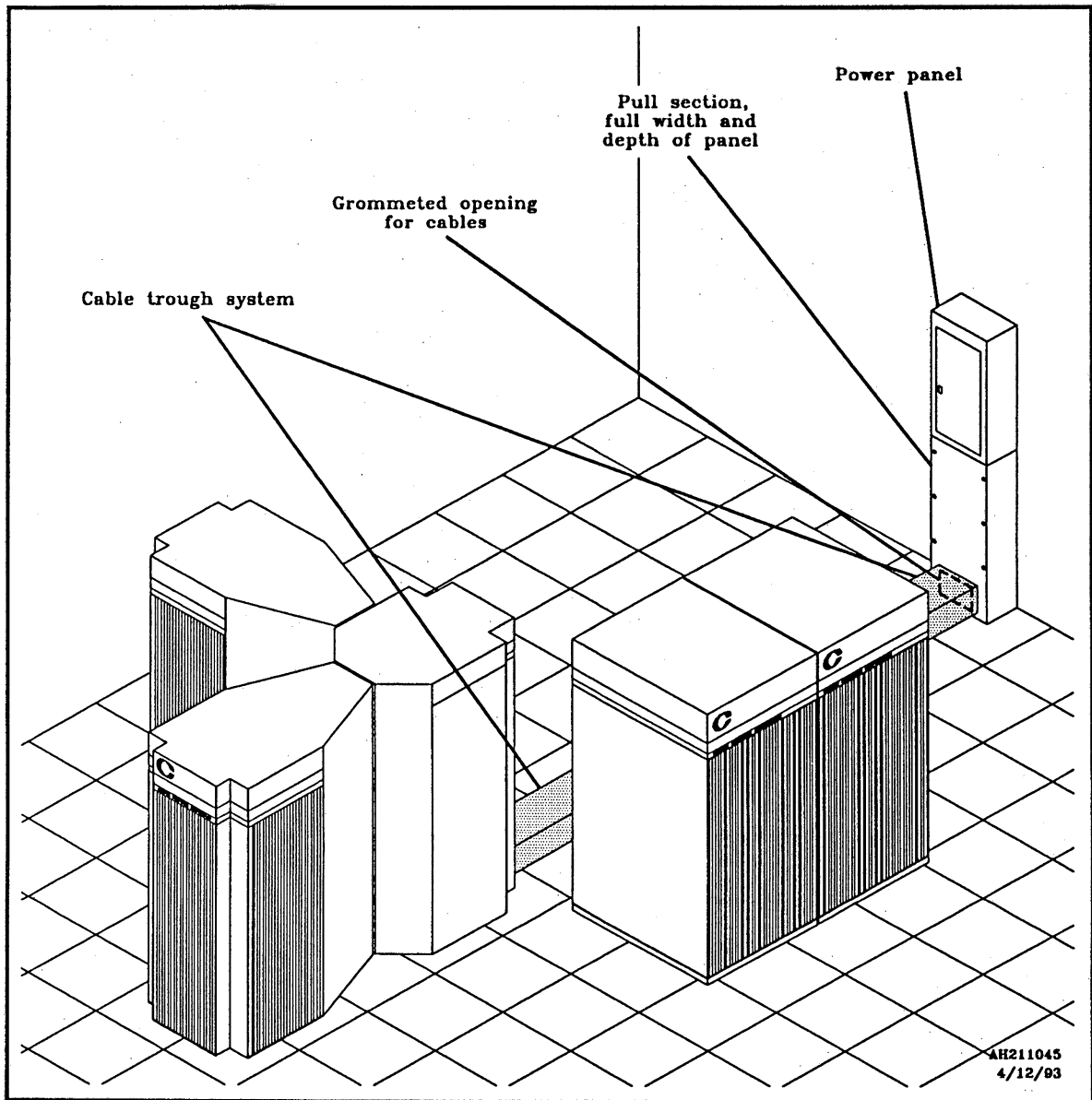
Notes

The cable trough must be recognized by safety agencies as a ground conductor.

The cable trough cover must be capable of supporting the weight of a person.

Figure 4 illustrates a nonraised floor installation.

Figure 4 Power panel detail (nonraised floor)



Grounding systems

C3800 Series computers require two systems of grounding:

- Power distribution safety grounding
- High frequency intercabinet grounding

The following text describes power distribution safety grounding. Refer to the *CONVEX Computers Site Preparation Guide (C3800 Series)*, Order No. DHW-211, for details on high frequency intercabinet grounding.

Power distribution safety grounding

The power distribution safety grounding system consists of connecting various points in the power distribution system back to earth ground using green (green/yellow) wire ground conductors. Having these ground connections tied to metal chassis parts that may be touched by computer room personnel, protects against shock hazard from current leakage and fault conditions.

The C3800 power distribution consists of several parts. Interconnect these parts solidly to provide an equipotential ground to all points. If this level of interconnection is not possible, locally connect the electrical service panel, the main system complex isolation transformer, CPU power panel, and peripheral power panel to solid earth ground.

Main building electrical ground

Connect the main electrical service entrance equipment to an earth ground, as required by applicable codes. Suitable ground connections include a grounding rod, building steel, or a cold water service pipe.

Electrical conduit ground

Provide a continuous grounding system throughout the power installation by using a rigid metallic conduit securely connected or bonded to panels and electrical boxes.

Power panels and isolation transformer ground

Ground each power panel and the isolation transformer to the electrical service entrance with green (green/yellow) wire ground conductors. Choose the size of the wire ground conductors according to applicable codes, based on circuit overcurrent device ratings.

Verifying ground impedance

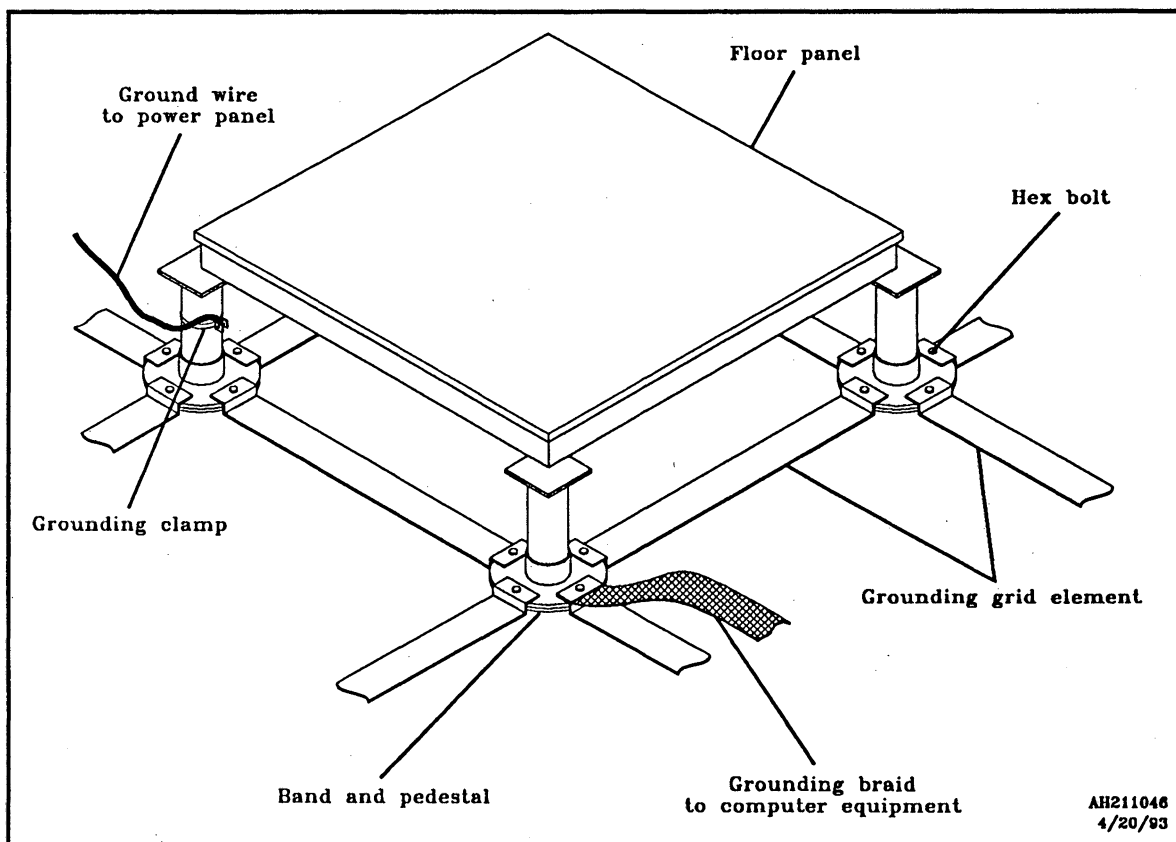
Local codes define requirements and standards for measuring impedance between power distribution system safety ground and actual earth ground. CONVEX offers the following electrical service grounding guidelines to ensure that the installed equipment operates properly. Refer to the *CONVEX Site Preparation Guide (C3800 Series)*, Order No. DHW-211, for details on computer cabinet grounding.

Raised floor installations

If you use a raised floor system and signal grounding grid, connect the grounding grid to the power cabinet and electrical service entrance ground at multiple points via minimum #6 AWG (16 mm²) wire ground conductor. Connection points should be free of paint or other insulating material. Treat connection points with a contact enhancement compound similar to Burndy Penetrox.

Figure 5 illustrates a raised floor ground system.

Figure 5 Raised floor ground system



Note

CONVEX discourages installing a C3800 Series computer system in a computer room without a raised floor, due to the difficulty of providing adequate electrical grounding, cable routing, and cooling.

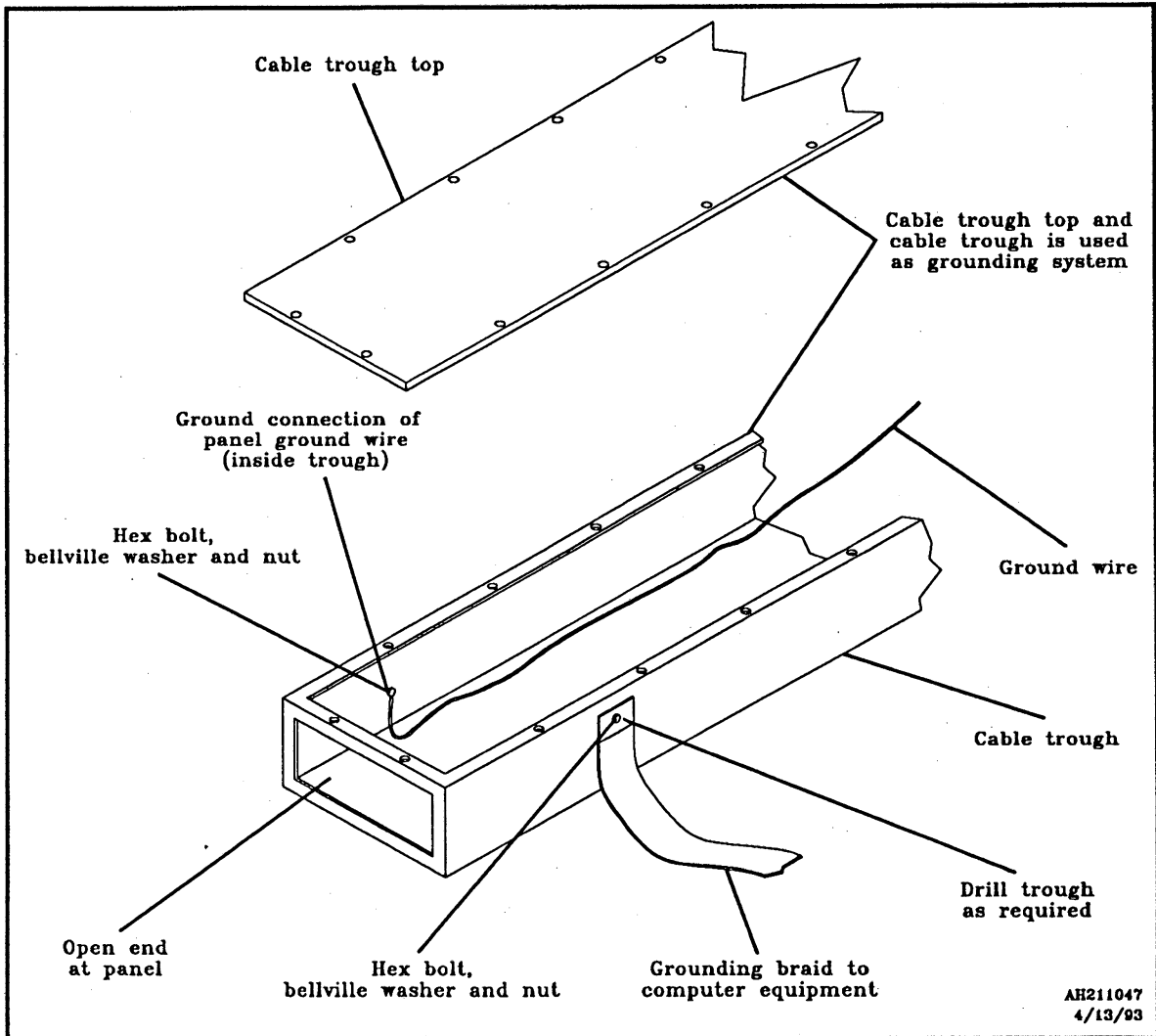
Nonraised floor installations

When the computer room does not have a raised floor, route equipment power cables and intercabinet communication cables from the central cabinet of the main system complex to the peripheral cabinets, external peripherals, and power drops through a customer-supplied cable trough assembly.

Connect the cable trough to the electrical service entrance ground at multiple connection points via a minimum #6 AWG (16 mm²) wire ground conductor (Figure 6). Connection points should be free of paint or other insulating material. Treat connection points with a contact enhancement compound similar to Burndy Penetrox.

Figure 6 illustrates a cable trough ground system.

Figure 6 Cable trough ground system



Installation guidelines

This section contains information about installation practices, and highlights some of the more common pitfalls.

Note

In domestic installations, the proper receptacles should be installed prior to the arrival of CONVEX equipment. Refer to the *CONVEX Computers Site Preparation Guide (C3800 Series)*, Order No. DHW-211, for installation procedures.

Wiring connections

Expansion and contraction rates vary among different metals. Therefore, the integrity of an electrical connection depends on the restraining force applied. Connections that are too tight compress or deform the hardware and cause it to weaken. This can lead to a short circuit that causes circuit breakers to trip.

Loose connections have high resistance that can cause serious problems such as erratic equipment operation. A high resistance connection can overheat and cause fire or destroy hard-to-replace components such as distribution panels or system bus bars.

Torque all wiring connections according to equipment manufacturers' specifications. Most equipment manufacturers mark the proper connection torque values on their hardware.

Make all ground connections on conductive, nonpainted surfaces. Use lockwashers on all connections where equipment vibration is present, to prevent connection hardware from working loose.

Wiring for power conditioning equipment

When power conditioning equipment is used, route its sense wires well away from main power conductors and electrical devices that might produce stray coupling between circuits. Stray coupling could interfere with power conditioning sense circuits, thus nullifying their benefits.

Installing your power source

2

This chapter provides guidelines for preparing the site. Careful site planning and preparation ensures trouble-free installation and reliable operation of the C3800 Series computer system. Specialized skills are required for the proper design and installation of the power source. Those responsible for this task must have a thorough knowledge and understanding of appropriate electrical codes and the limitations of power sources.

In general, a well designed power source and distribution system exceeds the requirements of most electrical codes. A good design, when coupled with proper installation procedures, produces the most trouble-free operation.

Service entrance panel

Choose the service entrance panel size to accommodate the C3800 Series current and potential upgrade power requirements, in addition to other building power requirements.

A locally licensed electrician should install your service entrance panel. This panel need not be in the computer room. It supplies three-phase power to both your computer and your peripheral equipment, through separate circuits. It may also supply power to other computer room devices. The input power and all output power drops should have overcurrent protection.

Isolation transformer

CONVEX offers two optional isolation transformer kits for different power sources.

The kit for 200/208/380/415 Vac power contains:

- CONVEX *Dedicated Power System (C3800Series)*, Order No. DHW-213
- Five power connectors with 1.5-in. conduit adapters, IEC 309 connector no. 5100C9, CONVEX Part No. 500-000517-200/201
- Isolation transformer, 200/208/380/415 Vac, Part no. 200-000115-003
- Tool kit, Part no. 902-000067-001

The kit for 480 Vac power contains:

- CONVEX *Dedicated Power System (C3800Series)*, Order No. DHW-213
- Five power connectors with 1.5-in. conduit adapters, IEC 309 connector no. 5100C9, CONVEX Part No. 500-000517-200/201
- Isolation transformer, 480 Vac, Part no. 200-000115-004

Figure 7 illustrates the isolation transformer for the computer. Figure 8 and Figure 9 are schematics of the multivoltage transformer and the 480 Vac transformer, respectively.

The isolation transformer should be in place before installing the computer. CONVEX typically ships the transformer in advance of the computer so that you can install it before the computer arrives. Base the location and installation of the transformer on the parameters in the next sections.

Dimensions

The transformer enclosure dimensions are:

- Length 36 in (914 mm)
- Width 24 in (610 mm)
- Height with casters 46.56 in (1183 mm)
- Height without casters 42.25 in (1074 mm)

Transformer unit gross weight is:

- 200/208/380/415 Vac transformer, 1150 lbs (521.6 kg)
- 480 Vac transformer, 975 lbs (442.2 kg)

Figure 7 Computer isolation transformer

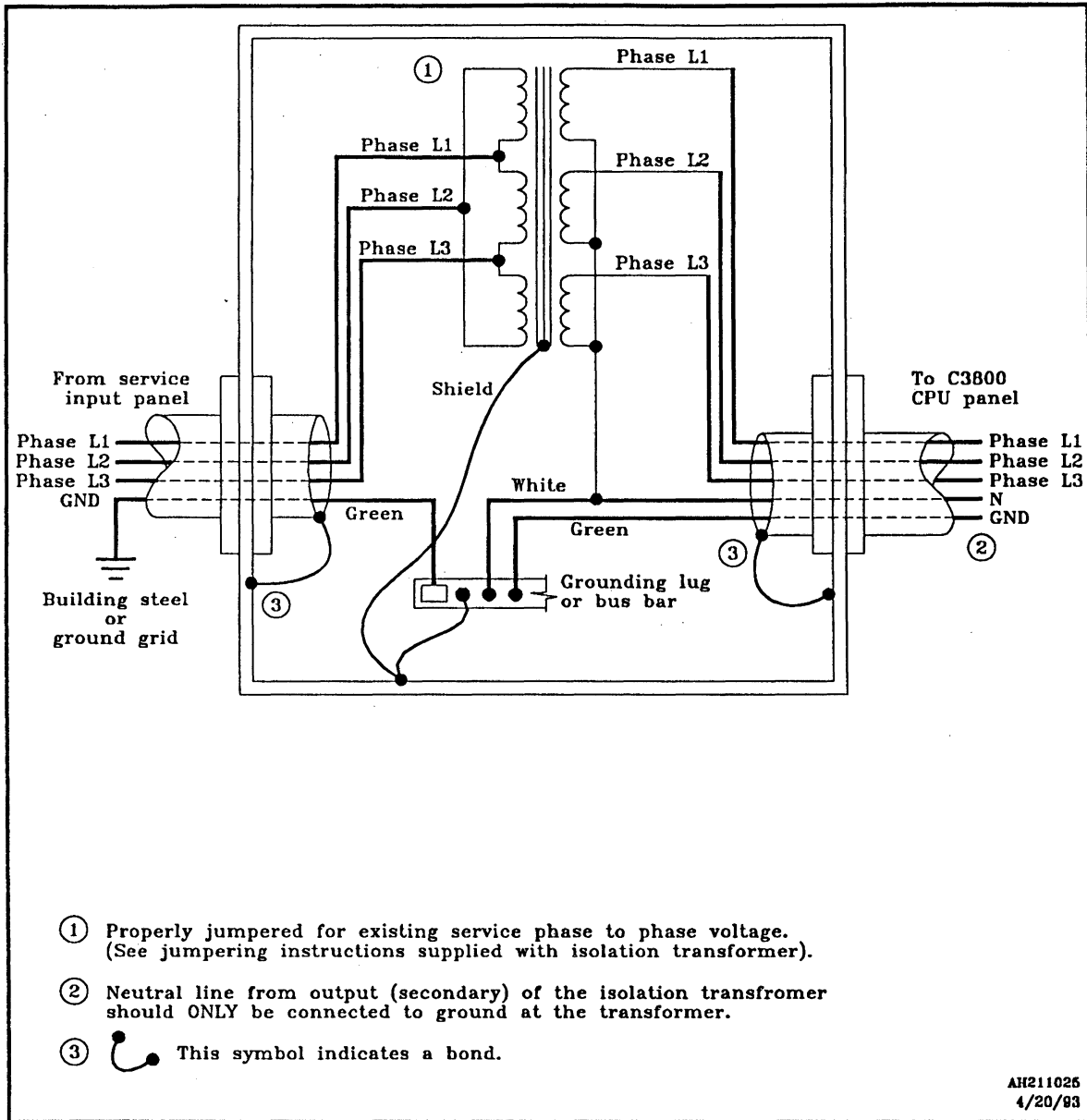


Figure 8 Multivoltage isolation transformer schematic

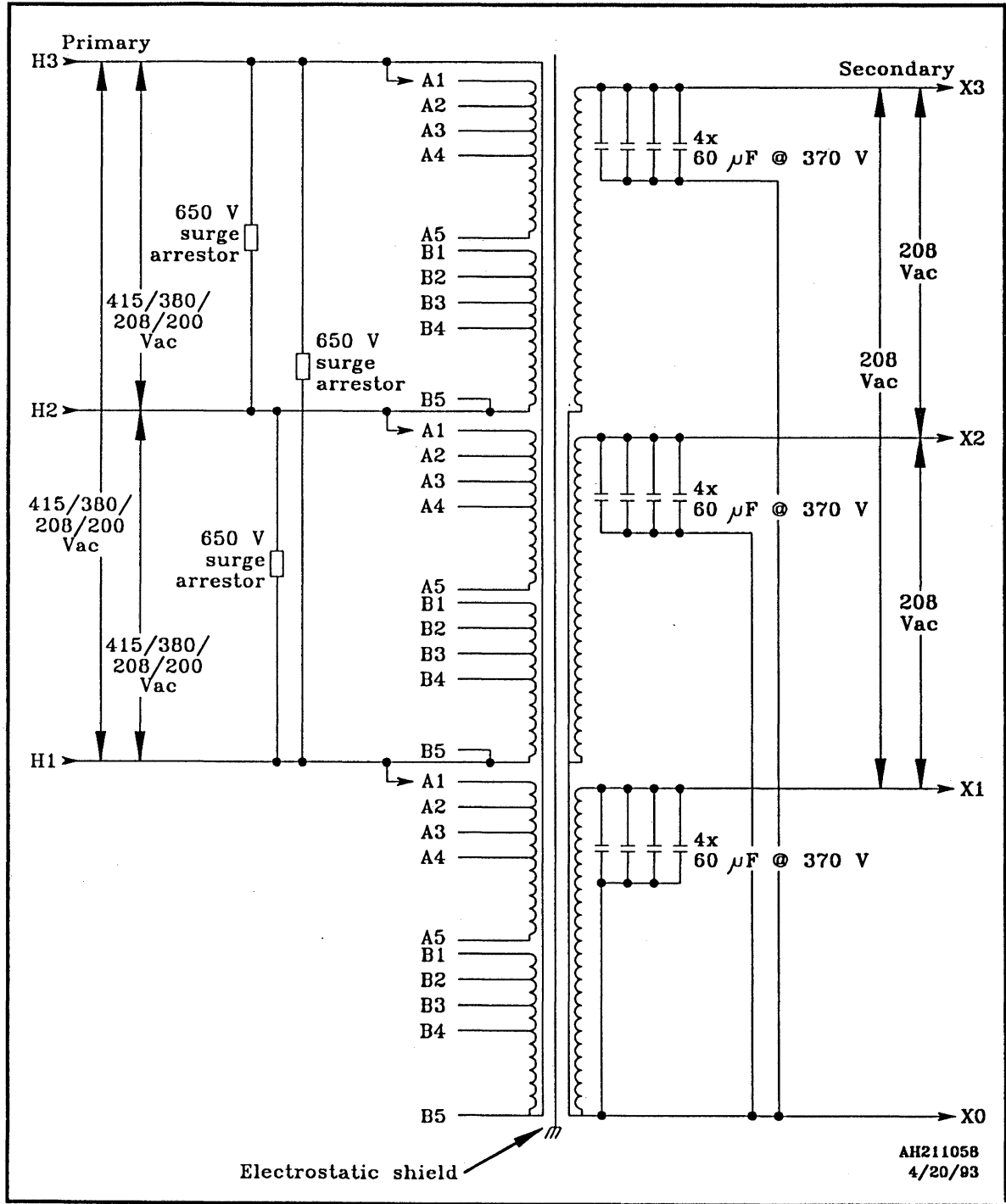
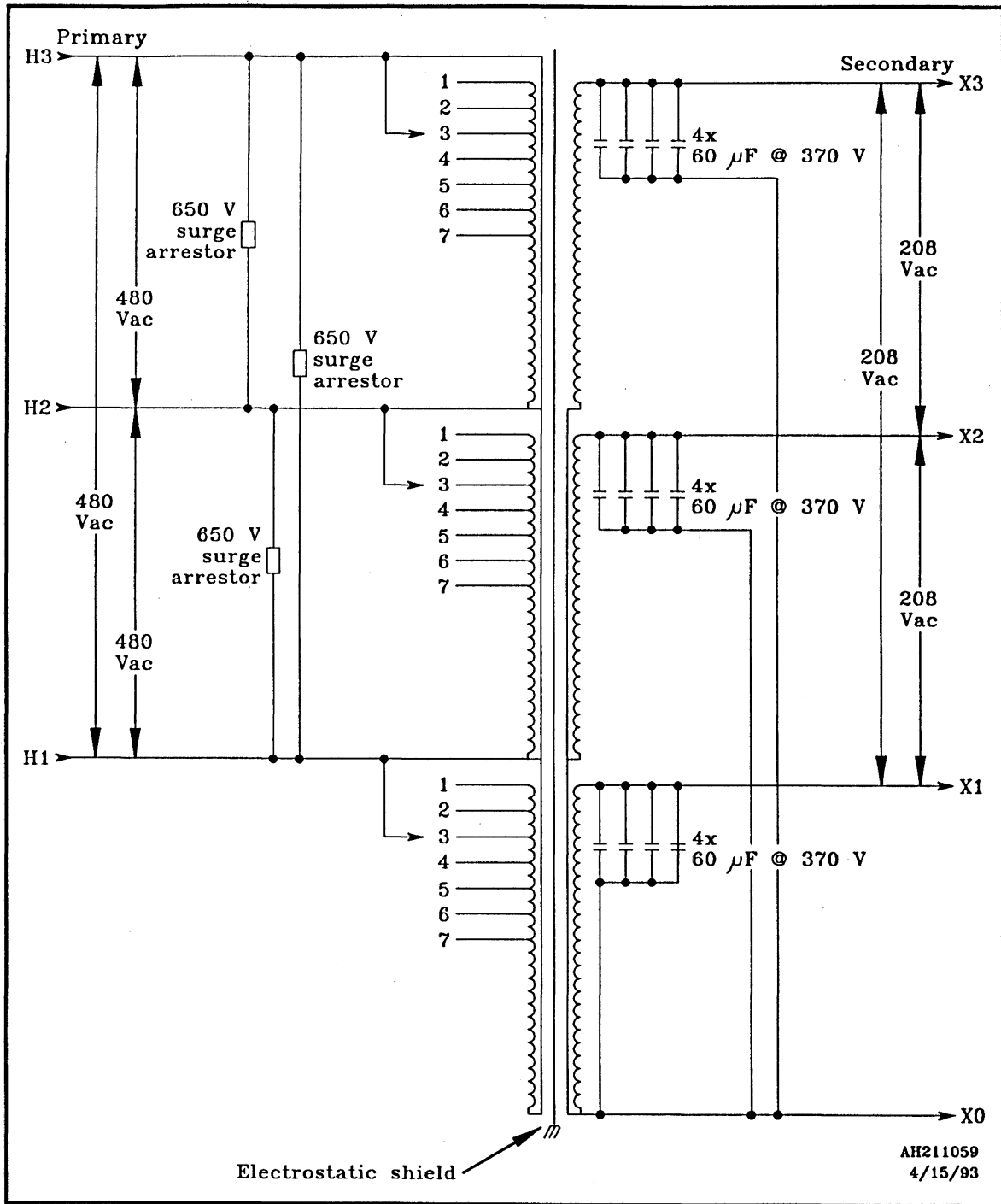


Figure 9 480 Vac isolation transformer schematic



Clearances

The isolation transformer requires a total floor space of 914 mm (36 in.) by 1.219 m (48 in.) for service clearance, plus sufficient clearance for installation of power cabling and access to transformer jumper lugs. Figure 10 illustrates the required floor space. Appendix B provides scale copies of the floor-plan grid and isolation transformer footprint.

You may either remove the casters or lock them in place.

Power cable length

Locate the isolation transformer as close as possible to the outer bay cabinets of the C3800 computer to minimize line losses and grounding problems. Maximum total power cable length between the isolation transformer and the computer outer bay cabinets is 30.5 meters (100 feet). Figure 11 illustrates the maximum power cable length, which includes the following cabling:

- The cable from the isolation transformer output to the CPU power panel (cable length A on Figure 11)
- The length of the CPU power panel outer bay cabinet power drops (cable length B on Figure 11)
- The length of the outer bay cabinet power cables (cable length C on Figure 11, typically 4.5 M or 15 ft)

To summarize, the total of A + B + C on Figure 11 cannot exceed 30.5 M (100 ft).

Conduit access

Each end of the transformer has a paneled access area for input and output conduit. Use one of these accesses for input and the other for output. *Keep input and output separate to preserve electrical isolation.* You may use either end of the transformer for input wiring, but do not mix input and output wiring at the same end.

Remove the access area covers and punch them to the correct conduit size for the specific application and local electrical codes.

Do not bundle input and output wires together.

Figure 10 Required floor space for isolation transformer

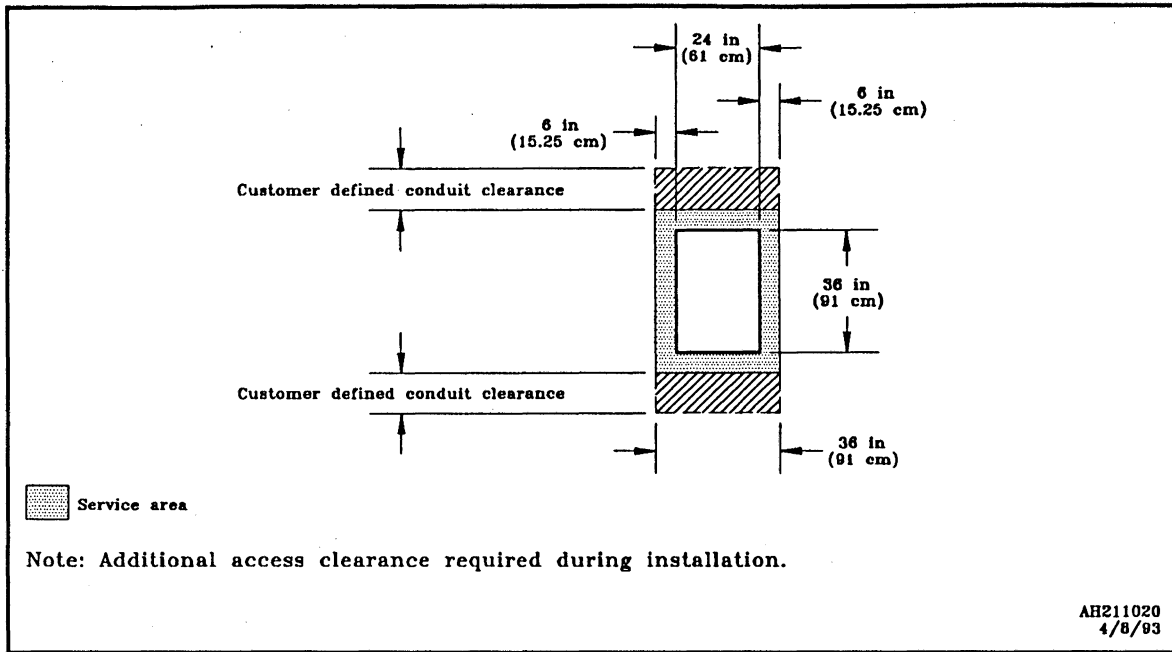
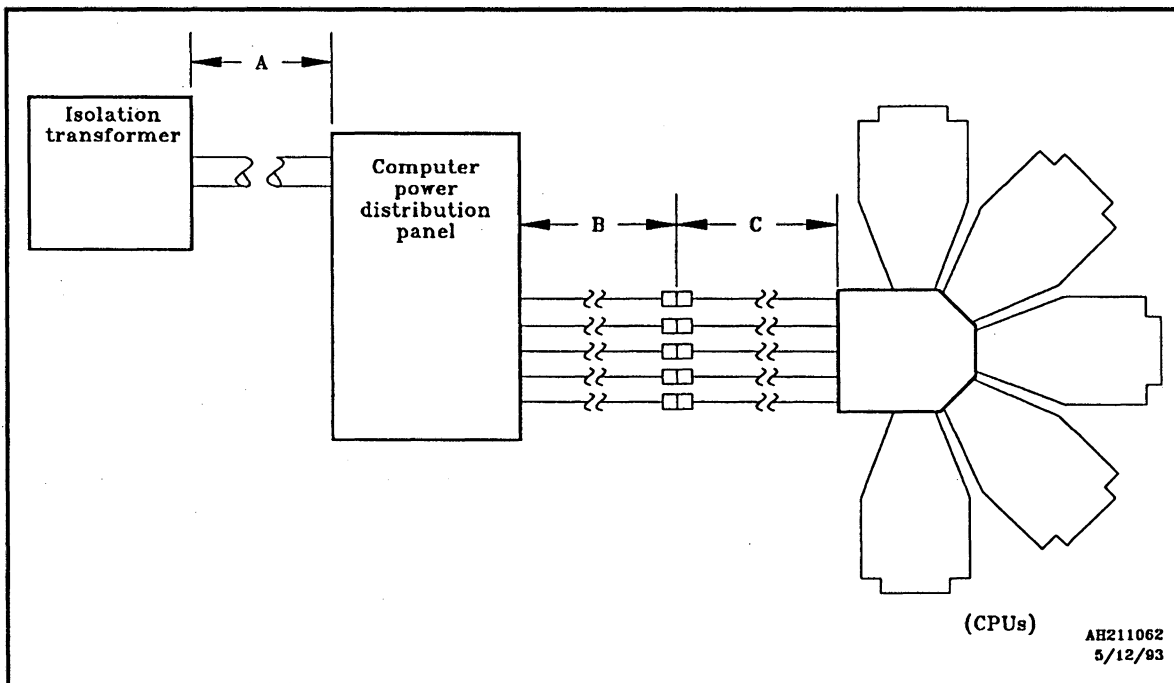


Figure 11 Cable lengths between isolation transformer and computer



Voltage selection jumpers

Figure 12 through Figure 19 are wiring diagrams for the several input voltages available on the 200/208/380/415 Vac transformer. Figure 20 through Figure 26 are the wiring diagrams for the 480 Vac transformer. Each transformer package has a copy of this document, *CONVEX Dedicated Power System (C3800Series)*, Document No. 081-022630, and a schematic diagram enclosed.

200/208/380/415 Vac transformers arrive from CONVEX jumpered for 415 Vac operation. Verify that all nine jumper wires are present to allow reconfiguration to any voltage. Three unused jumper wires are stored on the floor of the transformer.

480 Vac transformers arrive from CONVEX jumpered for 480 Vac nominal.

Recommended jumper hardware torque is 28.3 newton-meters (250 inch-pounds).

Wiring the transformer

Wires entering and leaving the transformer terminate to screw clamp terminals that are capable of wire ranges from 6AWG to 250MCM (thousand circular mils (16 to 125 mm²)). All connection wire should be rated at least 75 degrees Celsius. Route all wire below the connection bus mounting bar. The screw-down wire clamps require a 5/16 in. (7.9 mm) hex key. Recommended torque for the screw clamp terminals is 275 inch-pounds (31.1 newton-meters).

Take special care not to bundle the input and output wires together inside the transformer. Keep input and output separate to preserve the electrical isolation that the transformer provides.

Phase voltage balancing

If the voltages on the input phase legs vary by more than 5% from one another, use the voltage adjustment taps of the affected phase(s) on the primary side of the isolation transformer (taps A1 through A4 on Figure 12 through Figure 19, or taps 1 through 7 on Figure 20 through Figure 26) to adjust phase voltages . Use the voltage taps as shown in Table 5 or Table 6 to balance the output phase voltages to within 5% of each other .

Table 5 Voltage taps on multivoltage isolation transformer

Primary voltage on phase leg	Maximum input current	See Figure
Nominal primary voltage 208 Vac		
208	208.2	Figure 12
198	218.7	Figure 13
188	230.3	Figure 14
182	237.9	Figure 15
Nominal primary voltage 380 Vac		
416	104.1	Figure 16
396	109.3	Figure 17
376	115.2	Figure 18
364	119.0	Figure 19

Table 6 Voltage taps on 480 Vac isolation transformer

Primary voltage on phase leg	Maximum input current	Connect to tap	See Figure
504	85.9	1	Figure 20
492	88.0	2	Figure 21
480	90.2	3	Figure 22
468	92.5	4	Figure 23
456	95.0	5	Figure 24
444	97.5	6	Figure 25
432	100.2	7	Figure 26

Figure 12 Isolation transformer wiring diagram for 208 Vac input (all phases)

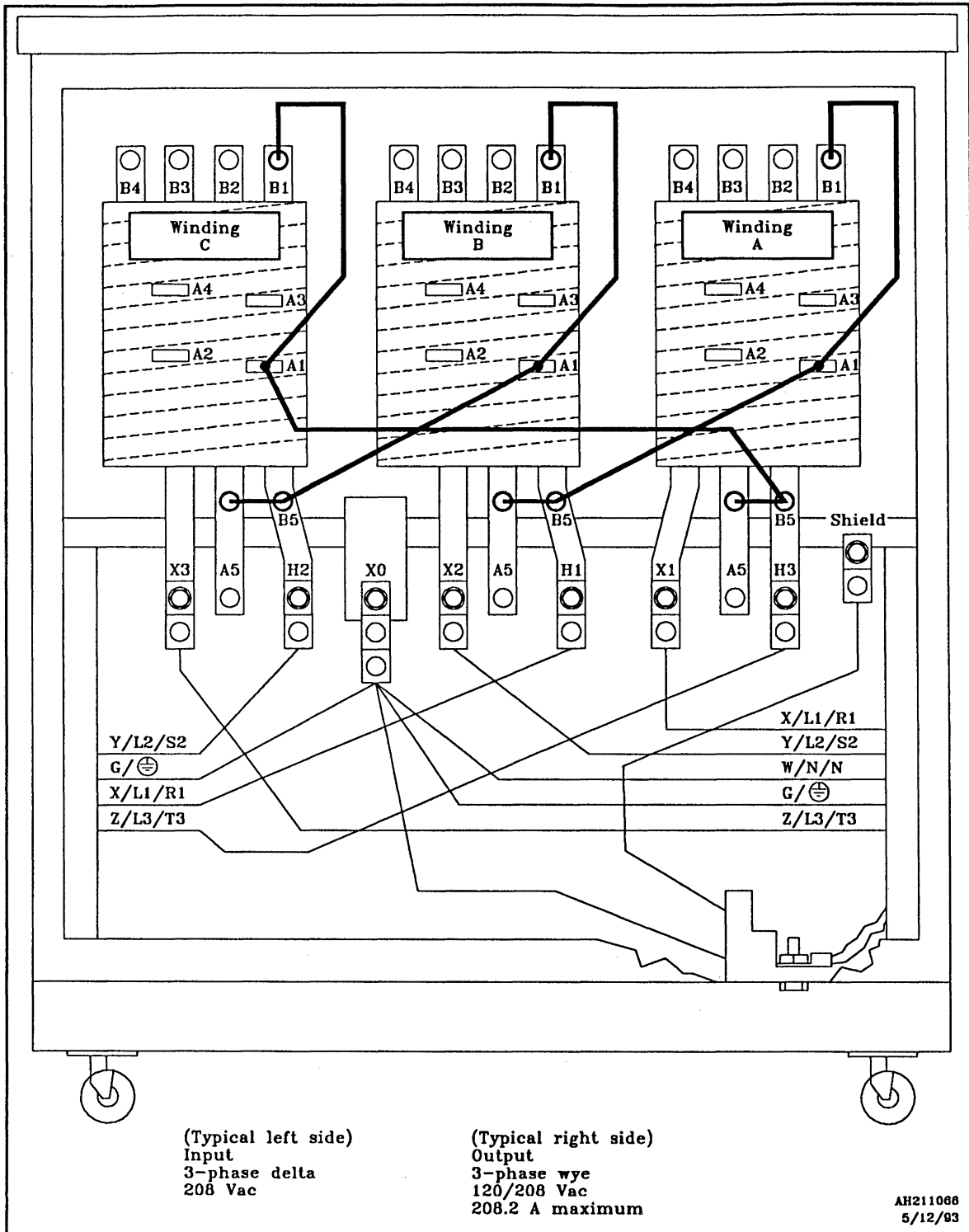


Figure 13 Isolation transformer wiring diagram for 208 Vac input (1 or more phases at 198 Vac)

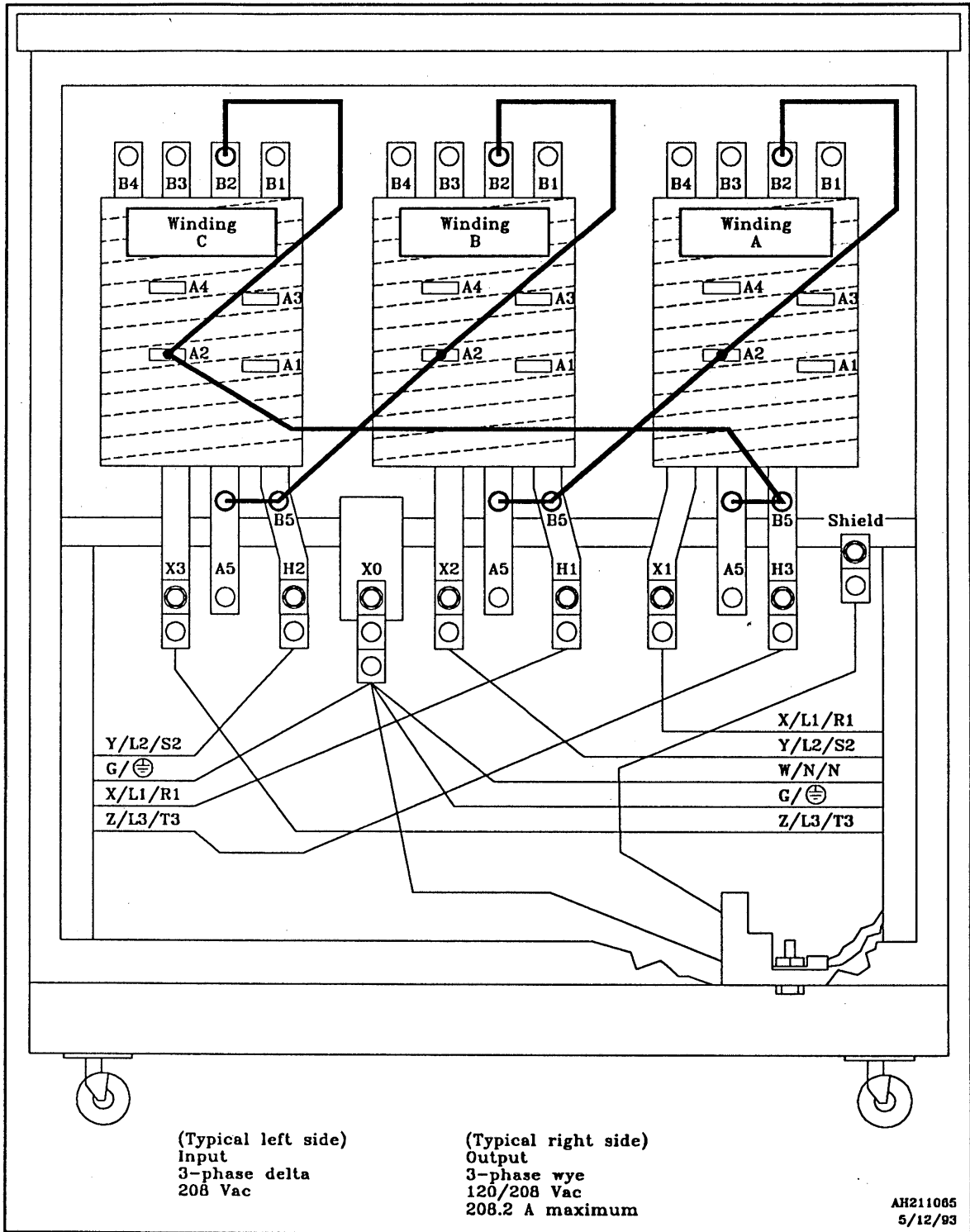


Figure 14 Isolation transformer wiring diagram for 208 Vac input (1 or more phases at 188 Vac)

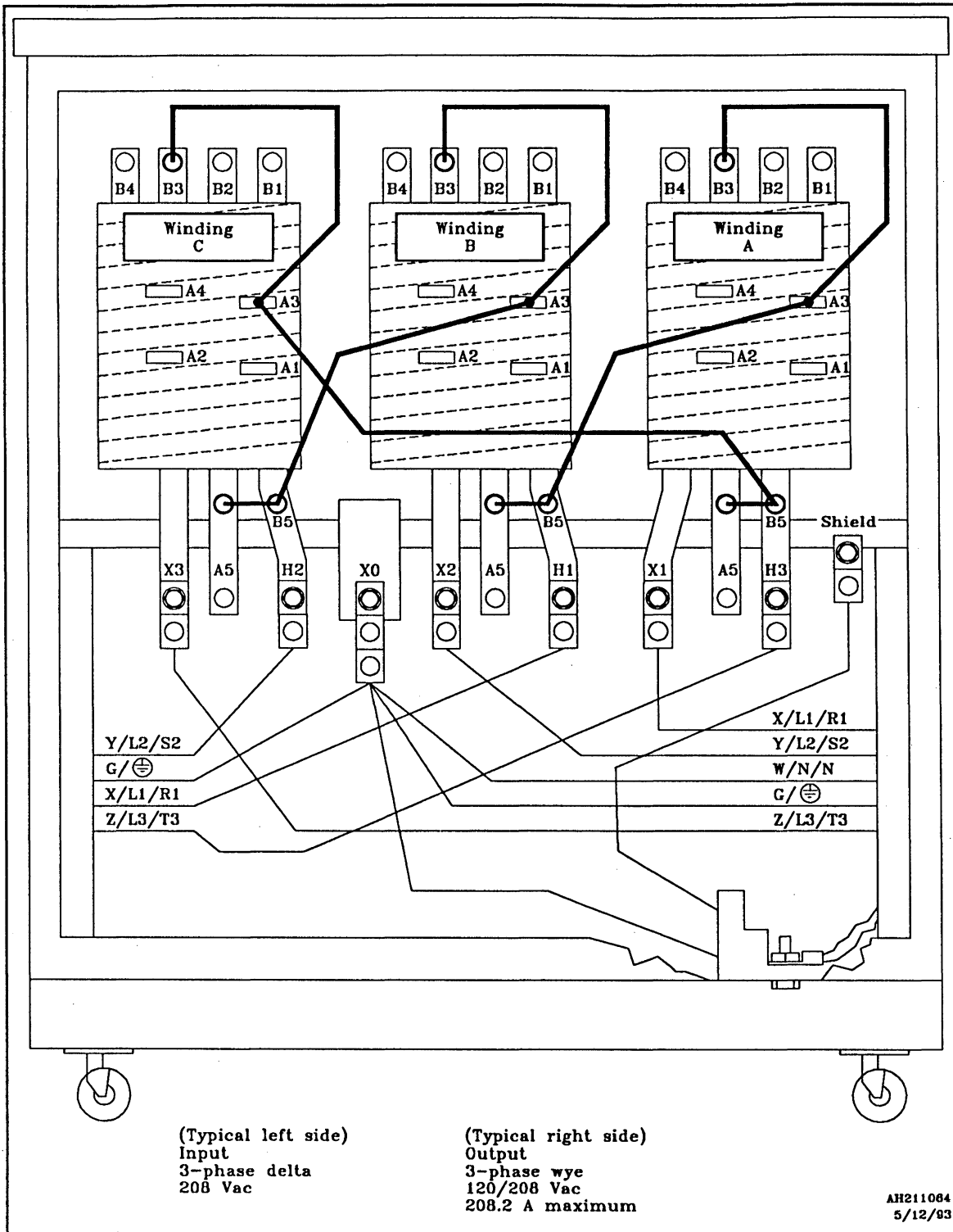


Figure 15 Isolation transformer wiring diagram for 208 Vac input (1 or more phases at 182 Vac)

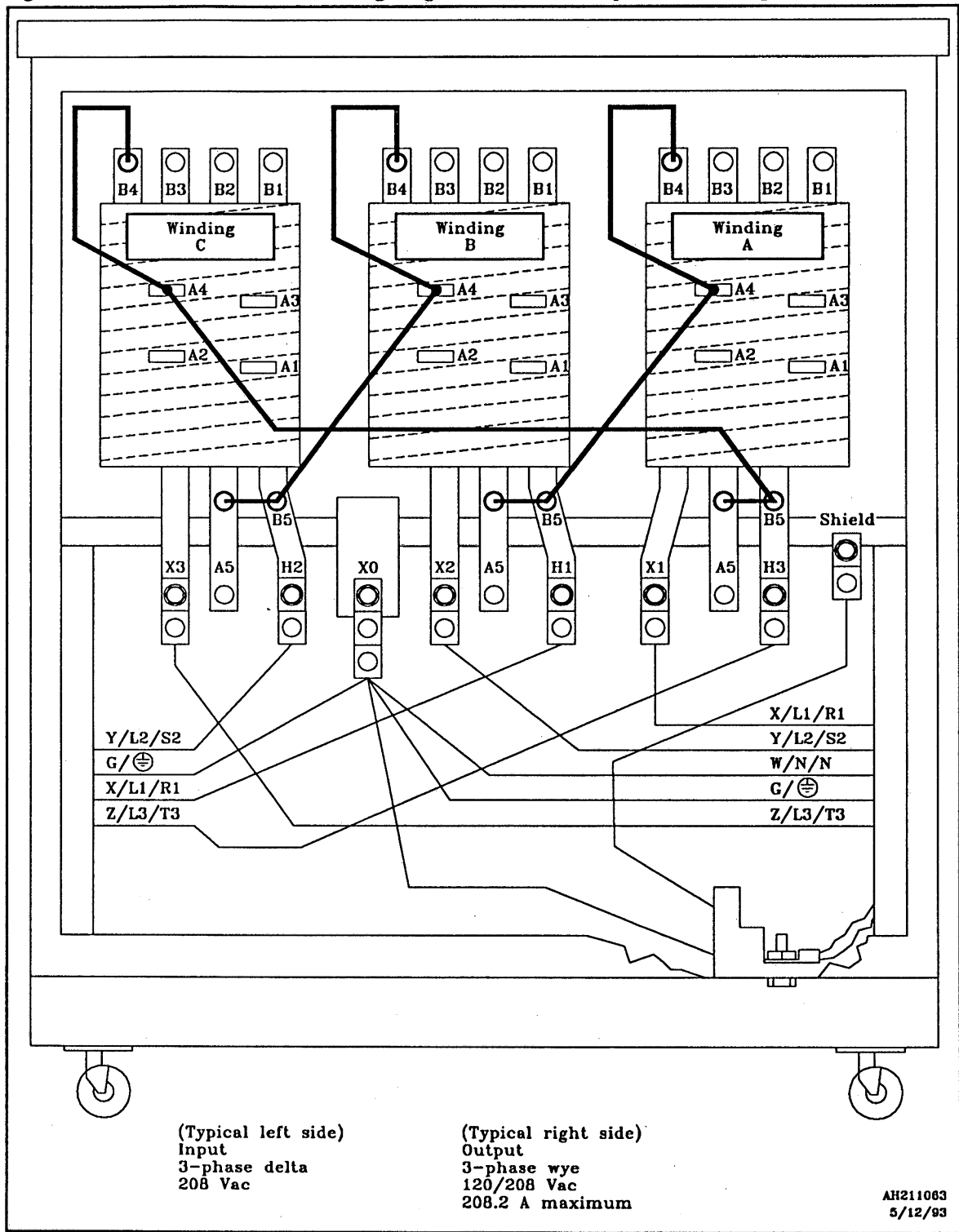


Figure 16 Isolation transformer wiring diagram for 380 Vac input (1 or more phases at 416 Vac)

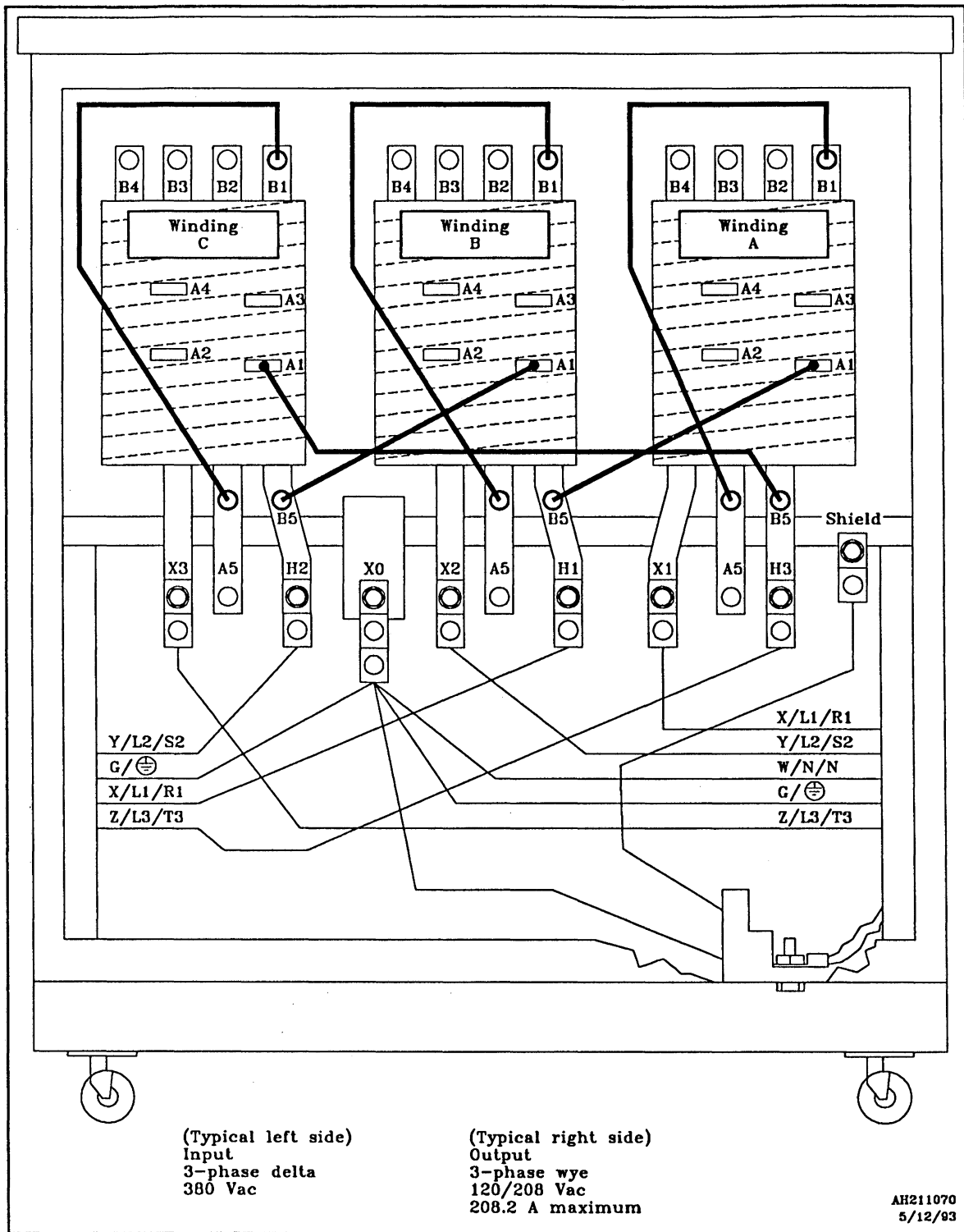


Figure 17 Isolation transformer wiring diagram for 380 Vac input (1 or more phases at 396 Vac)

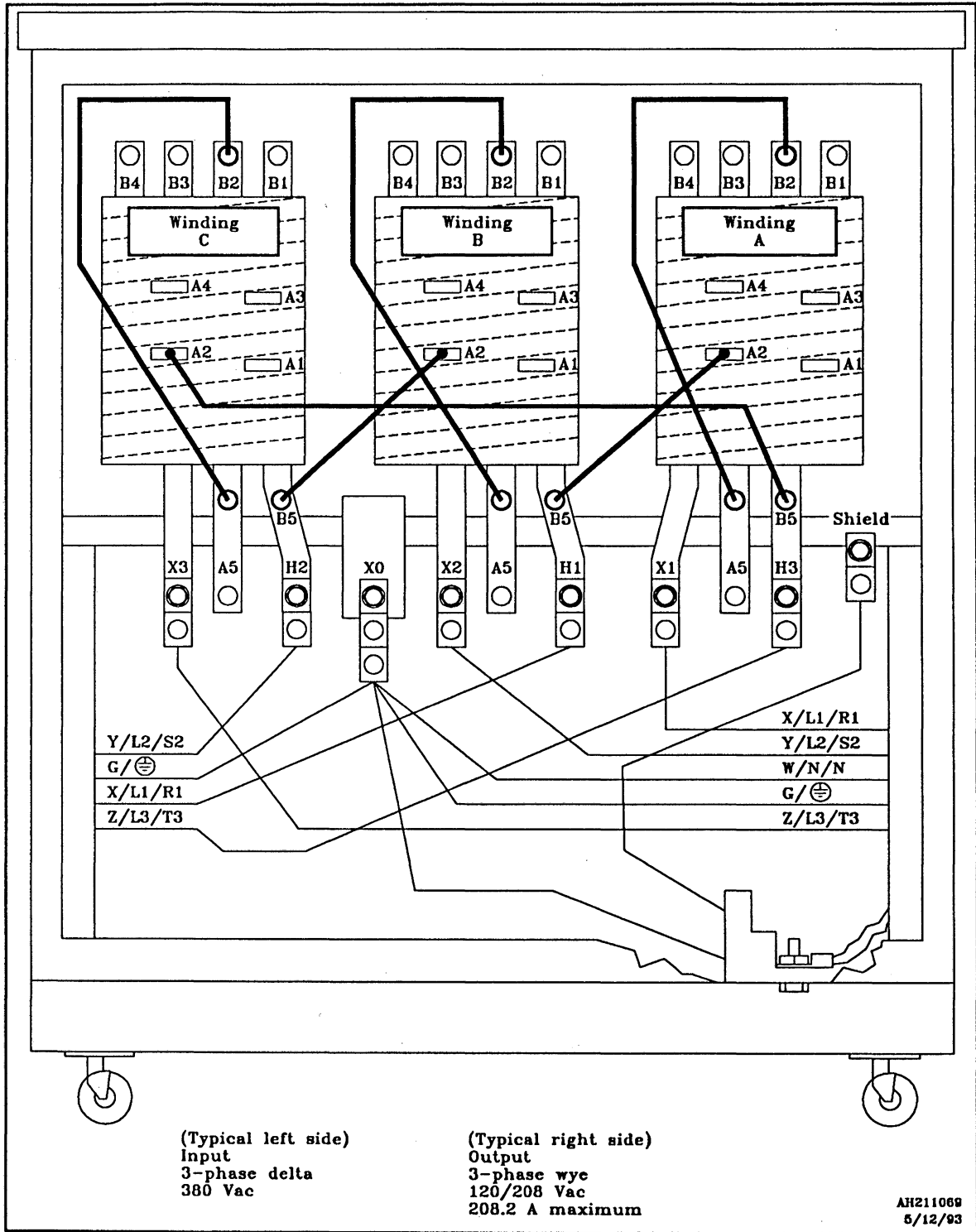


Figure 18 Isolation transformer wiring diagram for 380 Vac input (all phases)

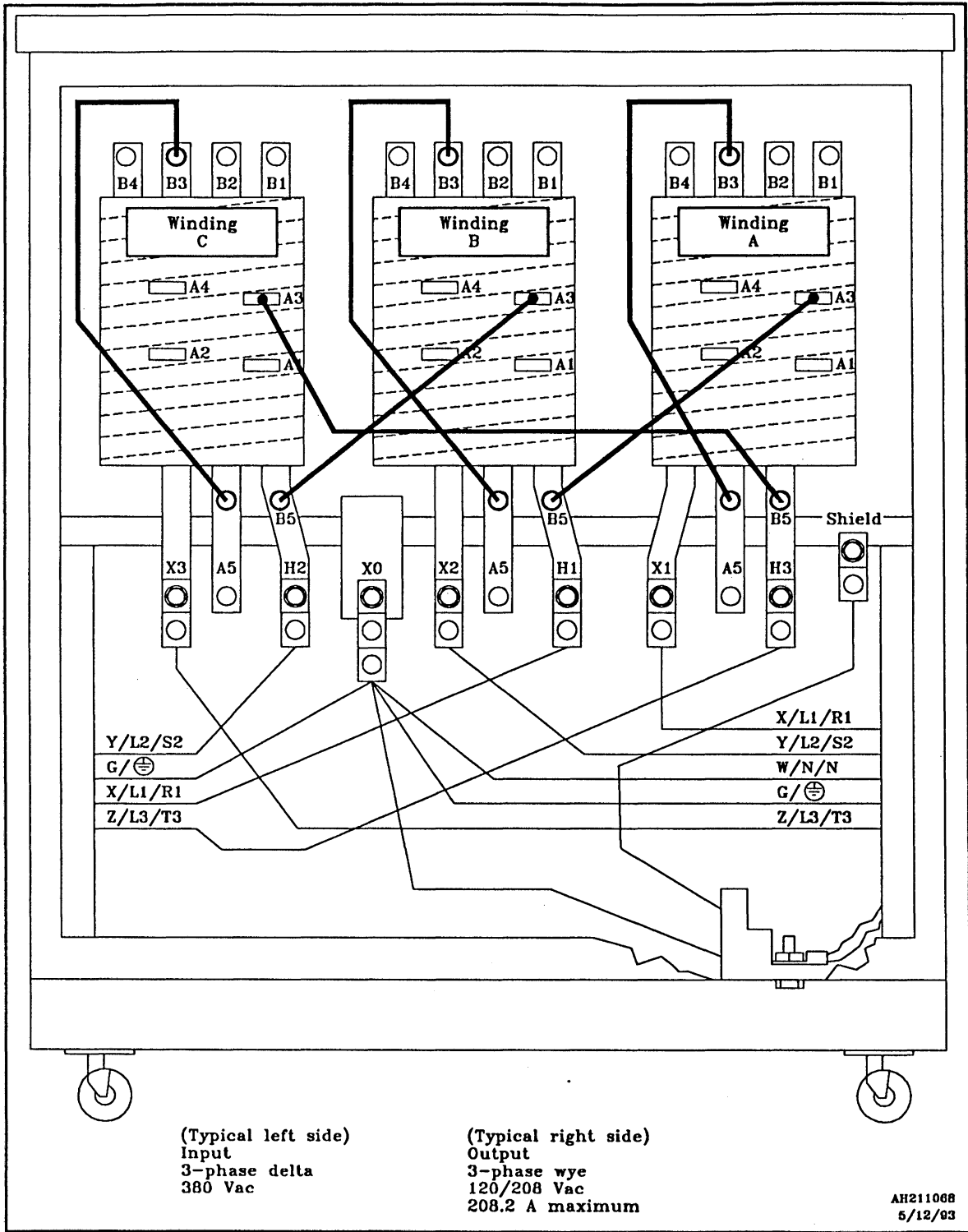


Figure 19 Isolation transformer wiring diagram for 380 Vac input (1 or more phases at 364 Vac)

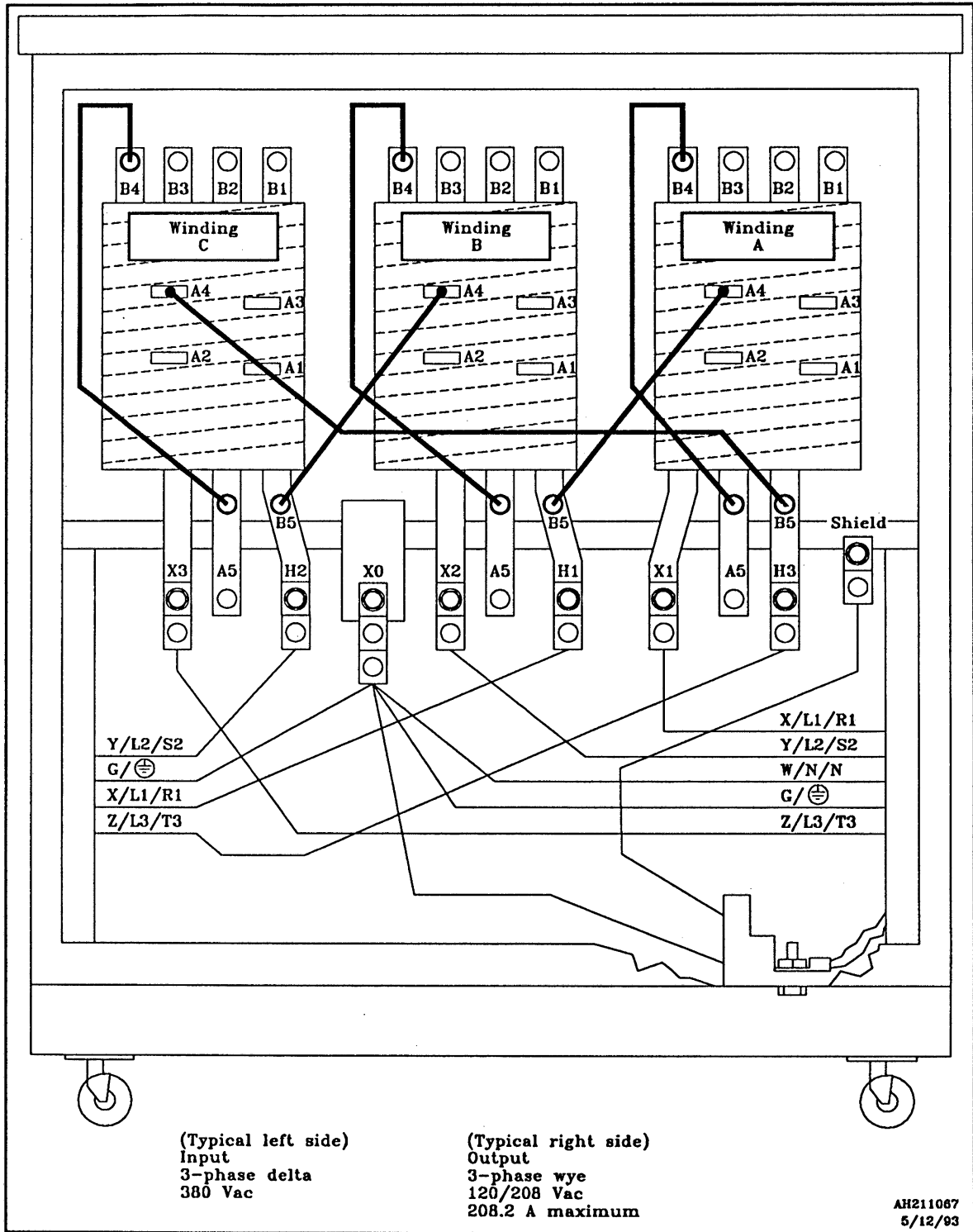


Figure 20 Isolation transformer wiring diagram for 480 Vac input (1 or more phases at 504 Vac)

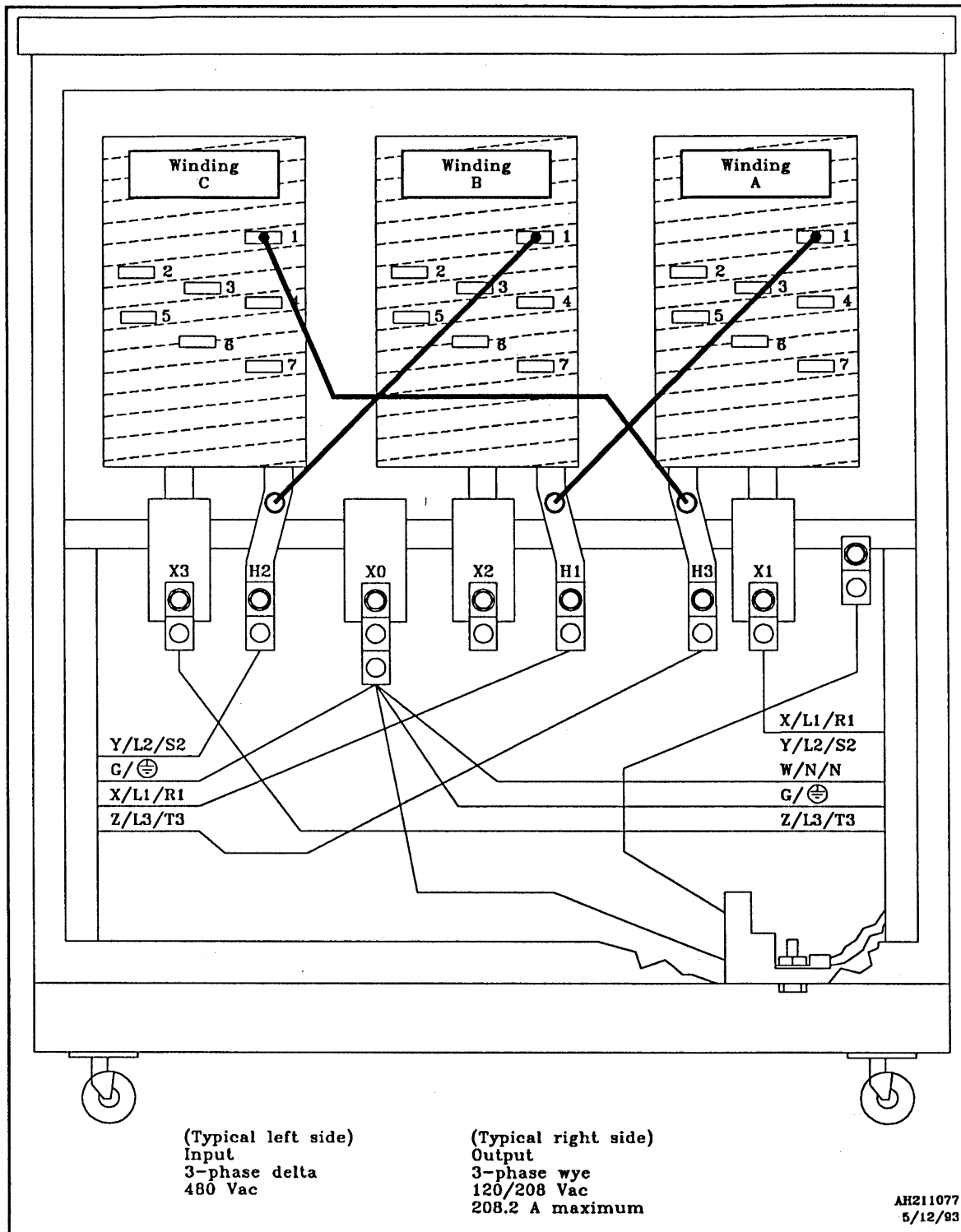


Figure 21 Isolation transformer wiring diagram for 480 Vac input (1 or more phases at 492 Vac)

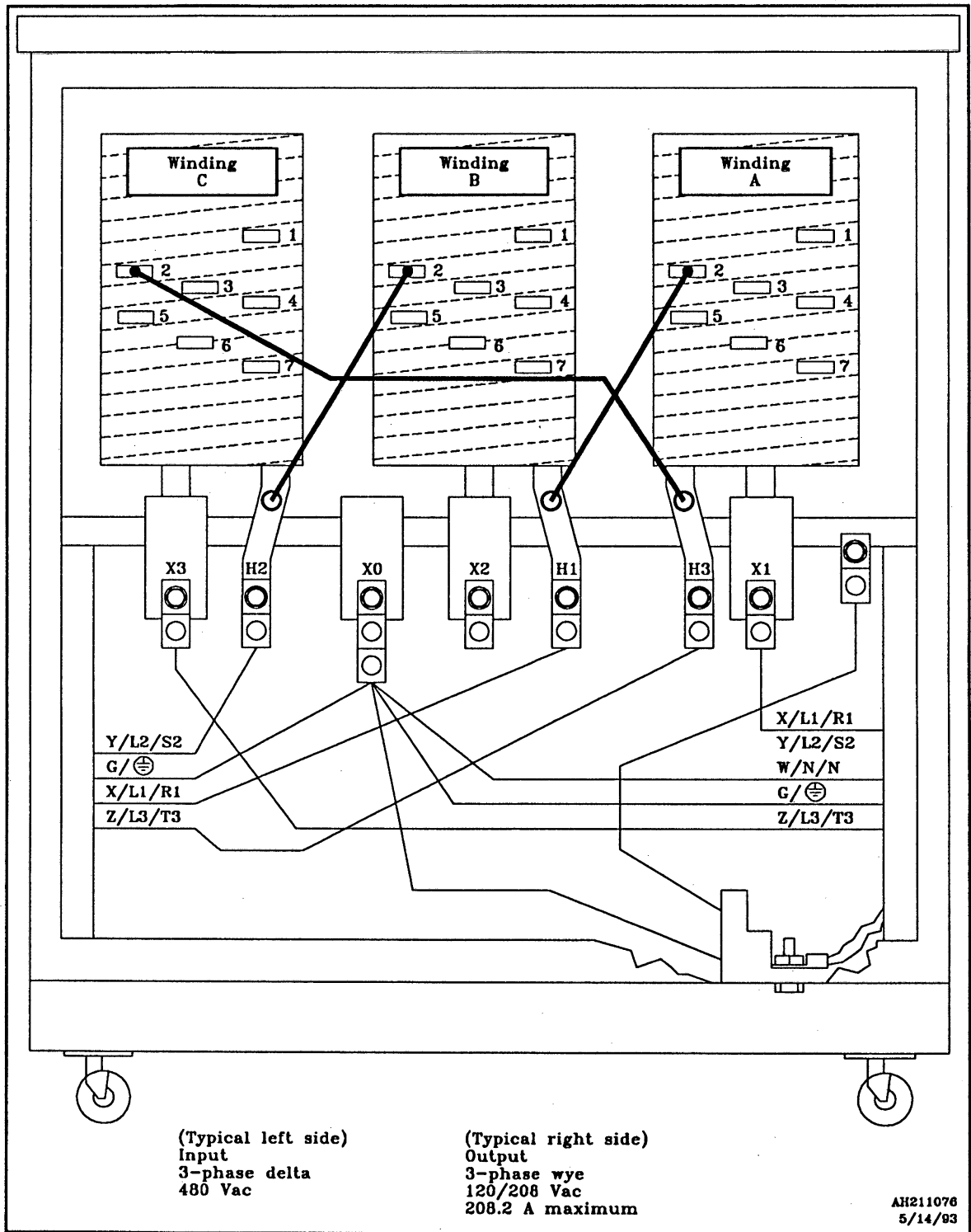


Figure 22 Isolation transformer wiring diagram for 480 Vac input (1 or more phases at 480 Vac)

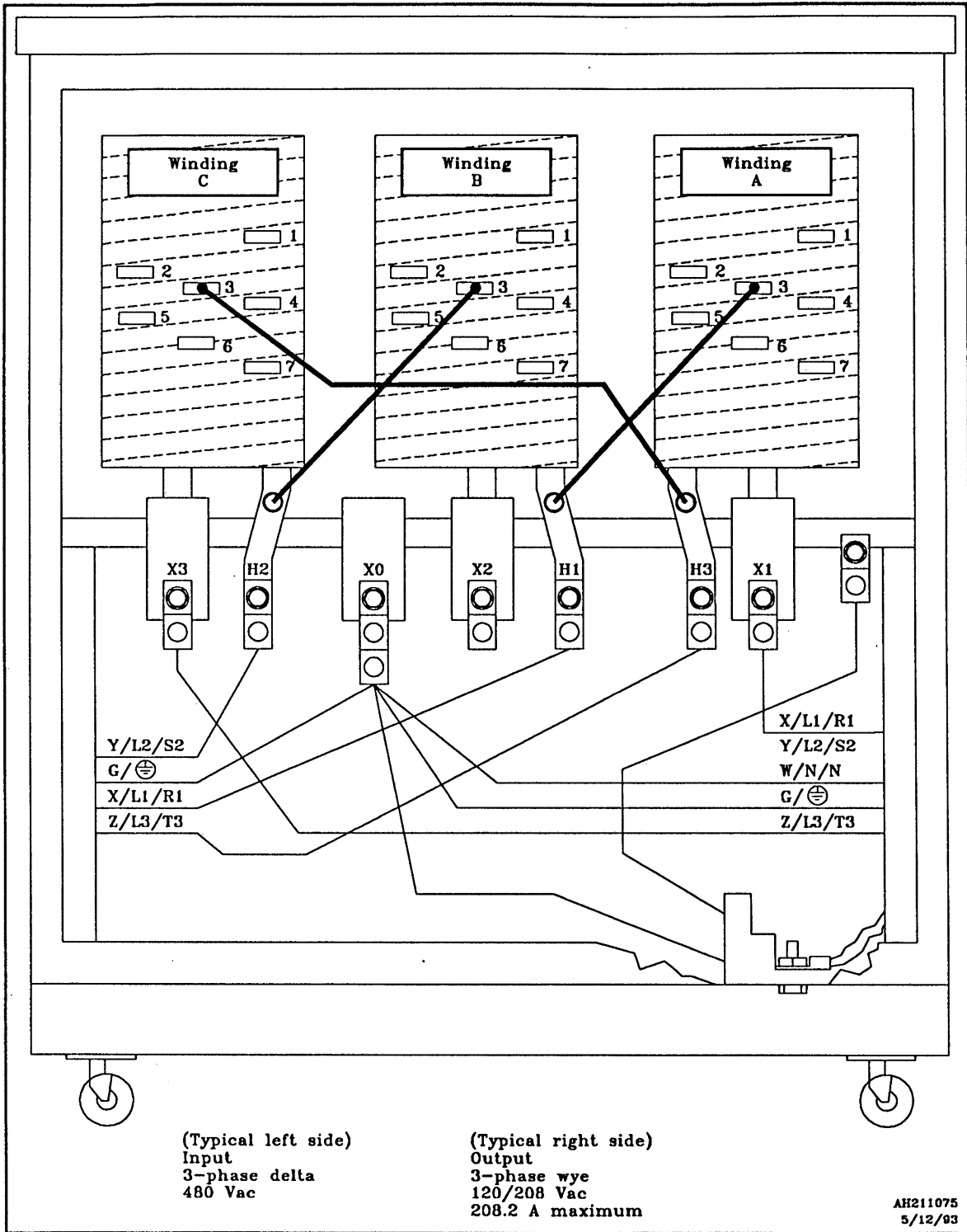


Figure 23 Isolation transformer wiring diagram for 480 Vac input (1 or more phases at 468 Vac)

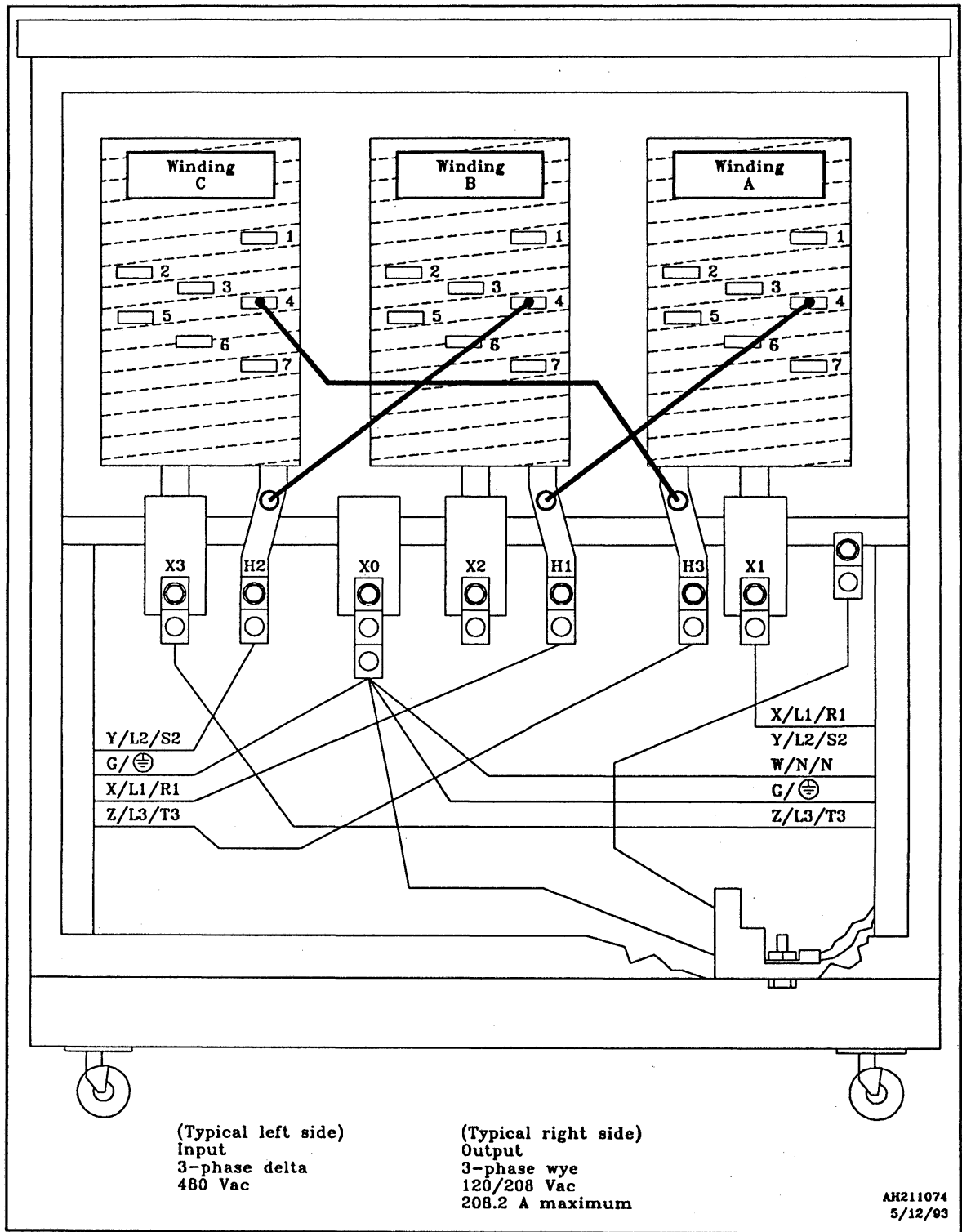


Figure 24 Isolation transformer wiring diagram for 408 Vac input (1 or more phases at 456 Vac)

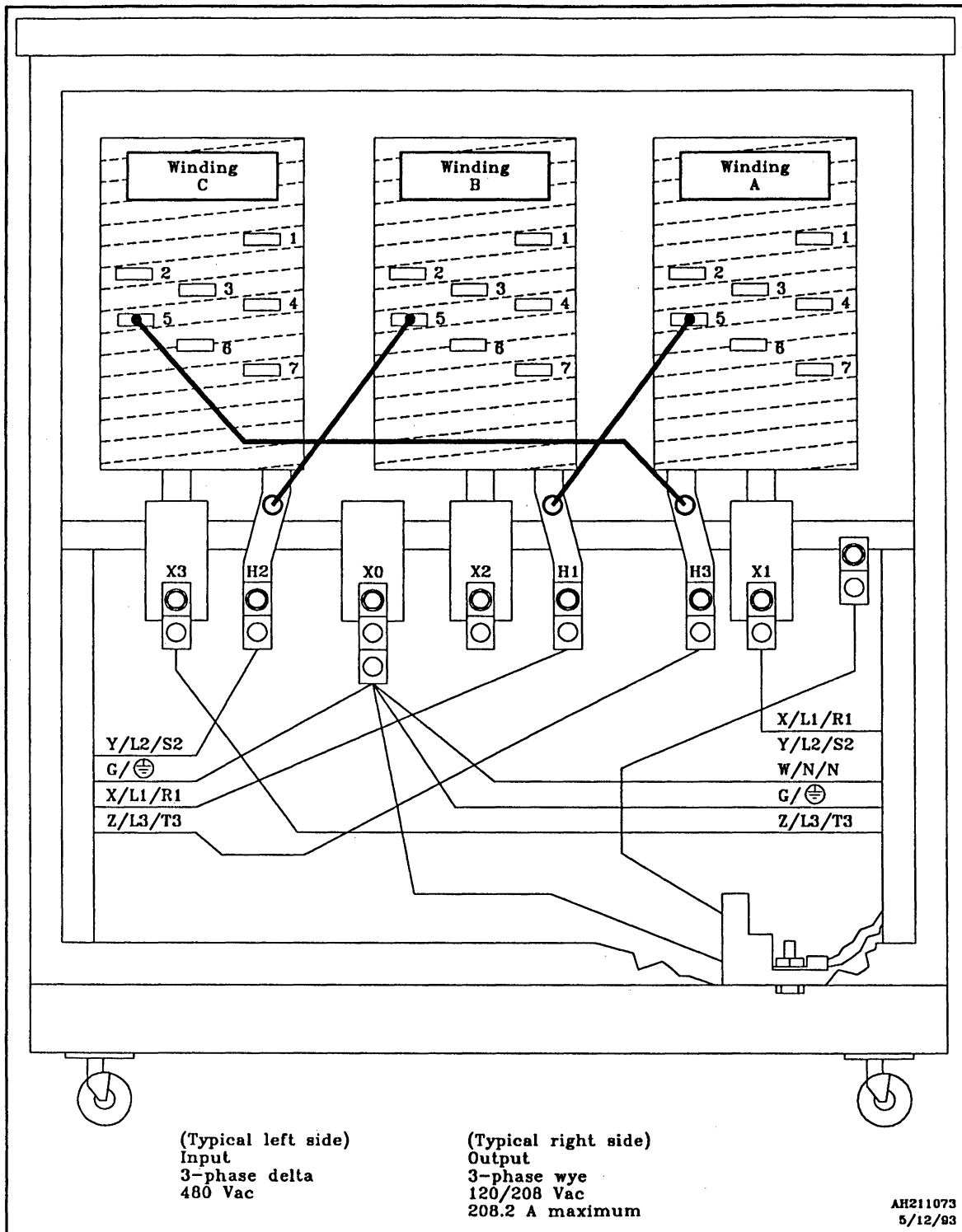


Figure 25 Isolation transformer wiring diagram for 408 Vac input (1 or more phases at 444 Vac)

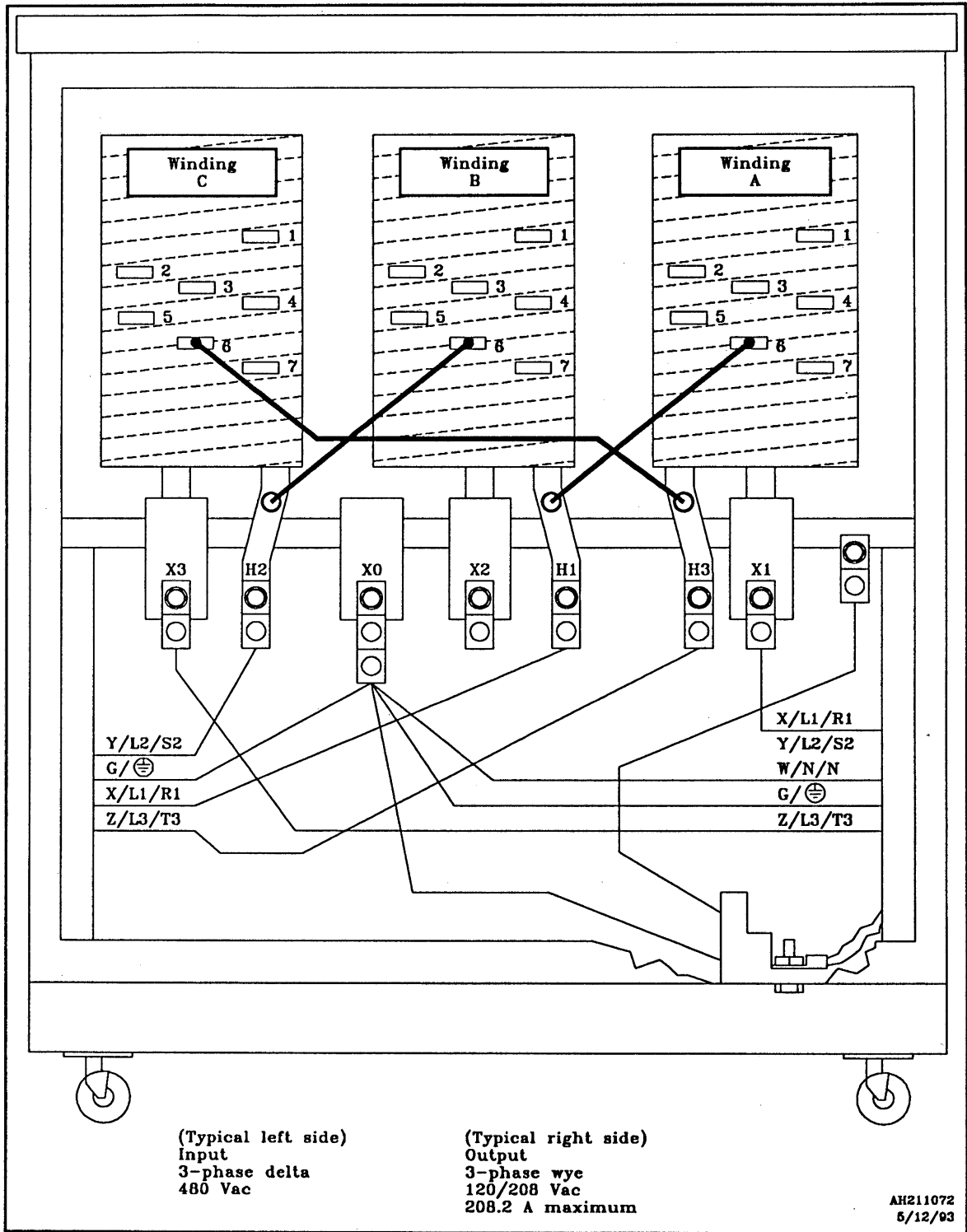
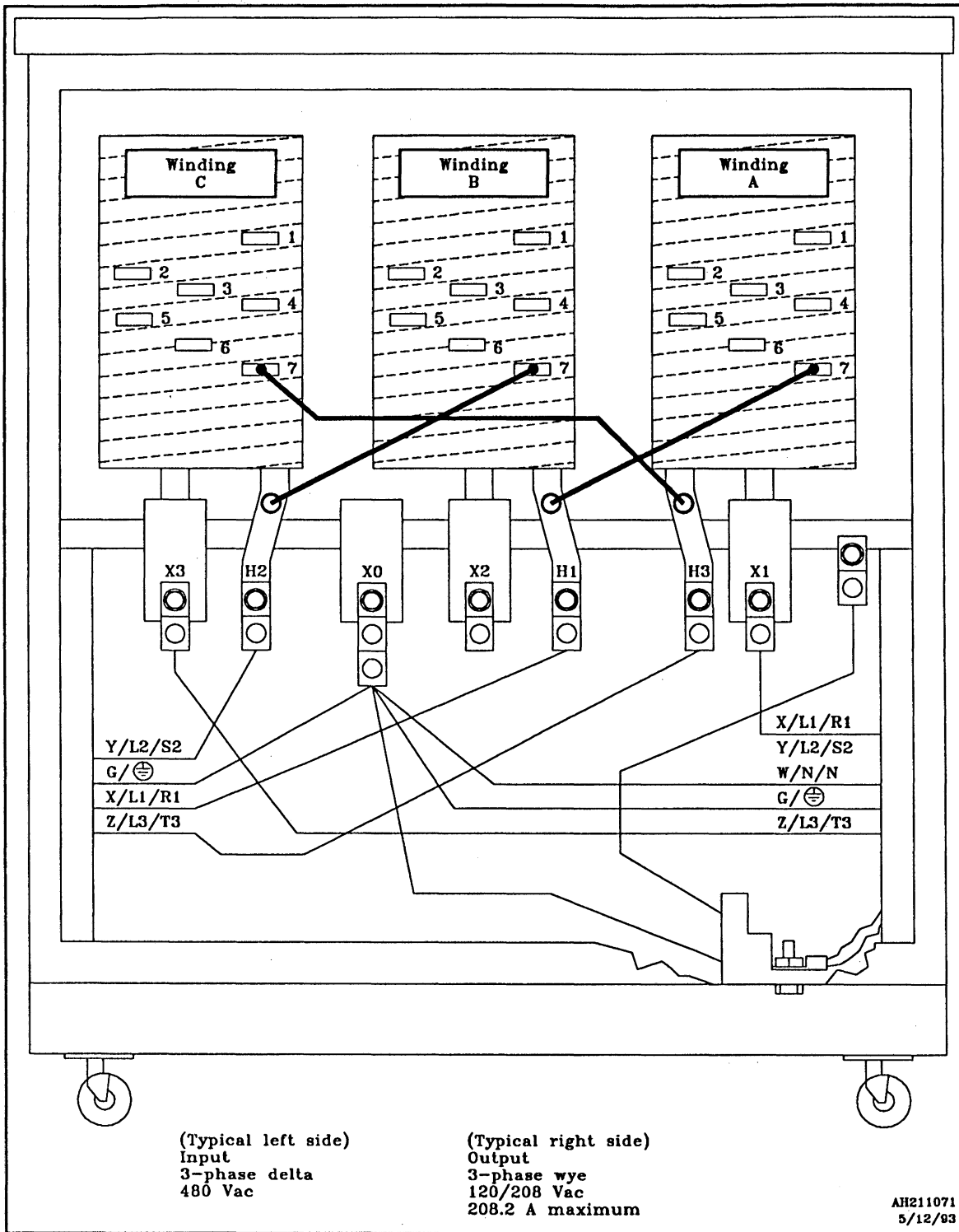


Figure 26 Isolation transformer wiring diagram for 408 Vac input (1 or more phases at 432 Vac)



Dedicated power panels

The computer power panel and the peripheral power panel (see the *CONVEX I/O Site Preparation Guide*, Order No. DHW-010) must conform to prevailing ordinances and codes. Some code and ordinance requirements follow:

- Include neutral and ground bus bars in the panels
- Neutral bus bars should be insulated from the panels
- Neutral and ground bus bars should not be interconnected

Computer power panel

Choose the computer power panel size to accommodate the C3800 Series current and potential upgrade power requirements.

Figure 27 is a schematic diagram of a typical computer power panel. The panel must conform to local electrical codes.

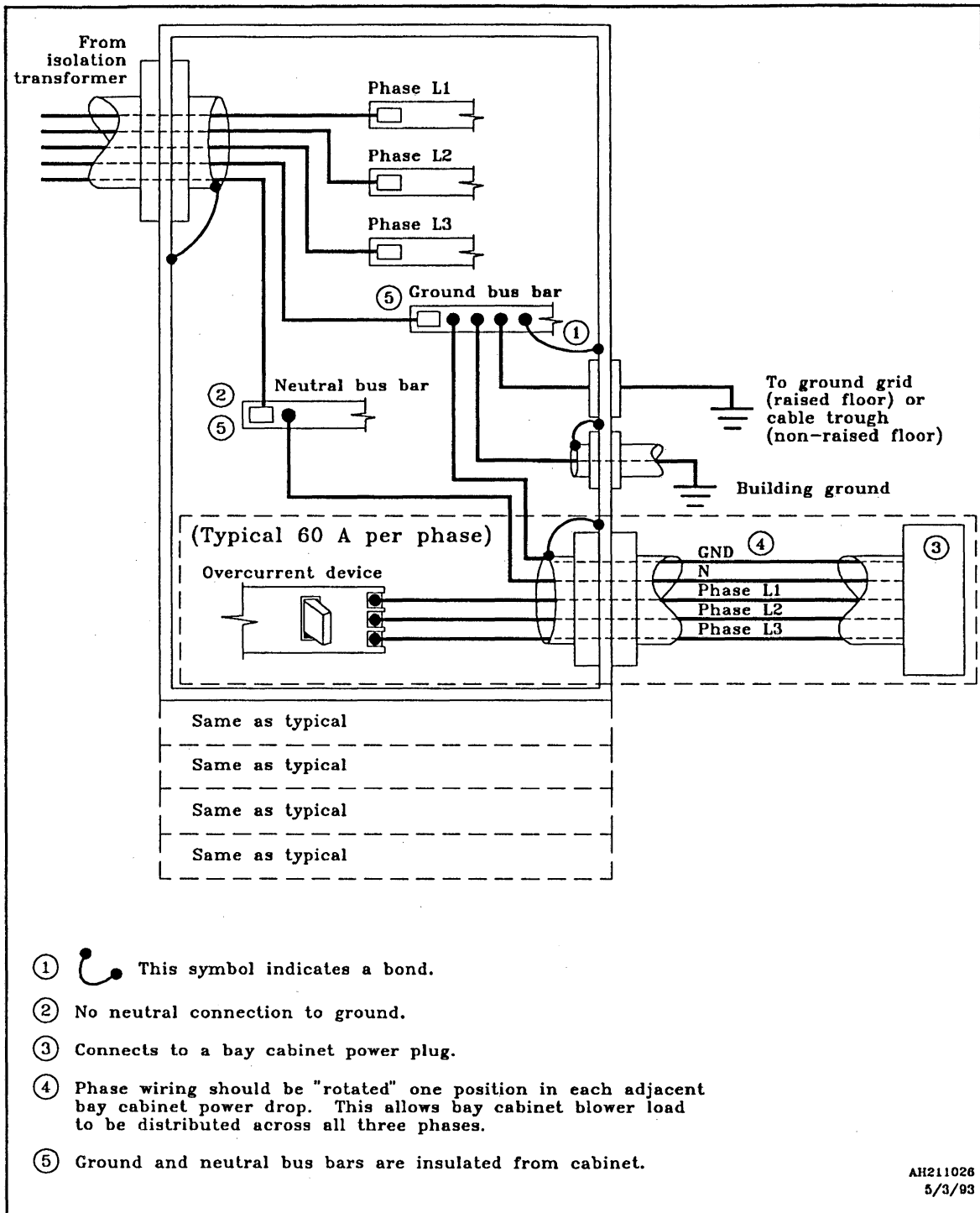
A locally licensed electrician should install your computer power panel. This panel supplies three-phase power to all bays of your computer, through separate circuits. It must not supply power to any other device except your C3800 Series service processor workstation. The input power and up to five output power drops should all have overcurrent protection. Refer to the "Circuit breakers" section on page 4 for details on circuit breaker sizing.

The receptacle at the end of a CPU panel power drop mates with a plug on the end of the 4.5-m (15-ft) power cable from an outer bay cabinet in the C3800 main system complex. You may add breakers and ac outputs for SPU equipment to either the computer power panel or the peripheral power panel (customer option).

Note

The Isolation transformer kit contains receptacles for the CPU power panel power drops.

Figure 27 Typical computer power panel



Phase rotation

When connecting the computer power panel output cables to the input power line, rotate the phase connections according to Table 7. L1/L2/L3, A/B/C, and X/Y/Z are labeling conventions for power phases in the United States. R/S/T are labeling conventions for power phases in Europe.

Table 7 Computer power drop phase rotation

Output phases for computer bays	Input phase 1 (L1, A, X, R)	Input phase 2 (L2, B, Y, S)	Input phase 3 (L3, C, Z, T)
Power drop 1 (bay 4)	Phase 1 (L1, A, X, R)	Phase 2 (L2, B, Y, S)	Phase 3 (L3, C, Z, T)
Power drop 2 (bay 0)	Phase 3 (L3, C, Z, T)	Phase 1 (L1, A, X, R)	Phase 2 (L2, B, Y, S)
Power drop 3 (bay 1)	Phase 2 (L2, B, Y, S)	Phase 3 (L3, C, Z, T)	Phase 1 (L1, A, X, R)
Power drop 4 (bay 2)	Phase 1 (L1, A, X, R)	Phase 2 (L2, B, Y, S)	Phase 3 (L3, C, Z, T)
Power drop 5 (bay 3)	Phase 3 (L3, C, Z, T)	Phase 1 (L1, A, X, R)	Phase 2 (L2, B, Y, S)

Note

Only the conductors for the three phases are affected by phase rotation. The neutral and chassis ground conductors remain in the same position for each drop.

The connections are normally rotated at the power panel end of the power drop, but can be rotated at either end. At the CPU power panel end, move the wires on the phase terminal blocks. At the receptacle end, move the wires in the pin and sleeve assemblies. This phase load balancing should be completed before connecting a CONVEX C3800 Series computer to the power distribution system.

Customer-supplied isolation transformer

A

The use of your own power source is at your discretion as long as you meet the requirements listed in this appendix. Testing has confirmed that a high quality isolation transformer or power distribution unit can perform the required isolation and attenuation functions.

Your dedicated power source must include an isolation transformer to isolate the C3800 Series computer from all other electrical equipment. This isolation both protects the computer from line noise and surges, and protects other site equipment from spurious power signals that the CONVEX computer may generate.

CONVEX peripheral equipment must also draw power through another isolation transformer, separate from both the C3800 Series computer power and other equipment power.

Your most reliable option would be to use the CONVEX power isolation transformer in your C3800 Series power source. CONVEX engineers developed and tested the C3800 Series system with a power source including this transformer. CONVEX can provide this transformer to every site to give superior noise immunity and phase balance performance.

If you choose to supply your own dedicated power source, specify that the power source meets the following criteria:

- Fully isolate the dedicated power source output from the building electrical mains.
- Deliver power from the dedicated power source to the CONVEX C3800 Series computer only.
- Design the dedicated power source to have at least 50 kVa capacity, with a minimum K factor of 7 to handle fundamental and harmonic currents.
- Ensure that the dedicated power source meets all local performance and safety codes for the installation site.

- Provide a separate 60 A circuit from the dedicated power source to each of a maximum of five C3800 Series computer bays.
- Locate the dedicated power source within 100 feet of the CONVEX C3800 Series computer.
- Choose the size of the main circuit breaker on the input to the dedicated power source (circuit breaker B, as shown in Figure 2 on page 6) to be less than 125 percent of the power load current rating.
- Select a dedicated power source isolation transformer that provides full isolation.
- Ensure that attenuation of line noise and transients equals or exceeds the limits listed in Table 8 at full load and unity power factor.

Table 8 Attenuation of power line noise and transients

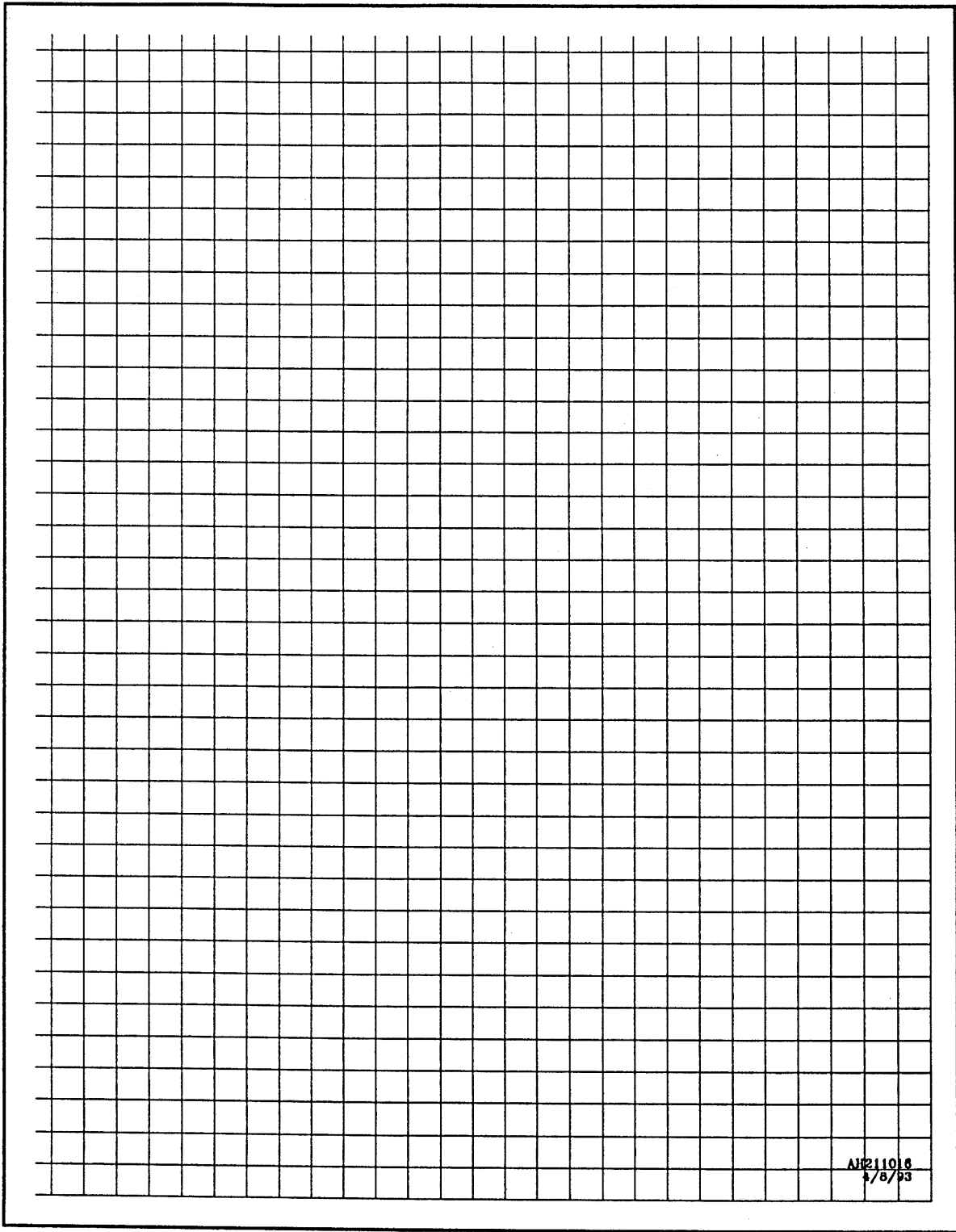
Frequency range	Common mode transients	Transverse mode transients
0 to 1.5 KHz	120 dB	NA
1.5 KHz to 10 KHz	115 dB	60 dB
10 KHz to 100 KHz	110 dB	62 dB
100 KHz to 1 MHz	60 dB	56 dB

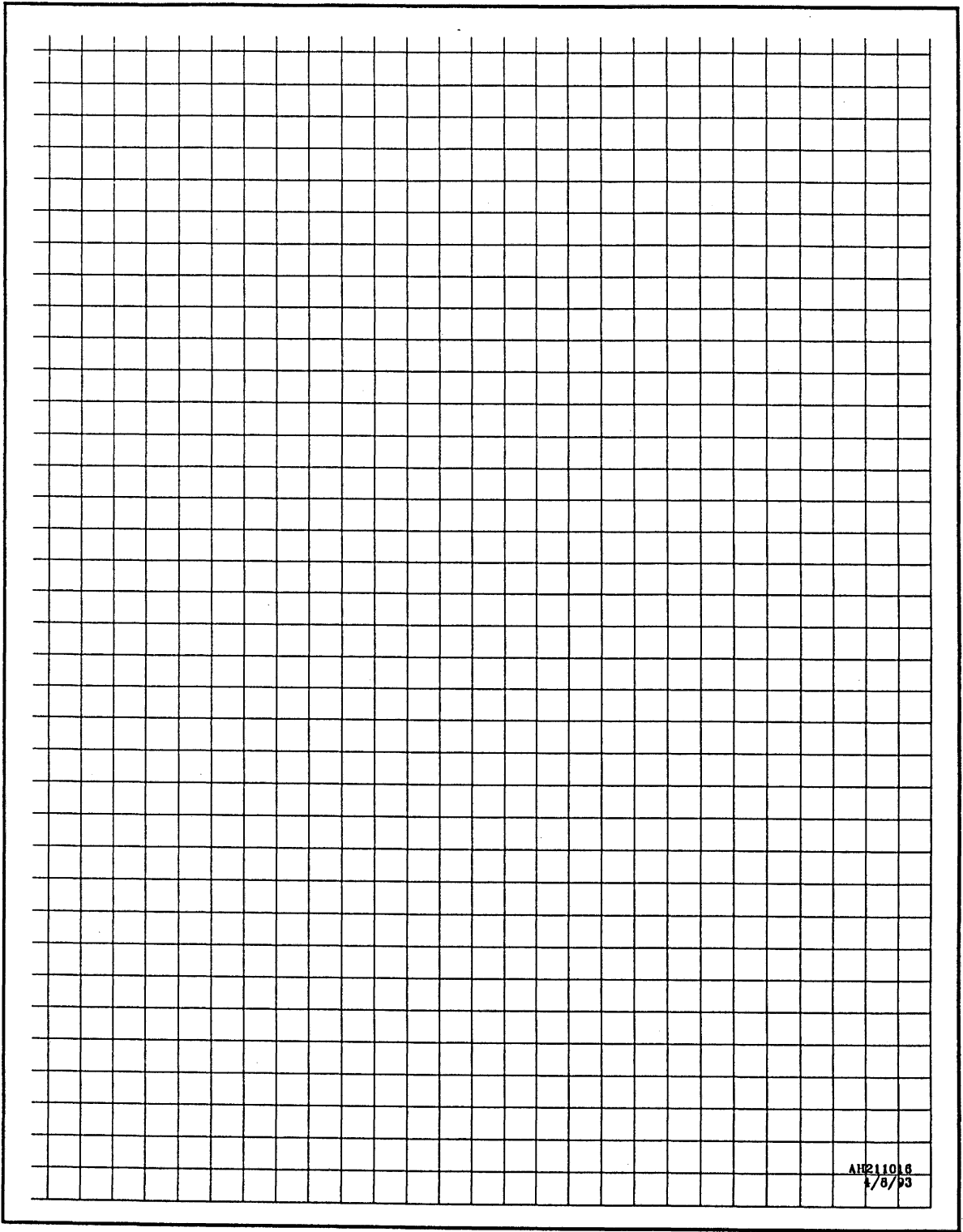
- Ensure that the dedicated power source output surge levels do not exceed levels specified in IEEE 587 category A.

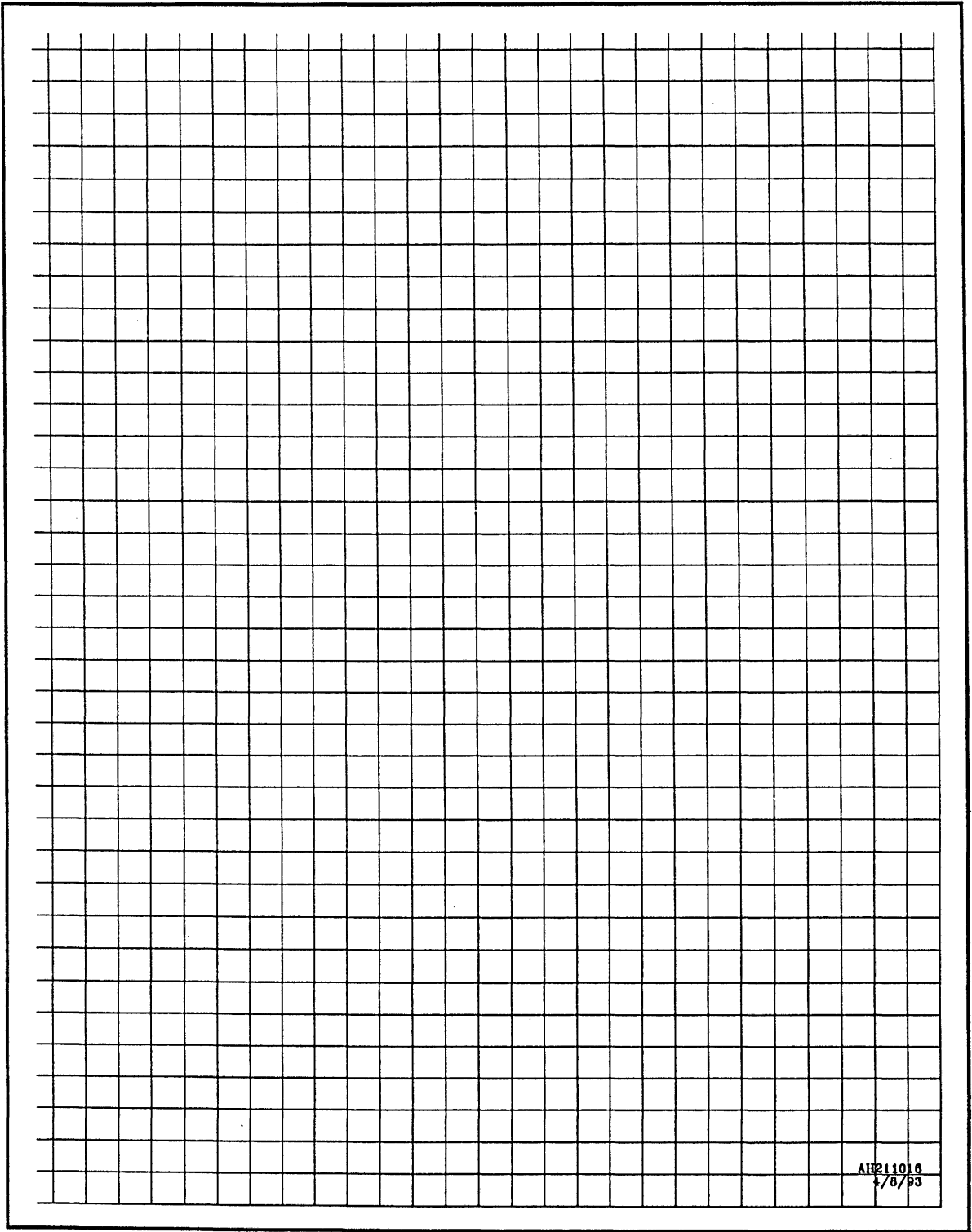
Floor-plan grid and templates

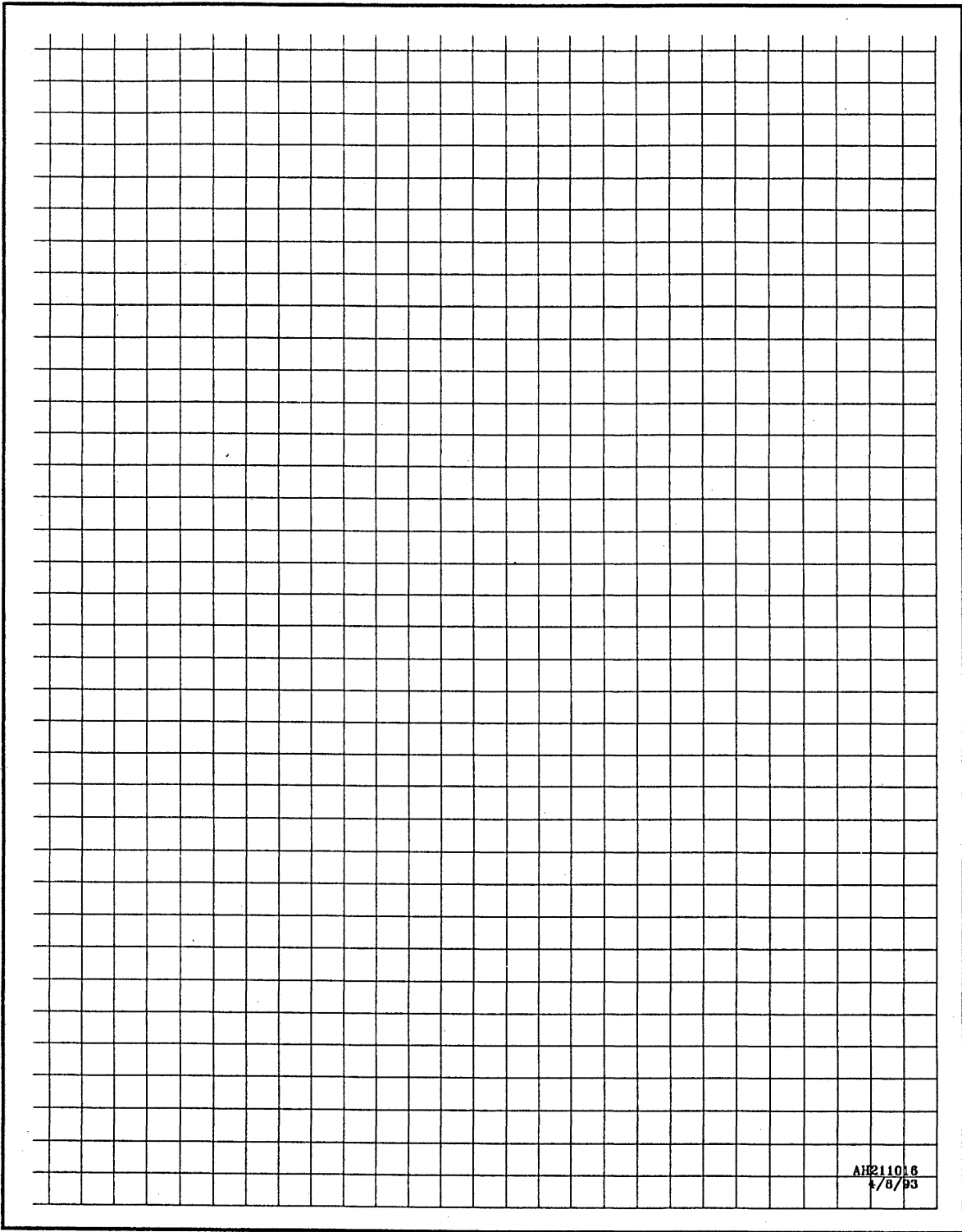
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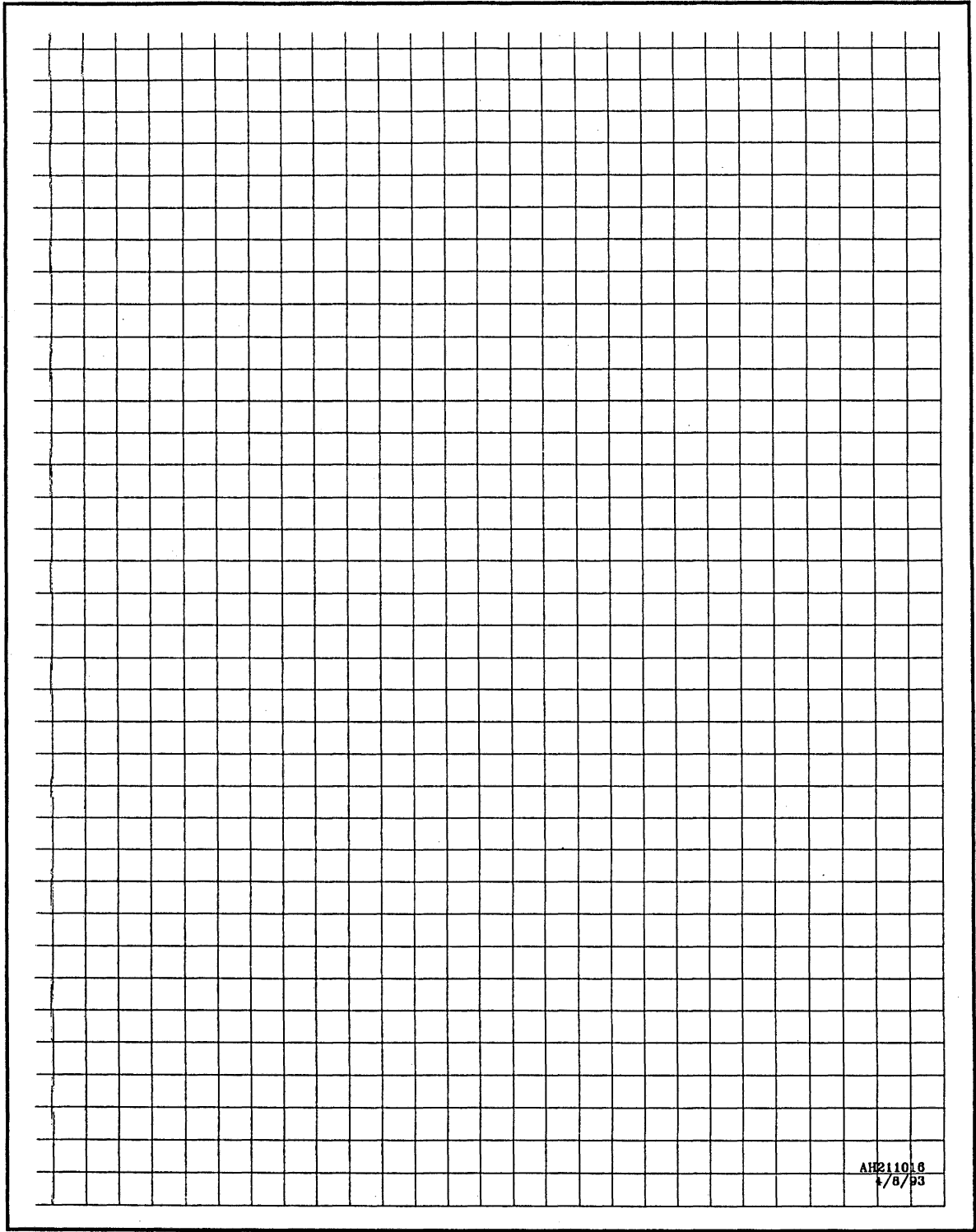
The following pages contain copies of the floor-plan grid and isolation transformer footprint. Size of an individual grid cell is one square foot. The footprint diagrams are to the same scale.



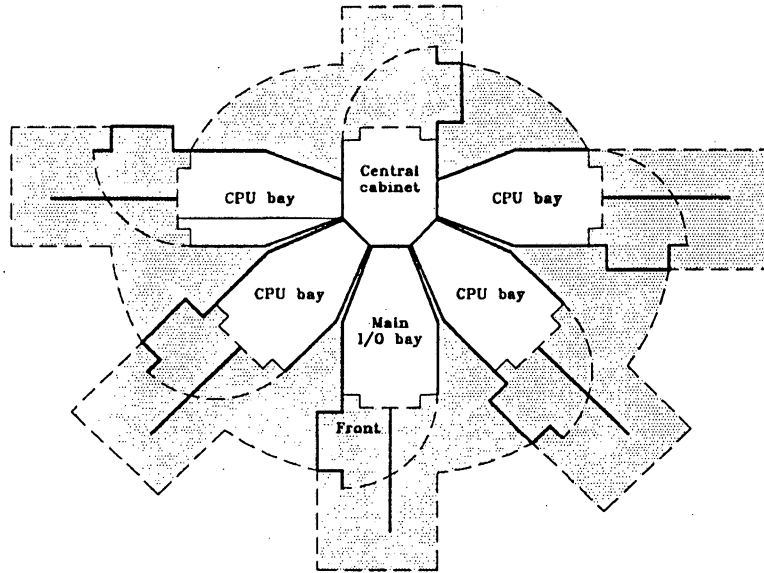




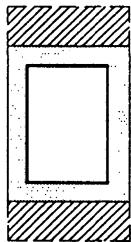




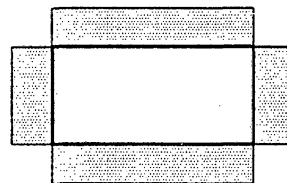
C3860/C3880



Isolation transformer



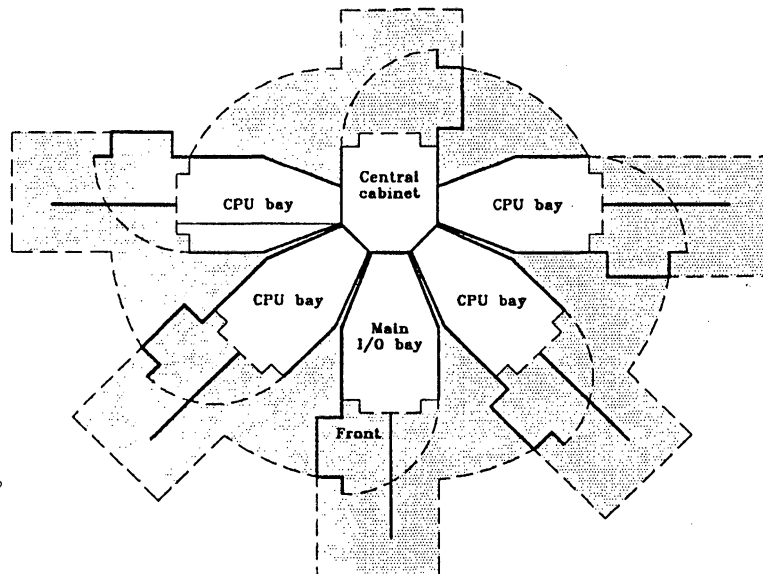
System console



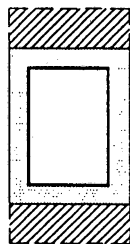
 Service area

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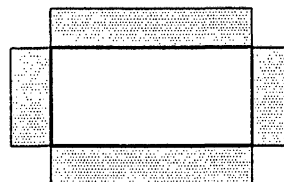
C3860/C3880



Isolation transformer



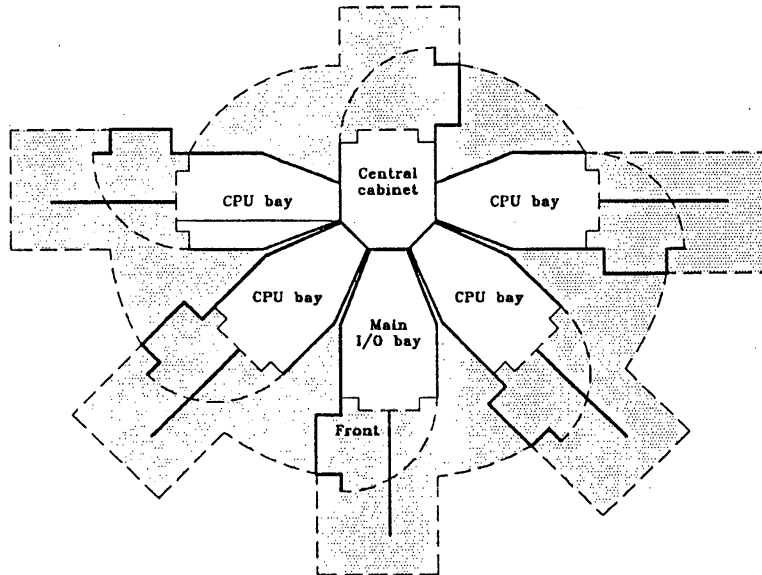
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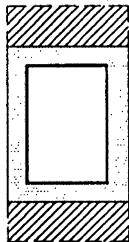
 Service area

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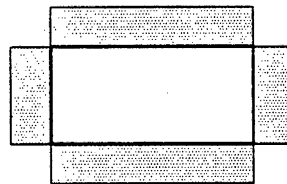
C3860/C3880



Isolation transformer



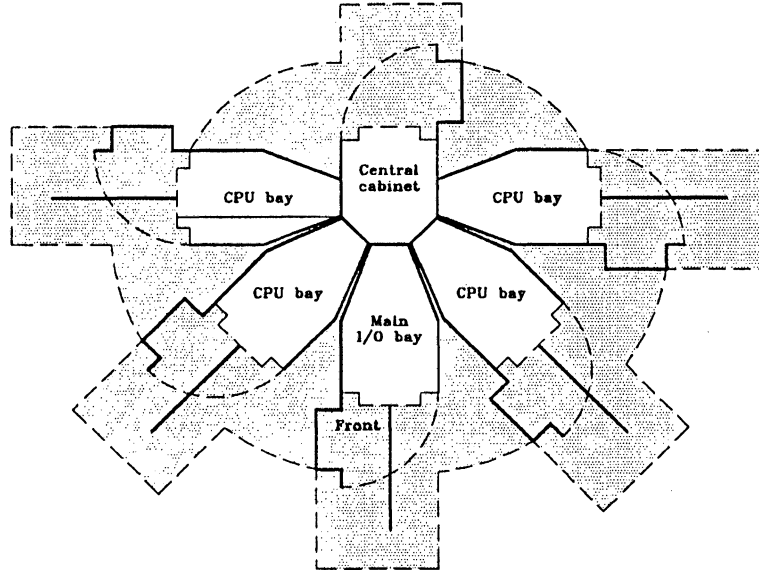
System console



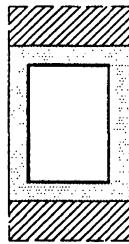
 Service area

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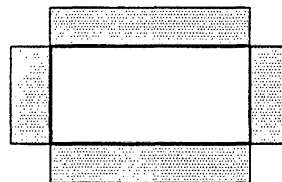
C3860/C3880



Isolation transformer



System console



 Service area

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