APACS+™

eXcelerated Advanced Control Module Plus (ACM™)
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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Technical data subject to change.
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Conventions and Symbols

The following symbols may appear in this manual and may be applied to the equipment. The reader should become familiar with the symbols and their meaning. Symbols are provided to quickly alert the user to safety related situations, issues, and text.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
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<tr>
<td>DANGER</td>
<td>Indicates an immediate hazardous situation which, if not avoided, will result in death or serious injury.</td>
</tr>
<tr>
<td>WARNING</td>
<td>Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.</td>
</tr>
<tr>
<td></td>
<td>Indicates a potentially hazardous situation which, if not avoided, may result in property damage.</td>
</tr>
<tr>
<td>NOTICE</td>
<td>Indicates a potential situation which, if not avoided, may result in an undesirable result or state.</td>
</tr>
<tr>
<td>Important</td>
<td>Identifies an action that should be taken to avoid an undesirable result or state.</td>
</tr>
<tr>
<td>Note</td>
<td>Identifies additional information that should be read.</td>
</tr>
<tr>
<td>Electrical shock hazard.</td>
<td>The included Warning text states that the danger of electrical shock is present.</td>
</tr>
<tr>
<td>Electrical shock hazard.</td>
<td>Indicated that the danger of electrical shock is present.</td>
</tr>
<tr>
<td>Explosion hazard.</td>
<td>Indicates that the danger of an explosion hazard exists.</td>
</tr>
<tr>
<td>Electrostatic discharge.</td>
<td>The presence of this symbol indicates that electrostatic discharge can damage the electronic assembly.</td>
</tr>
</tbody>
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Qualified Persons

The described equipment should be installed, configured, operated, and serviced only by qualified persons thoroughly familiar with this publication. The current version, in Portable Document Format (PDF), is available at http://sitescape.sea.siemens.com/.

For the purpose of this publication and product labels, a qualified person is one who is familiar with the installation, construction, and operation of the equipment, and the involved hazards. In addition, he or she has the following qualifications:

- Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- Is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
- Is trained in rendering first aid.

Scope

This publication does not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matter should be referred to one of the support groups listed in the Product Support section of this manual.

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements continued herein do not create new warranties or modify the existing warranty.

General Warnings and Cautions

WARNING

This equipment contains hazardous voltages, and it has been certified for use in the hazardous locations specified on the product nameplate and in the Model Designation and Specifications section. Death, serious personal injury, or property damage can result if safety instructions are not followed. Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with all warning, safety notices, and maintenance procedures contained herein. The successful and safe operation of this equipment is dependent upon proper handling, installation, operation, and maintenance.

The perfect and safe operation of the equipment is conditional upon proper transport, proper storage, installation and assembly, as well as, on careful operation and commissioning.

The equipment may be used only for the purposes specified in this publication.
Electrostatic discharge can damage or cause the failure of semiconductor devices such as integrated circuits and transistors. The symbol at right may appear on a circuit board or other electronic assembly to indicate that special handling precautions are needed.

- A properly grounded conductive wrist strap must be worn whenever an electronics module or circuit board is handled or touched. A service kit with a wrist strap and static dissipative mat is available from Siemens. Equivalent kits are available from both mail order and local electronic supply companies.

- Electronic assemblies must be stored in anti-static protective bags when not installed in equipment.

<table>
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<tr>
<th>DANGER</th>
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</thead>
<tbody>
<tr>
<td>Explosion hazard</td>
</tr>
<tr>
<td>Will cause death, serious injury or property damage</td>
</tr>
<tr>
<td>• In potentially hazardous atmosphere, remove power from equipment before connecting or disconnecting power, signal, or other circuit, or extracting/inserting module.</td>
</tr>
<tr>
<td>• Observe all pertinent regulations regarding installation in hazardous area.</td>
</tr>
<tr>
<td>• Ensure all devices are rated for hazardous (classified) locations.</td>
</tr>
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</table>
1.0 Introduction

This Instruction provides installation and service information for the following APACS+™ eXcelerated Advanced Control Module Plus (ACM²) hardware:

- Model 39ACM34AAN (5407 CPU, 4MB SDRAM) P/N 16139-111
- Model 39ACM38AAN (5407 CPU, 8MB SDRAM) P/N 16139-121
- ACM² Transition Board with Node Switch P/N 16147-51

This Instruction is divided into six major sections:

- Section 1, Introduction – Contains product description, product support, and lists related literature.
- Section 2, Installation – Describes environmental considerations and mechanical and electrical installation.
- Section 3, Maintenance – Consists of preventive maintenance, troubleshooting, assembly replacement procedures, and spare and replacement parts suggestions.
- Section 4, Circuit Description – Contains a brief system level description of the ACM².
- Section 5, Model Designation – Provides model designation and lists of accessories and options.
- Section 6, Specifications – Consists of mechanical, electrical, and environmental specifications.

1.1 Product Description

The microprocessor-based eXcelerated Advanced Control Module (ACM²) is a key element of the APACS+™ Advanced Controller. An ACM² can communicate with any APACS+ I/O module via the IOBUS or communicate with control, computer, and communication modules via the MODULBUS. Figure 1–1 illustrates the ACM² and its associated transition boards.

The ACM² occupies a single module rack slot. The top connector at the rear of the module mates with a connector on the rack backplane. This connector provides power bus, IOBUS, and MODULBUS access. The bottom connector mates with an ACM² transition board to access the serial ports and redundancy connector. Each installed ACM² requires a transition board to operate, which includes two RS-232C serial ports for serial communications applications. Also provided is a redundancy connector, which permits two ACM² (s) to operate in a redundant configuration.
The ACMx contains 1MB of FLASH ROM memory for non-volatile storage of the operating system software. FLASH ROM storage protects the operating system software from accidental modification and/or corruption. As with the ACM+, it is no longer possible to erase the operating software by pulling the module out of the rack and removing the battery. The module must be re-initialized via 4-mation or cross-loaded to load new operating system software. However, the configuration still resides in RAM.
1.1.1 LED Indicators
The ACM’s LEDs support local troubleshooting without an operator interface. The module includes three LEDs, which indicate the following module statuses:

- Module OK
- Module Faulted
- Module Unconfigured
- Module Failed
- Module Active
- Module Inactive
- Security Enabled
- Security Disabled

See Table 3–2 for a detailed description of the ACM’s status LED indications.

1.1.2 Configuration
The ACM is configured using the ProcessSuite® 4-mation™ Configuration software. 4-mation allows a control strategy to be defined using any mix of four languages, which are based on the IEC specification for programmable controllers (IEC 1131-3). These languages are function blocks, ladder logic, sequential function charts, and structured text. These languages allow a configuration to be created using the tool(s) most effective for each application.

4-mation is also used to configure an ACM’s I/O, as well as modules within an APACS+ system. A backup copy of the I/O module’s configuration is maintained by the ACM to allow automatic configuration of an I/O module when it is inserted into a module rack.

An ACM’s configuration can be created off-line and transferred to the module, or a configuration can be created within an on-line ACM during the initial design phase. On-line configuration is possible because all of the information needed to configure an ACM is stored in its database, thus eliminating the need to have a disk-based master database for viewing or editing a configuration. Several different restriction levels are available.

The ACM’s security can be programmed so no unauthorized or inadvertent changes are made to a configuration. When this security feature is activated, a configuration can be opened in “read only” mode only, ensuring that no further changes are made to the control strategy.

The ACM also includes features to simplify start-up should operation be disrupted. An ACM’s configuration is battery-backed so that the configuration for an ACM and its I/O is maintained when power is lost. Also, variables within an ACM can be assigned warm start and cold start values. When power is lost, the ACM’s real-time clock continues to run so that warm start and cold start states can be determined and acted upon once power is restored.

1.1.3 Software Functions
The ACM can be used in conjunction with APACS+ I/O modules to control either a continuous or batch process. ACM software is able to execute Function Block Diagrams, Ladder Diagrams, Sequential Function Charts, and Structured Text.
1.1.4 Control Strategies

The ACMx can be used in conjunction with APACS+ I/O modules to build DCS style and/or PLC style systems. It can also be used by itself (or with I/O modules) to supervise the operation of other APACS+ control modules, as required by the process strategy.

1.2 Product Support

Our Technical Support Centers (TSC) offer a variety of technical support services that are designed to assist you with Siemens products and systems. Our support engineers have experience with troubleshooting, development, system startup, and system test. They will help you to solve your issues in an efficient and professional manner.

Customers in North America can contact Siemens Technical Support Center at 1-800-333-7421, on the web at: [http://support.automation.siemens.com](http://support.automation.siemens.com), or by e-mail: techsupport.sea@siemens.com

Customers outside North America can contact their local Siemens subsidiary; addresses and telephone numbers are listed on the Internet at the web site: [http://support.automation.siemens.com](http://support.automation.siemens.com).

When contacting Siemens, customers will be asked to provide site-contact information (name, address, and phone number), the product involved and detailed information regarding the nature of the issue.

Product documentation is now located in the Library forum of the Process Automation User Connection at: [http://sitescape.sea.siemens.com/](http://sitescape.sea.siemens.com/). The Process Automation User Connection is a secure site. Registration is open to all verified users of Siemens process automation systems. If you are not already, and would like to become a member, please visit our Process Automation User Connection web page at: [http://www.sea.siemens.com/process/support/papauc.html](http://www.sea.siemens.com/process/support/papauc.html)

Contained within the Process Automation User Connection is the APACS+/QUADLOG Secure Site at: [http://sitescape.sea.siemens.com/forum/aca-1/dispatch.cgi?f.apacsquadlo](http://sitescape.sea.siemens.com/forum/aca-1/dispatch.cgi?f.apacsquadlo) forum. This site is only open to customers with an active service agreement. It contains all service manuals, service memos, service notes, configuration manuals, etc. for the APACS+ and QUADLOG family of products. If you are experiencing technical difficulties with the site, please contact SiteScape technical support at: toll free 1-877-234-1122 (US) or 1-513-336-1474.
### A&D Technical Support
Worldwide, available 24 hours a day:

![World map with locations indicated](image)

<table>
<thead>
<tr>
<th>United States: Johnson City, TN</th>
<th>Worldwide: Nürnberg</th>
<th>Asia / Australia: Beijing</th>
</tr>
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<tr>
<td><strong>Technical Support and Authorization</strong>&lt;br&gt;Local time: Monday to Friday&lt;br&gt;8:00 AM to 5:00 PM&lt;br&gt;Telephone:+1 (423) 262 2522&lt;br&gt;or +1 (800) 333-7421 (USA only)&lt;br&gt;Fax:+1 (423) 262 2289&lt;br&gt;Mail to: <a href="mailto:techsupport.sea@siemens.com">techsupport.sea@siemens.com</a>&lt;br&gt;GMT: -5:00</td>
<td><strong>Technical Support</strong>&lt;br&gt;24 hours a day, 365 days a year&lt;br&gt;Phone:+49 (180) 5050-222&lt;br&gt;Fax:+49 (180) 5050-223&lt;br&gt;E-Mail: <a href="mailto:ad.support@siemens.com">ad.support@siemens.com</a>&lt;br&gt;GMT:+1:00</td>
<td><strong>Technical Support and Authorization</strong>&lt;br&gt;Local time: Monday to Friday&lt;br&gt;8:00 AM to 5:00 PM&lt;br&gt;Phone:+86 10 64 75 75 75&lt;br&gt;Fax:+86 10 64 74 74 74&lt;br&gt;Mail to: <a href="mailto:ad.support.asia@siemens.com">ad.support.asia@siemens.com</a>&lt;br&gt;GMT:+8:00</td>
</tr>
<tr>
<td><strong>Authorization</strong>&lt;br&gt;Local time: Monday to Friday&lt;br&gt;8:00 AM to 5:00 PM&lt;br&gt;Phone: +49 (180) 5050-222&lt;br&gt;Fax: +49 (180) 5050-223&lt;br&gt;Mail to: <a href="mailto:ad.support@siemens.com">ad.support@siemens.com</a>&lt;br&gt;GMT: +1:00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Automation and Drives Service and Support International<br>[http://www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support)

The languages of the SIMATIC Hotlines and the authorization hotline are generally German and English.
1.3 International Standards Organization (ISO) Symbols

Refer to Table 1-2 for an explanation of ISO and IEC symbols that, when appropriate, are prominently displayed on the surfaces of hardware. The symbols are also used in instructions to denote CAUTION and WARNING notes.

Table 1–1 ISO/IEC Symbols

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PUBLICATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Symbol" /></td>
<td>ISO 3864, No. B.3.1</td>
<td><strong>CAUTION</strong>: Refer to accompanying Installation and Service Instruction. The symbol is prominently displayed on the surfaces of hardware. When used in an instruction, text accompanies the symbol which identifies something that can damage equipment or cause a control problem with a process. For example: <strong>CAUTION</strong>: The safety system should not be operated with forced I/O.</td>
</tr>
</tbody>
</table>

Background Color=Yellow
Symbol Color = Black
Outline Color = Black
1.4 Related Literature

The following literature should be available when performing an ACM³ installation.

- APACS+ MODULRAC Installation and Service Instruction
  (Document # SD39MODULRAC-1)

- APACS+ SIXRAC Installation and Service Instruction
  (Document # SD39SIXRAC-1)
2.0 Installation

This section describes the installation of the ACM\(^x\) and its associated transition board. Read this entire section before starting an installation.

**IMPORTANT NOTE**

ACM\(^x\) installation should be performed in accordance with the National Electrical Code (NEC) and other applicable construction and electrical codes.

2.1 Hardware Identification

2.1.1 eXcelerated Advanced Control Module (ACM\(^x\))

The ACM\(^x\) is identified by the letters “ACM\(^x\)” on the bezel and by two nameplate labels. One nameplate label is large, similar to that shown in Figure 2–1, located on the tracking plate (left side of ACM\(^x\) in Figure 1–1). A smaller label is located inside the bezel battery compartment. Access this compartment by loosening a captive screw in the hinged compartment cover. Both labels contain the module’s Model Designation, Part Number, and Serial Number. The larger label also shows its current and voltage requirements.

![Figure 2–1 ACM\(^x\) Identification Label](image-url)
2.1.2 ACM® Transition Board

The Transition Board is identified by information silk screened on the component side of the board.

![ACM Transition Board Image]

2.2 Considerations and Preparations

Read Sections 2.2.1 and 2.2.2 before continuing with ACM® installation. Section 2.2.1 describes considerations required to ensure that APACS+ modules are compliant with the European Union’s Electromagnetic Compatibility (EMC) Directive.

2.2.1 EMC Directive Installation Considerations

Some installations of APACS+ modules may require adherence to the European Union’s Electromagnetic Compatibility (EMC) Directive. Section 6 features the Declaration of Conformity statement showing the certificate number of the Technical Construction File issued to the ACM®. EMC compliance requires the following:

- APACS+ systems must use enclosures having sufficient RF attenuation.
- AC power input conductors to the enclosure must be filtered.
- MODULBUS cables that enter or exit the enclosure must be filtered.
- The shield of all shielded cables that exit the enclosure must be connected to the enclosure.

Consult the factory for additional information concerning EMC Directive installation and the availability of enclosures and needed hardware.
2.2.2 Preparations

1. Install SIXRACs or MODULRACs with Local Termination Panels (for local termination only) in cabinets where the ACMx is to be installed. The ACMx should not be installed in the rack at this time. However, its rack slot number should be known.

2. Note that in determining a rack slot for an ACMx:
   - Only I/O modules installed in slots to the right of an ACMx (higher slot numbers or in next IOBUS-connected rack) are slaved to that ACMx.
   - Only an empty slot, Bus Continuation Module (BCM), or Bus Diverter Module (BDM) may be between an ACMx and any of its slaved I/O modules. Empty slots are not permitted on the IOBUS of rack-to-rack redundant systems.
   - Terminate the IOBUS before assigning slot numbers for the next ACMx and its I/O modules.

3. Determine whether redundant ACMx (s) will be installed. ACMx hardware and software provide for module-to-module and rack-to-rack redundancy as described as follows:
   - **Module-to-Module Redundancy** – Two ACMx (s) are mounted in adjacent ascending odd-even (e.g. 1-2, 3-4, 7-8) slots in a rack sharing common I/O modules. One ACMx operates while the other is in standby and can instantly assume control should a failure occur in the operating module. The operating ACMx accesses I/O modules in the rack via IOBUS. Both ACMx (s) communicate over a dedicated redundancy cable.
   - **Rack-to-Rack Redundancy** – Two ACMx (s) are mounted in two module racks that are complete duplicates. One rack is operating, the other is in standby and can instantly assume control should a failure occur in the operating rack. They communicate over a dedicated redundancy cable.

A transition board NODE Switch provides for the setting of a node address for each ACMx when the controller’s MODULBUS is not connected via MBX module to MODULNET.

**CAUTION**

Redundant ACMx (s) must be identical. Therefore, the ACMx model number, part number, and software version must be identical.
2.3 Environmental Considerations

Many industrial environments create severe operating conditions. The conditions at each ACM location must be within the specifications stated in Section 6.2, Environmental Specifications, of this Guide.

CAUTION

Exceeding specified operating temperature limits can adversely affect performance and cause damage. Air temperature should be periodically checked to ensure that this specification is not exceeded.

To ensure reliable data communications, it would be prudent to locate APACS+ module enclosures as far as possible from sources of interference such as high current electrical equipment, which emit strong electromagnetic fields and switching transients.

Industrial environments often contain particulate, liquid, and gaseous contaminants. Particulate matter, usually dust and dirt, is abrasive and can cause intermittent contact in connectors associated with circuit assemblies. A layer of dust on circuit boards will interfere with semiconductor heat dissipation. Liquid and gaseous contaminants can have a corrosive effect on metal, rubber, plastic and circuit board components. Extended exposure to this environment may result in equipment malfunction.

To reduce contaminant related equipment malfunctions:

- Identify contaminants and implement methods to reduce their presence.
- When cleaning equipment and surrounding area, especially the floor, either vacuum away all dust and dirt or use a dampened rag or mop.
- Clean or replace all air conditioning filters, room air filters, and equipment filters regularly.
- Inform personnel with access to APACS+ modules of the need for site cleanliness.

2.4 Equipment Delivery and Handling

The following subsections provide information of interest to shipping, receiving, and warehouse personnel.

2.4.1 Predelivery Test

An ACM that will be installed by the user is fully tested and inspected to ensure proper operation. If the ACM is ordered factory installed in an enclosure, the ACM is tested as part of the APACS+ system and inspected to ensure proper operation.
2.4.2 Factory Shipment

ACMx (s) to be installed by the user are placed in static shielding bags and packaged for shipment. Accessories are packaged separately.

If the ACMx is ordered factory installed in an enclosure, the enclosure is bolted to a pallet and wrapped for protection during shipment.

2.4.3 Receipt of Shipment

All cartons should be inspected at the time of their delivery for possible external damage. Any visible damage should be immediately recorded on the carrier’s copy of the delivery slip. Each carton should be carefully unpacked and its contents checked against the enclosed packing list. At the same time, each item should be inspected for hidden damage that may or may not have been accompanied by exterior carton damage.

If it is found that some items have been damaged or are missing, notify Siemens immediately and provide full details. In addition, damages must be reported to the carrier with a request for their on-site inspection of the damaged item and its shipping carton.

2.4.4 Equipment Handling

The ACMx is completely enclosed and may be safely handled without undertaking special ESD (electrostatic discharge) handling procedures provided the battery compartment door is closed and secured. DO NOT touch the connector pins on the back of the module. Handle the module carefully and do not subject it to excessive shock or vibration.

CAUTION

A grounded wrist strap must be used to provide ESD protection whenever the battery compartment door is opened to access the backup battery or Security Enable switch.

2.4.5 Equipment Storage

The storage temperature and humidity parameters of Section 6.2 must be met to properly store an ACMx.

When the ACMx is in long term storage, the backup battery must be disabled to preserve battery life. An ACMx removed from storage for use must be prepared as described in Section 2.6.3.
IMPORTANT

Prior to applying power to the ACM®, connect the backup battery.

2.4.6 Return of Equipment within North America

US Customers:

- Call the Repair Order PAS Inside Sales/Order Management Group at (215) 646-7400, ext 4RMA (4762) weekdays between 8:00 a.m. and 4:45 p.m. eastern time to obtain an RMA number. Mark the RMA number prominently on the outside of the shipment.

- When calling for an RMA number, provide the reason for the return. If returning equipment for repair, a detailed description of failure symptoms and system behavior will be requested. Supply a purchase order number for repairs. Follow the TSC specialist's recommendation for battery connection, if applicable.

- If applicable, you must supply a Material Safety Data Sheet (MSDS) with each item being returned if it was stored or used in a location where hazardous materials were present.

- Package items to be returned in their original shipping containers. Otherwise, package it for safe shipment or contact the factory for shipping recommendations. A module must be placed inside a static shielding bag to protect it from electrostatic discharge.

Canadian customers:

Contact Siemens Canada.

2.4.7 Return of Equipment outside North America

Contact your Siemens Representative.
2.5 Mechanical Installation

This section provides detailed information on the installation of transition boards and the module.

2.5.1 ACMx Transition Board Installation

Mount the ACM Transition Board (Figure 1–1) at the MODULRAC or SIXRAC slot location of its companion ACMx.

Refer to Figure 2–2 and the following mounting instructions:

1. Consult user documentation and note the slot location assigned to the ACMx(s).

2. Note the following on a MODULRAC/SIXRAC and on the transition board:

   • At the rear of the rack, locate and identify the extruded spacer to which the lower edge of the backplane is mounted. Note that the bottom of the extruded spacer is grooved. The top edge of the transition board will rest in this groove.

   • Identify alignment pins located below the rack’s frame that span the width of the rack. The left-most pin corresponds to rack slot #1. One of these pins will engage a hole located on the termination board above the SIEMENS logo.

   • A transition board’s captive mounting screws can be seen projecting from the bottom of the plastic extrusion panel.

3. Mount the transition board at its assigned location as follows:

   a) Angle the top edge of the board toward the back plane’s extruded spacer and insert the tip of the board in the spacer’s groove.

   b) Slide the board in the groove until it is vertically and horizontally aligned with the appropriate pin.

   c) Carefully lower the transition board and engage the alignment pin with the extrusion and board pin mounting holes. Firmly push down to seat the board on the pin. When the board is properly seated, the pin will be flush with, or project slightly above the board’s surface.

   d) Tighten the captive mounting screws, which are automatically aligned with their respective panel mounting holes.
2.5.2 ACMx Installation

Modules are shipped individually packaged in protective, sealed, static shielding bags. Refer to Section 2.4.4 for module handling considerations. Each MODULRAC/SIXRAC slot and each module must be keyed to prevent accidental installation of a module into an incompatible slot. Keying is highly recommended. A unique keying pattern is assigned to each module type. See Figure 2–3 for ACMx keying patterns.

A factory-assembled rack is keyed at the factory. A user-assembled rack must be keyed by the user according to the module types assigned each slot. Slot keying patterns must complement those of each module. MODULRACs/SIXRACs are supplied with stop plugs.

2.5.2.1 Module Rack Mechanical Keying

1. Get the MODULRAC Keying Kit supplied with the MODULRAC/SIXRAC.

2. Refer to Figure 2–3 and note the MODULRAC keying pattern. Also, locate the MODULRAC top and bottom rails. ACMx can use the same keying pattern as the ACM+.

3. Press the stop plugs into the holes identified by the solid dots.
Figure 2–2  Transition Board Mounting
2.5.2.2 Module Installation

Use the following instructions to install the ACMx’s. Refer to Figure 2–3.

1. Refer to user documentation for the correct module slot number and proper placement of the ACM transition board. For module-to-module redundancy, ACMx (s) are adjacently mounted in odd-even (1-2, 3-4, 7-8) slots.

2. Remove the ACMx from its static shielding bag and ensure that the module is keyed. Also, check the rack slot to be sure it is keyed.

3. Insert the module in the assigned rack slot. Firmly seat the module in the back plane and transition board connectors. A properly seated module will have the rear of its bezel flush against the rack’s front rails. A keyed module that is not matched to a keyed slot will not engage the back plane or transition board connectors or seat flush against the rack’s front rails.

4. Pull open the bezel’s pivoting top and bottom handles to expose the slotted captive mounting screws and secure the module to the top and bottom rails. Close the bezel’s handles when finished.

CAUTION

Do not use the captive mounting screws to seat the module. Doing this may damage the ACMx’s bezel.
Figure 2–3  Module Keying Assignment and Installation

NOTES:

1. Keying pins are threaded into 4 of the 8 holes in the rear top and bottom sections of the modules bezel.
2. Plastic stop-plugs are pressed into top and bottom rail holes at a particular slot to match a keyed module to a slot.

WHERE:

- Indicates a pin installed in a module bezel’s key hole or a stop plug installed in a modulrac rail’s key hole.
- Indicates an empty key hole.

Module bezel viewed from rear, modulrac rail viewed from front.
2.6 Electrical Installation

This section describes cable connections and switch settings.

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion hazard</td>
</tr>
<tr>
<td>Will cause death, serious injury or property damage</td>
</tr>
<tr>
<td>• In potentially hazardous atmosphere, remove power from equipment before connecting or disconnecting power, signal, or other circuit, or extracting/inserting module.</td>
</tr>
<tr>
<td>• Observe all pertinent regulations regarding installation in hazardous area.</td>
</tr>
<tr>
<td>• Ensure all devices are rated for hazardous (classified) locations.</td>
</tr>
</tbody>
</table>

2.6.1 Cable Connections

The following subsections provide details for the connection of redundancy and serial port cables.

2.6.1.1 Redundancy Cable

Redundancy is discussed in Section 2.2.2. Refer to Figure 2–4 and connect the cable as follows:

1. Consult user documentation and identify the module rack(s) and ACMx slots for each redundant pair.

2. Install one of the following redundancy cables between the transition boards of each redundant ACMx pair. Mate the cable connectors with the J2 Redundancy Connectors on the ACM transition boards.

- Module-to-Module Redundancy Cable ..................... 3.3 Ft. (1 M)
- Rack-to-Rack Redundancy Cable, single cabinet..... 6.6 Ft. (2 M)
- Rack-to-Rack Redundancy Cable, two cabinets ....... 19.7 Ft. (6 M)

NOTE

Refer to Section 3.4.3, Online Redundancy Cable Replacement, regarding the online replacement of a redundancy cable.
2.6.1.2 Serial Port Cables

Serial Ports 1 and 2 are RS-232 industrial (isolated) serial communication ports with a software selected communications rate of between 110 and 250,000 Baud. They provide an interface to the ACMs for serial communications applications and are located on the transition board.

Serial ports can be connected to foreign devices non-redundantly or redundantly. For non-redundant installations, use the ACM Serial Port Cable to Converter, P/N 16137-191. For redundant installations, use the Redundant ACM Serial Port Cable to Converter, P/N 16137-221. For users wishing to fabricate a serial cable, Table 2–1 lists serial pin designations.

Figure 2–4 Redundancy Cable Connection
Table 2–1  ACM® Serial Ports 1 and 2 Pin Assignments

<table>
<thead>
<tr>
<th>PIN #</th>
<th>DESCRIPTION</th>
<th>DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Connection</td>
<td>----------</td>
</tr>
<tr>
<td>2</td>
<td>Transmitted Data (TD)</td>
<td>Output</td>
</tr>
<tr>
<td>3</td>
<td>Received Data (RD)</td>
<td>Input</td>
</tr>
<tr>
<td>4</td>
<td>Data Carrier Detect (DCD)</td>
<td>Input</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground (Common Return)</td>
<td>----------</td>
</tr>
<tr>
<td>6</td>
<td>No Connection</td>
<td>----------</td>
</tr>
<tr>
<td>7</td>
<td>Clear To Send (CTS)</td>
<td>Input</td>
</tr>
<tr>
<td>8</td>
<td>Request To Send (RTS)</td>
<td>Output</td>
</tr>
<tr>
<td>9</td>
<td>Serial Port 2 - Ring Indicator (RI)</td>
<td>Input</td>
</tr>
<tr>
<td></td>
<td>Serial Port 1 - Reserved</td>
<td>----------</td>
</tr>
</tbody>
</table>

2.6.2 Switches

The following subsections provide details for the setting of the Security Enable and Node switches.

2.6.2.1 SECURITY ENABLE Switch Setting

The ACM®’s SECURITY ENABLE Switch and the 4-mation Security function block can be configured to either:

- Protect the data and/or configuration database stored in the ACM® from being changed by any MODULBUS station (i.e. ACM®, CCM, or PC running 4-mation software).

- Allow a transfer to overwrite the data and/or configuration database.

When the SECURITY ENABLE Switch is set to ENABLE and the EN input to the Security function block is true, a level of security will be established. The LED on the ACM® bezel indicates as follows.

- Security is available when the SECURITY LED is Green
- Security in not available when the SECURITY LED is Off
Note that the level of security is determined by the inputs to the Security function block. Refer to the *Using ProcessSuite™ 4-mation Configuration Guide* (CG39-20) to determine the actual protection and LED operation. Set the Security Enable Switch, shown in Figure 2–5, as follows:

1. Place wrist strap on and connect its ground lead to module rack ground stud.

2. Loosen the battery compartment cover screw and open the pivoting cover. The SECURITY ENABLE Switch is located above the DIAG PORT connector.

3. Push the toggle right or left as follows.
   - SECURITY ENABLE – Move the switch to the right, as indicated by the label
   - SECURITY DISABLE – Move the switch to the left

4. Secure the battery compartment cover and disconnect the wrist strap.

5. For redundant ACMx (s), follow the above procedure and set the SECURITY ENABLE Switch on the redundant module. Security is only enabled when both redundant partners have the security switch enabled.
Figure 2–5 SECURITY ENABLE Switch
2.6.2.2 NODE Switch Setting

Every MODULBUS device, such as an ACM\textsuperscript{x}, RIC/ICM, PC with MBI or MNI, RNI/NIM and MBX has an address associated with it. This address consists of the Node, Rack, and Slot identifiers. However, the ACM\textsuperscript{x} is different in that its Node identifier (also called \textit{number} or \textit{address}) is determined by one of the other M-BUS devices. The following subsections describe the procedures used to establish the operational Node number under which an ACM\textsuperscript{x} in a particular local area system will appear.

Proceed to the subsection that describes your specific local area system to determine the correct Node switch setting (0 or 1) on a particular ACM transition board.

\textbf{Systems with an MBX}

If the local area system (LAS) contains an MBX, the Node selector switch on the ACM transition board is ignored (leave it in 0 or 1 position). The ACM\textsuperscript{x} will appear with the same Node address as the MBX.

- The MBX Node address can be set to any number from 1 to 63. Each RNI/NIM, RIC/ICM, and PC with MBI should have its Node set to the same number as that of the MBX in that cluster. A PC with MNI can have the same Node number as the MBX or its own unique Node number; a unique Node number is recommended.

- When using MBXs in Rack-to-Rack redundant systems, the first MBX is set to \textit{N} and the second MBX is set to \textit{N+1}, where \textit{N} is an even number. (e.g. 2/3, 4/5, 6/7). Do not use 00 and 01.

- Do not change the Node address (SNA-System Node Address) when the MBX is powered ACM\textsuperscript{x} (s) will not pick up a change in Node address until the ACM\textsuperscript{x} is fully reinitialized (power down, remove battery).

\textbf{Systems without an MBX}

If the local area system (LAS) does \textbf{not} have an MBX, the ACM\textsuperscript{x}’s Node address will be determined by the Node address of the first client that communicates to it and by the Node selector switch setting on its transition board. This client could be an RIC (or an ICM), PC with MBI, or an RNI (or NIM). Each of these devices has a Node number in the APACS.INI file (“Node=”). The ACM\textsuperscript{x}’s ultimate Node address will depend on the Node address of one of these clients and on the setting of the Node selector switch on the ACM’s transition board (see Table 2–2).

- When an application is started on a client machine that then communicates with the ACM\textsuperscript{x}, the ACM\textsuperscript{x} will use the Node address of the client and its selector switch to determine its operational Node address. Running 4-mation on-line and just opening the module tree is enough to start this process.

- If the application is run from a PC over Ethernet, the Node address of the RNI/NIM is actually used; not that of the PC. However, when setting up the architecture, the PC and RNI/NIM would typically have the same node number; if only for system documentation reasons.
IMPORTANT

The Node switch setting on the ACM transition board determines the ultimate Node address used by the ACMx (with no MBX present). See Table 2–2 to determine an ACMx’s Node address.

Table 2–2 Determining ACMx’s Node Address

<table>
<thead>
<tr>
<th>CLIENT’S NODE ADDRESS</th>
<th>EFFECT OF ACMx NODE SWITCH (when no MBX is present)</th>
<th>EXAMPLES</th>
</tr>
</thead>
</table>
| EVEN (including 0)    | Add the Switch setting to determine the ACMx’s final Node address | 1. Client=4, ACMx Node Switch=0 yields ACMx Node=4  
2. Client=4, ACMx Node Switch=1 yields ACMx Node=5 |
| ODD                   | Switch=0; ACMx Node is one less than client  
Switch=1; ACMx Node equals client | 1. Client=7, ACMx Node Switch=0 yields ACMx Node=6  
2. Client=7, ACMx Node Switch=1 yields ACMx Node=7 |

- An ACM transition board must always be installed for each ACMx, even when redundancy and serial ports are not being used.

- An older ACM transition board without the Node selector switch will operate as if the switch is set to 0.

- For Module-to-Module redundant ACMx(s), the switches should be equal (both 0 or both 1). The criteria in Table 2–2 will still apply in determining the operational Node address of the ACMx.
IMPORTANT

If you need to change the Node number of an ACMx, the ACMx must be fully reinitialized to take on the new Node number. To fully reinitialize the ACMx, pull the ACMx, remove the battery, wait about 1 minute, reinstall the battery, then reinsert the ACMx and Initialize it through initialization.

It is not recommended to change the Node address of an MBX while ACMx(s) are on-line. The ACMx will keep the original Node number and will log an error, System Service Code 28, Error Code 03. You must fully reinitialize the ACMx in order to have it appear with the new Node address.

2.6.3 RAM Battery

The purpose of the RAM battery is to retain configuration contents in memory and real-time clock orientation during power interruptions. The battery MUST be connected just prior to applying power to the ACMx. See Section 6.0 for battery life data.

IMPORTANT

When powered up, a disconnected or failed battery or a battery with a voltage below specifications will cause the ACMx to lose its configuration.

Note the following:

- It is **recommended that the battery be disconnected** to preserve battery life when the module is placed in long term storage or stock.

- The battery is disconnected when a module is shipped from the factory.

To check the status of the battery, and connect the battery if it is disconnected, perform the following steps:

1. Place wrist strap on wrist and connect ground lead to module rack’s ground stud. ESD protection is required when the battery compartment is opened.

2. Loosen the battery compartment cover screw and open the pivoting cover.

3. Refer to Figure 2–5 and note the location of the battery and its plug.

4. If the module’s battery is not connected, orient the keyed plug and push it onto the circuit board connector pins. If the module’s battery is connected, proceed to step 5.

5. Proceed to Section 2.6.2.1 to set the SECURITY ENABLE Switch and close the battery compartment door.
2.7 Configuration

The ACMx and its associated I/O modules must be configured using the 4-mation configuration software along with the appropriate APACS+ software. The 4-mation software runs on an MS Windows-based personal computer (PC). It is a graphical software tool for configuring control, communications, and I/O modules within a APACS+-based process control or safety system. When the configuration is complete, it is to be transferred from 4-mation to the ACMx. Once the configuration is resident within the ACMx, each I/O module’s portion of the configuration is automatically forwarded from the ACMx to the appropriate I/O module. During online operation, the ACMx executes the configuration while controlling the operation of its I/O modules.

There are many computer platforms possible for setting up a 4-mation-based configuration station. Two examples are listed here:

- Run 4-mation on a Rack-mounted Industrial Server (RIS)
- Run 4-mation on a personal computer (PC)

For additional information about 4-mation, refer to the related literature listed in Section 1.4.
3.0 Maintenance

The ACM\textsuperscript{x} and its associated transition board require minimal maintenance. Some routine maintenance is recommended in the form of a visual inspection and a possible cleaning.

<table>
<thead>
<tr>
<th>DANGER</th>
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</tr>
<tr>
<td>Observe all pertinent regulations regarding installation in hazardous area.</td>
</tr>
<tr>
<td>Ensure all devices are rated for hazardous (classified) locations.</td>
</tr>
</tbody>
</table>

3.1 Tool and Equipment Requirements

The following tools and equipment are necessary for servicing:

- Common electronic servicing hand tools.
- Grounded wrist strap to use when replacing a backup battery or opening the battery compartment.
- Safety glasses and rubber gloves to when handling a leaking lithium battery.

3.2 Preventive Maintenance

The following subsections describe the recommended preventive maintenance procedures.

3.2.1 Visual Inspection

The ACM\textsuperscript{x} and its transition board should be inspected periodically. The frequency of inspection will depend on the severity of the operating environment. The primary aim of the inspection is to watch for excessive accumulations of dust, dirt, or other foreign material on the ACM\textsuperscript{x}’s transition board and protective covers. Excessive accumulations impede heat dissipation and may eventually cause module or system failure. The ACM\textsuperscript{x} will alarm on an over-temperature condition long before over-temperature failure can cause permanent damage. If the ACM\textsuperscript{x} is installed in a NEMA 12/IP55 compliant cabinet, the ACM\textsuperscript{x} does not require cleanliness inspections. Refer to Section 3.2.2 for cleaning instructions.

The ACM\textsuperscript{x} status is indicated by LEDs located on its bezel. Refer to Section 3.3.2 for LED indications.
3.2.2 Cleaning

Cleaning a module involves brushing or vacuuming the protective covers to restore cooling efficiency that may have been degraded by accumulated dust.

Cleaning a transition board involves careful brushing and vacuuming to remove accumulated dust and dirt harboring chemical particulate that may accelerate terminal, switch, or connector contact corrosion.
3.3 Troubleshooting

Fault analysis focuses on identifying a failure annunciated by the operator interface, or by status LEDs located on the ACM’s bezel. If the operator interface alarm blocks have been configured, module errors will be reported. The operator can access error code descriptions and recommended corrective actions.

Failure annunciation and fault analysis is also available within 4-mation software (refer to Using the ProcessSuite 4-mation Configuration Software, CG39-20). The on-line display of the Module Tree in 4-mation graphically represents both the hardware modules that comprise a system and the function that hardware performs. There is an entry in the Tree for each module including its node, rack, and slot address.

In the Module Tree, ACM symbols are displayed to the left of the address. When 4-mation is running in the on-line mode, these symbols are displayed in one of three colors, depending upon a module’s state of operation:

- Red – Indicates a module which is not initialized
- Yellow – Indicates a module which is initialized but not configured
- Green – Indicates a configured module

The ACM address text (e.g. [R01,S02] ) is displayed in one of four colors, based on error status:

- White – error information could not be obtained from the module
- Red – the module has errors
- Green – the module does not have errors
- Yellow – the resource module does not have errors, but it’s I/O module(s) do have errors

Once a fault is identified, correct the fault by replacing the failed ACM with a known good module and return the failed ACM to one of the addresses in the warranty statement for repair.

3.3.1 Typical ACM Error Codes

Table 3-1 lists typical error codes associated with ACM (s). This list is similar to the ACM+. For a detailed description of all module error codes, refer to ProcessSuite Module Diagnostic Error Codes (CG39-19).
### Table 3–1 Typical Error Codes

<table>
<thead>
<tr>
<th>System Service Code</th>
<th>Error Code</th>
<th>Error Description</th>
<th>User Action</th>
</tr>
</thead>
</table>
| 28 - Common         | 01 - Battery Low | Class: 1  
Scope: Module  
System Response: None | 16 - Replace battery in module |
| Resource Misc       |             | The battery test diagnostic detected that the battery is low. It should be replaced to allow for retention of data through power outages. The board will continue to run. |                                            |
| 28 - Common         | 02 - Over temperature | Class: 2  
Scope: Module  
System Response: Output Fault State | 15 - Check ambient temperature at module |
| Resource Misc       |             | Indicates when temperature of the module is too high |                                          |
| 28 - Common         | 03 - Node Number Changed | Class: 2  
Scope: System  
System Response: None | 25 - Check M-Net; node address has unexpectedly changed on MBX |
| Resource Misc       |             | Indicates that the node number has changed since the module was first powered up. |                                           |
| 28 - Common         | 04 - ACM Code CRC/Checksum Error | Class: 4  
Scope: System  
System Response: None | 29 - Re-install software to controller |
| Resource Misc       |             | A CRC/Checksum test resulted in a failure when it was performed on the Controller Operating System Code. |                                             |
| 28 - Common         | 19 - Battery Not Installed | Class: 1  
Scope: Module  
System Response: None | 16 - Replace battery in module |
<p>| Resource Misc       |             | A test has determined that there is no battery connected or the battery has failed. This test does NOT put a load on the battery. |                                         |</p>
<table>
<thead>
<tr>
<th>System Service Code</th>
<th>Error Code</th>
<th>Error Description</th>
<th>User Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 - ACM/CCM Specific</td>
<td>01 - Software Flow Error--Task out of Order</td>
<td>Class: 4 Scope: Module Shutdown Controller Manual Clear Allowed A software task in the CCM/ACM was either skipped or executed out of order.</td>
<td>12 - Monitor module for Repeated Failure</td>
</tr>
<tr>
<td>08 - ACM/CCM Specific</td>
<td>02 - Software Flow Error--Task Timeout</td>
<td>Class: 4 Scope: Module Shutdown Controller Manual Clear Allowed A CCM/ACM software task was improperly started, failed to finish, or took too long to complete. Under normal conditions, this error may occasionally be reported after the module is powered up.</td>
<td>12 - Monitor module for Repeated Failure</td>
</tr>
<tr>
<td>08 - ACM/CCM Specific</td>
<td>03 - Invalid Flow Controller Type</td>
<td>Class: 4 Scope: Module Shutdown Controller Manual Clear Allowed Flow Controller software was initialized using invalid parameters, which suggests software failure.</td>
<td>29 - Re-install software to controller</td>
</tr>
<tr>
<td>08 - ACM/CCM Specific</td>
<td>09 - Infinite Loop Detected</td>
<td>Class: 4 Scope: Module Manual Clear Allowed The controller has detected an Infinite Loop in a structured text algorithm. The sheet/action that has the infinite loop is currently disabled and is not being processed. In order to clear this error and begin processing this sheet/action again, fix or remove the infinite loop and download the sheet/action again. In order to find out which sheet/action has the infinite loop, check the extra information found through the Diagnostic Logger.</td>
<td>63 - See error code description for user action</td>
</tr>
<tr>
<td>System Service Code</td>
<td>Error Code</td>
<td>Error Description</td>
<td>User Action</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>27 – Redundancy</td>
<td>01 - Redundant Switchover Occurred</td>
<td>Class: 1 Quality: Not Affected System Response: None A redundant switchover occurred. The switch could be caused by one the following: failure of primary controller, difference in error counts, breaking of primary I/O loop, or forced by the user via the function block.</td>
<td>00 - No action required</td>
</tr>
<tr>
<td>27 - Redundancy</td>
<td>02 - Fast Redundant Switchover Occurred</td>
<td>Class: 1 Quality: Not Affected System Response: None A fast redundant switchover occurred. The fast switchover is performed using the I/O loop and redundant OK interrupts and can only take place after the first major I/O error in the system.</td>
<td>00 - No action required</td>
</tr>
<tr>
<td>27 - Redundancy</td>
<td>03 - Redundancy not in operation</td>
<td>Class: 1 Quality: Not Affected System Response: None Redundancy is not in operation. This may be due to the backup not being installed, the backup having failed, or some error in the redundancy hardware such as the redundancy cable.</td>
<td>34 - Check and/or replace the redundant backup.</td>
</tr>
<tr>
<td>27 - Redundancy</td>
<td>09 - Fatal redundant communications fault</td>
<td>Class: 1 Quality: Not Affected System Response: None Too many communications errors have occurred on the redundancy bus. Redundancy is terminated. Note that this error will occur as a result of most fatal redundancy errors and may not indicate bad communications alone.</td>
<td>34 - Check and/or replace the redundant backup.</td>
</tr>
<tr>
<td>27 - Redundancy</td>
<td>40 - Serial Port 1 Failed, Confirm Problem</td>
<td>Class: 3 Quality: Not Affected System Response: None Serial Port 1 has failed to receive messages that the partner has received. Possible problems may be: ACM module failed, Serial Port cabling or Interface Converter failed.</td>
<td>63 - See error code description for user action</td>
</tr>
<tr>
<td>System Service Code</td>
<td>Error Code</td>
<td>Error Description</td>
<td>User Action</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>27 - Redundancy</td>
<td>51 - Redundancy Bus Communications Failure</td>
<td>Class: 4 Scope: Module Quality: Not Affected System Response: None Manual Clear Allowed Redundant controllers have failed to successfully communicate with each other for over 24 hours</td>
<td>18 - Replace module immediately</td>
</tr>
<tr>
<td>27 - Redundancy</td>
<td>56 - Redundant Configurations Do Not Match</td>
<td>Class: 4 Scope: System Quality: Not Affected System Response: None Manual Clear Allowed When in secure mode, the configuration data is compared between redundant controllers. This check failed. The entire database should be retransferred. The error should be manually cleared. If it occurs again, replace module.</td>
<td>30 - Re-transfer data base in system</td>
</tr>
</tbody>
</table>
### 3.3.2 Bezel LEDs

Three LEDs on the ACM\(^x\) bezel show module status as indicated in Table 3-2.

**Table 3–2 ACM\(^x\)  Status LED Indications**

<table>
<thead>
<tr>
<th>LED LABEL</th>
<th>LED INDICATION</th>
<th>ACM(^x) STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>Steady GREEN</td>
<td>ACM(^x) OK</td>
</tr>
<tr>
<td></td>
<td>Flashing GREEN</td>
<td>ACM(^x) not configured</td>
</tr>
<tr>
<td></td>
<td>Steady RED</td>
<td>ACM(^x) control functions inoperative</td>
</tr>
<tr>
<td></td>
<td>Flashing RED</td>
<td>ACM(^x) control functions partially operative</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>ACM(^x) input power fault</td>
</tr>
<tr>
<td>ACTIVE</td>
<td>Steady GREEN</td>
<td>ACM(^x) in control; lit on active ACM(^x) of redundant pair</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>ACM(^x) in backup state or control functions inoperative if OK LED is steady RED</td>
</tr>
<tr>
<td>SECURITY</td>
<td>Steady GREEN</td>
<td>Security enabled; cannot download to ACM(^x)</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Security disabled; can download to ACM(^x)</td>
</tr>
</tbody>
</table>

### 3.3.3 Diagnostic Port

A diagnostic port is located in the bezel battery compartment. It is an engineering and manufacturing port. It is not a field troubleshooting port.
3.4 ACMx Removal/Replacement

A module can be removed from or installed in the rack without removing power from the module slot, from I/O circuits, or from the rack.

3.4.1 ACMx Removal

Remove the ACMx as follows:

1. As shown in Figure 2–3, pull open bezel’s pivoted top and bottom handles to expose the module’s slotted captive mounting screws. Loosen the screws.

2. Grasp the top and bottom handles and pull the module from the card cage.

3. Place the module in a static shielding bag and package for return (see Section 2.4.6). Disconnect the battery for long term storage.

3.4.2 ACMx Replacement

Replace the ACMx as follows:

1. Remove the replacement ACMx from its protective bag. Its protective covers permit the ACMx to be handled without a grounded wrist strap. Connect the battery before applying power (see Section 2.6.3).

2. Insert the module in its MODULRAC slot. Firmly seat the module in the back plane and termination board connectors. A properly seated module will have the rear of its bezel flush against the MODULRAC housing rails.

**NOTE**

A keyed module that is not matched to a slot will not engage the back plane or termination board connectors or seat flush against the MODULRAC housing’s front rails.

3. As shown in Figure 2–3, pull open bezel’s pivoted top and bottom handles to expose the module’s slotted captive mounting screws and secure the module to the top and bottom rails. Close the bezel’s handles when finished.

**CAUTION**

Do not use the captive mounting screws to seat the module. Doing this may damage the bezel.
4. Set the Security Enable switch as described in Section 2.6.2.1.

3.4.3 Online Redundancy Cable Replacement

1. Remove the backup (verify) controller
2. Remove the old cable from the primary (calculate) termination strip.
3. Remove the old cable from the backup (verify) termination strip.
4. Insert and screw down the new cable to the backup (verify) termination strip.
5. Insert and screw down the new cable to the primary (calculate) termination strip.
6. Insert the backup (verify) controller.

3.5 ACM\textsuperscript{x} Upgrade

If you have redundant controllers or a non-redundant controller running, and you wish to upgrade to ACM\textsuperscript{x} controllers, it is necessary to go through the following steps:

1. Ensure the ACM\textsuperscript{x} software and all necessary libraries (such as SOER, MODBUS, etc. - only if these are employed in one or more of your configurations) are installed on the engineering station.

2. Identify the configurations that will be upgraded to ACM\textsuperscript{x} controllers.

3. Export these configurations. (See Updating an Existing Configuration to a New Release in document no. CG39-20, Using the ProcessSuite 4-mation Configuration Software.)

4. Create new offline configuration files and add the appropriate ACM\textsuperscript{x} controllers at the respective node rack, slot address. Also configure redundancy to match the online configuration.

5. Select the first offline ACM\textsuperscript{x} controller and import the appropriate configurations. Please note that this will import all function blocks from the main library and any other installed libraries (you may choose to delete unused function blocks - please refer to the APACS+ 4-mation help file topic, Maximizing Available ACM Memory - Unused Function Blocks).

\begin{center}
\textbf{CAUTION}
\end{center}

Do not copy and paste logic between ACM+ and ACM\textsuperscript{x}.

Export/Import 4-mation database must be performed if ACM+ configurations are to be transferred into ACM\textsuperscript{x}.

6. Repeat these steps for the remaining controllers.
7. To upgrade the controllers, the controllers must be removed (for a redundant system, both must be removed).

\[\text{\textbf{CAUTION}}\]

Do not mix ACM\textsuperscript{x} modules with ACM\textsuperscript{+} modules as redundant partners.

8. Insert the replacement controllers in the rack.

9. Open the online system and identify the new ACM\textsuperscript{x} controllers, which should show up with a red refrigerator unless it was previously initialized. (If the online system was already open, you may need to perform a rescan by pressing F2).

10. Open the offline configurations for the ACM\textsuperscript{x} controllers (created in steps 1 through 6)

11. Transfer the respective offline configurations to the online controllers. This will also initialize the controller with the ACM\textsuperscript{x} code. You also may choose to employ the resource initialization utility to speed up this process depending upon the number of controllers that you have.

\[\text{\textbf{CAUTION}}\]

Do not transfer configurations between ACM\textsuperscript{+} and ACM\textsuperscript{x} (unless the export/import database utility is completed first).

\[\text{\textbf{NOTE}}\]

Redundancy should be set prior to transferring a configuration to it. (Changing the redundancy mode clears the configuration and would have to be redownloaded.)


3.6 Transition Board Removal/Replacement

3.6.1 Removal

Refer to Figure 2–2 and the following removal procedure:

1. As necessary, take appropriate steps to shutdown the processes monitored or controlled by the field devices controlled by the ACMx.

2. Remove the associated ACMx from its slot in the module rack; see Section 3.4.1. Place the module in a static shielding bag for protection.

3. Remove redundancy and serial port cables from the transition board.

   IMPORTANT

   All cables should be labeled for correct reconnection.

4. Loosen the transition board’s captive mounting screws. Gently lift the bottom of the board in an arc until the board is free of its alignment pin located immediately above the Siemens logo. Pull the top of the transition board from the grooved back plane spacer and lift it from the module rack.

3.6.2 Replacement

Refer to Figure 2–2 and the following replacement procedure:

1. Refer to Section 2.5.1 and install the replacement transition board.

2. Reconnect redundancy and serial port cables.

3. Install the ACMx as described in Section 3.4.2.

   IMPORTANT

   Be sure that the battery is connected. Refer to Section 3.7.1 for the connection procedure.
3.7 Component Replacement

3.7.1 RAM Battery Replacement

A 3.6V lithium battery is housed in the module’s bezel battery compartment. When power is removed from the ACMx, the battery maintains ACMx memory (RAM) to retain the configuration. Only factory authorized replacement batteries should be used.

The memory circuits and battery test circuits have a tighter tolerance in the ACMx, and the 'bad battery' threshold has changed to a higher value. The "battery low" error (28:01) is no longer reported in ACMx. The "battery not installed" error (28:19) will be reported when it is time to replace the battery. This error also means that the battery test has failed, just as in previous modules. After reporting 28:19, the ACMx database cannot be saved on a power cycle. Keep a spare battery available.
Replace a battery as follows:

1. To protect the ACMx from electrostatic discharge, snap on a wrist strap and connect its ground lead to the ground stud on the module rack panel.

2. Loosen the bezel compartment screw and open the door. See Figure 2–5.

3. Unplug the battery; note how the connector is keyed.

4. Pull the battery from the compartment. A cloth hook and loop fastener secures the battery.

5. The replacement battery is supplied with a new hook and loop fastener. Separate the fastener halves.

6. If the compartment-mounted portion of the fastener is damaged, remove it and install the separated fastener half.

7. Mount the new RAM battery in the compartment.

8. Orient the keyed battery connector and plug it into the circuit board mounted connector.

9. Close and secure the battery compartment door. Remove the wrist strap.

**WARNING**

Be advised of the following with regard to handling lithium batteries:

- Properly dispose of a removed battery.
- Do not burn a battery.
- Do not short circuit battery terminals.
- Do not attempt to charge the battery.
- If battery electrolyte leaks, wear safety glasses and rubber gloves to avoid exposure.
3.8 Software Compatibility

The ACMx has two nameplate labels: a large label, shown in Figure 2-1, and a small label inside the battery compartment on the back of the door. Both labels contain the module’s software compatibility as well as the model designation, part number, and serial number.

Observe the following guidelines to ensure software compatibility between ACMx (s):

- **Module-to-Module Redundancy** – Both ACMx (s) should have the same software level installed.
- **Rack-to-Rack Redundancy** – Both ACMx (s) should have the same software level installed.
- **Spare ACMx (s)** – The software level of modules in service and those reserved as spares should agree.

The software version of the operating system and the database can be obtained by opening the online controller program using 4-mation.
3.9 Spare and Replacement Parts

One spare ACM® and battery should be stocked for every 1 to 10 in service. Spare and replacement parts can be ordered from one of the addresses in the Warranty statement or through a local Siemens representative.

Assembly part numbers are provided in Section 1 and printed on most modules and associated hardware. The battery part number is listed as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery, 3.6 V</td>
<td>14743-2</td>
</tr>
</tbody>
</table>

When ordering, provide the model number, part number, serial number, and software compatibility identification code from the module to be replaced or spared. A purchase order number should also be included.

**WARNING**

Be advised of the following with regard to storing a Lithium Battery:
- Store the battery in original shipping container
- Do not store battery loosely in a metal bin or short circuit battery terminals
- Store a battery in a cool well-ventilated area
- Maximum storage temperature should not exceed 85 °C (185 °F)

**IMPORTANT**

When placing an ACM® in spare parts stock, unplug the battery connector. This will extend battery life. Refer to Section 3.7.1 for the procedure. Also, cooler storage temperatures extends battery life.
3.10 Maintenance Records

An accurate recordkeeping system for tracking maintenance operations should be established and kept up to date. Data extracted from the record may serve as a base for ordering maintenance supplies, including spare parts. The record may also be useful as a troubleshooting tool. In addition, maintenance records may be required to provide documentary information in association with a service contract. It is suggested that the following information be recorded:

- Date of service incident
- Name or initials of service person
- Brief description of incident symptoms and repairs performed
- Replacement part or assembly number
- Software compatibility code of original part
- Software code of replacement part
- Serial number of original part
- Serial number of replacement part
- Issue number of original circuit module
- Issue number of replacement circuit module
- Date of completion
4.0 Circuit Description

This section provides a brief circuit description of the Advanced Control Module Plus (ACM\textsuperscript{x}). See Figure 4–1 and Figure 4–2.

4.1 ACM\textsuperscript{x} Functional Elements

Functionally, the ACM\textsuperscript{x} consists of the following elements:

- MCF5407 Central Processing Unit (CPU)
- 68302 Peripheral Controller
- 68824 Token Bus Controller
- IOBUS Modem with redundant drivers
- MODULBUS Modem with redundant drivers
- Redundant 4 or 8 megabyte battery-backed RAM
- 512 kilobytes of Boot Flash ROM
- 1 megabyte (operating system) Flash ROM
- Dual Direct Memory Access (DMA) RS-232 Serial Communication Ports
- Watchdog Timer

The MCF5407 CPU core operates at 200 MHz while its external bus operates at 50 MHz. The CPU provides code compatibility with the 68000-based logic and controller devices, while offering the computing power of a 32-bit architecture with instruction and data caches. Since the MCF5407 core processor operates so much faster, a floating-point coprocessor is not necessary.

4.2 Watchdog/Reset Circuit

During ACM\textsuperscript{x} power-up, the Reset circuit generates a system reset while the IC supply voltages from the on-board power supplies are rising to their operating values. During operation of the ACM\textsuperscript{x}, if at any time the IC supply voltages drop below minimum values, the Power Fail circuit generates an interrupt allowing the CPU to protect the RAM from invalid access during a power supply failure.

The Watchdog Timer is periodically triggered by software. It is configurable. If a software failure occurs and the Watchdog Timer does not receive its expected trigger signal, it “times out” based on its time out value setting and resets the module.
4.3 Memory

The ACMx has redundant banks of either 4 megabyte or 8 megabyte battery-backed RAM, 512K bytes of Boot Flash ROM, and 1 megabyte of Flash ROM.

4.3.1 RAM

The 4 megabyte or 8 megabyte RAM banks are redundant for detecting RAM errors. RAM write operations from the MCF5407 CPU are performed on both RAM banks. During RAM read operations by the CPU, only one bank is read while the other is used for comparison in a hardware compare circuit. Any discrepancy between the two RAM banks is considered a fault and is reported to the CPU.

The ACMx’s configuration code is transferred to it from a 4-mation workstation or a redundant unit. In either case, the configuration is stored in the module’s RAM. A 3.6 Volt lithium RAM backup battery maintains the RAM contents when power is removed from the module. A weak or disconnected battery is detected and reported by the module’s diagnostic software.

4.3.2 Flash ROM

The ACMx’s executable code is stored in its Flash ROM. The non-volatility of Flash ROM is such that its contents are retained when power is removed from the module.

4.3.3 Boot Flash ROM

The ACMx’s operating instructions are stored in a 512 kilobyte Boot Flash ROM.

4.4 Serial Ports

The ACMx’s serial ports are routed through the module’s companion transition board. They are intended for direct connections to the COM port of a personal computer. Connection to a printer requires a null modem cable (an RS-232 cable used to connect two devices together for file transfer. It attaches to the serial ports of both machines and crosses the sending wire with the receiving wire). The module’s on-board Peripheral Controller and RS-232 line driver/receiver circuits control each serial port.

4.5 MODULBUS

MODULBUS (M-BUS) elements consist of a Token Bus Controller (TBC), modem, and line drivers/receiver circuits.

The TBC is an intelligent peripheral device that operates under the supervision of the Peripheral Controller. The TBC implements the media access control portion of the IEEE 802.4 token passing bus standard. The TBC communicates serially with the modem, which is interfaced to MODULBUS through dual line driver/receiver circuits.
The TBC performs the following functions:

- Manages the ordered access to the token bus medium (MODULBUS)
- Provides a means for the admission and deletion of I/O modules
- Handles fault recovery

The modem does the following:

- Converts received MODULBUS data into a form compatible for data processing
- Converts serial data from the TBC into a form compatible for transmission over the MODULBUS

### 4.6 IOBUS

The IOBUS elements consist of an IOBUS modem and dual IOBUS line drivers/receivers. The 68302 Controller supervises IOBUS communications through handshaking operations with the IOBUS modem. The modem and dual line drivers/receivers perform the same tasks as described for the M-BUS modem and line drivers/receivers.

### 4.7 Small Computer System Interface (SCSI) and Redundancy

The SCSI redundancy port elements consist of a redundancy switchover circuit and an SCSI bus interface controller. The peripheral controller supervises redundant switchover and the SCSI bus.

Redundant ACMs (s) (rack-to-rack) communicate with each other over the high-speed SCSI bus. The SCSI bus controller interfaces the peripheral controller to the SCSI bus. SCSI bus communications are the exchange of I/O and diagnostic data between the primary and backup ACMs (s).

A primary-to-backup ACM switchover occurs in one of the following three ways:

- An operator can initiate a switchover if the Redundancy Control Function Block is configured (see the APACS+ 4-motion Configuration Guide).

- The standby ACM receives and stores all IOBUS data while in the standby mode. An exchange of data is made over the SCSI bus so both ACMs (s) can confirm and compare the others received data. If the data received by the backup from the active ACM contains any data-check error flags posted by the active ACM, a switchover is initiated by the standby.

- The active ACM sends an OK flag to the standby ACM as part of the exchange of diagnostic information. The OK flag indicates the ACM is functioning normally as a controller. If the active ACM’s onboard diagnostics detects a fault affecting ACM control, a NOT-OK flag is posted and the backup initiates a switchover.
5.0 Model Designation

Refer to Figure 5-1 to decode the model designation.

IMPORTANT

Before installing, applying power, or servicing, review the model designation on the nameplate and this section for required power, options, and electrical classification.

![Model Designation Diagram]

Figure 5–1 Model Designation

5.1 Accessories

Refer to Table 5-1 for the list of available ACMx accessories. Redundancy is briefly discussed in section 2.2.2, Preparations. A typical redundancy cable is illustrated in Figure 2–4. RAM battery installation and setup is described in section 2.6.3.

Table 5–1 ACMx Accessories

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>P/N 16137-221</td>
<td>Redundant ACMx Serial Port Cable to Converter</td>
</tr>
<tr>
<td>P/N 16137-191</td>
<td>ACMx Serial Port to Converter</td>
</tr>
<tr>
<td>P/N 16137-189</td>
<td>Redundancy Cable 3.3 ft. (1 m)</td>
</tr>
<tr>
<td>P/N 16137-188</td>
<td>Redundancy Cable 6.6 ft. (2 m)</td>
</tr>
<tr>
<td>P/N 16137-144</td>
<td>Redundancy Cable 19.7 ft. (6 m)</td>
</tr>
<tr>
<td>P/N 14743-2</td>
<td>RAM Battery, 3.6 V Lithium</td>
</tr>
</tbody>
</table>

5.2 Options

The only available option for the ACMx is the P/N 16147-51 Transition Board with NODE Switch. This board is illustrated in Figure 1–1 and its installation is described in Section 2.5.1.
# 6.0 Specifications

This section lists specifications for the APACS+ eXelerated Advanced Control Module (ACMx) Models 39ACM34AAN and 39ACM38AAN.

## 6.1 Module Specifications

Table 6-1 lists module specifications.

### Table 6–1  ACMx Module Specifications

<table>
<thead>
<tr>
<th>Category</th>
<th>Specification</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>Module Weight</td>
<td>4.5 lbs. (2.04 kg)</td>
</tr>
<tr>
<td></td>
<td>Supply Voltage</td>
<td>24 Vdc ± 10% (from MODULRAC/SIXRAC backplane)</td>
</tr>
<tr>
<td></td>
<td>Supply Input Current</td>
<td>0.27 Ampere typical</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.35 Ampere maximum</td>
</tr>
<tr>
<td></td>
<td>Power Dissipation</td>
<td>8.3 Watts ± 10%</td>
</tr>
<tr>
<td></td>
<td>CPU</td>
<td>MCF5407</td>
</tr>
<tr>
<td></td>
<td>Clock Speed</td>
<td>50 MHz (bus operations)</td>
</tr>
<tr>
<td></td>
<td>Internal Caches</td>
<td>16KB Instruction; 8KB Data</td>
</tr>
<tr>
<td>Electrical</td>
<td>I/O Coprocessor</td>
<td>68302 CPU</td>
</tr>
<tr>
<td></td>
<td>Real-Time Clock</td>
<td>Battery-backed</td>
</tr>
<tr>
<td></td>
<td>Memory</td>
<td>Redundant 4 Mb or 8 Mb RAM, battery-backed</td>
</tr>
<tr>
<td></td>
<td>Battery Life Expectancy:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ACMx in powered rack</td>
<td>10 Years</td>
</tr>
<tr>
<td></td>
<td>• Storage w/battery disconnected</td>
<td>10 Years @ 23 degrees C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.5 Years @ 71 degrees C</td>
</tr>
<tr>
<td></td>
<td>• Storage w/battery connected</td>
<td>8.5 Years @ 85 degrees C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Month</td>
</tr>
<tr>
<td></td>
<td>Communication Buses:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Backplane</td>
<td>Redundant MODULBUS interface</td>
</tr>
<tr>
<td></td>
<td>• I/O</td>
<td>Redundant IOBUS interface</td>
</tr>
<tr>
<td></td>
<td>• Serial Ports 1 and 2</td>
<td>RS-232, 110 to 250,000 baud (software selected)</td>
</tr>
</tbody>
</table>
6.2 Environmental Specifications

Table 6-2 lists the ACM\textsuperscript{e} EMC specifications and Table 6–3 the temperature and humidity specifications.

**Table 6-2 Electromagnetic Compatibility (ECM) Specifications**

<table>
<thead>
<tr>
<th>SPECIFICATON</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN55011, Radiated Emissions</td>
<td>30 to 230 MHz, 30 db (µV/m) at 30 m</td>
</tr>
<tr>
<td></td>
<td>230 to 1000 MHz, 37 db (µV/m) at 30 m. Requires RF shielded cabinet and accessories per Technical Construction File.</td>
</tr>
<tr>
<td>Immunity, Electrostatic Discharge (ESD) susceptibility: EN 61000-4-2</td>
<td>Contact discharge: 8 kV, Air discharge: 15 kV air</td>
</tr>
<tr>
<td>Immunity, Radiated Electromagnetic: Field (RFI) ENV 50140</td>
<td>10 V/m @ 80 to 1000 MHz</td>
</tr>
<tr>
<td>Immunity, Power Lines Fast Transients EN 61000-4-4</td>
<td>+/- 2 kV Criteria A</td>
</tr>
<tr>
<td>Immunity, Conducted Electromagnetic: Field (RFI) ENV 50141</td>
<td>0.15 to 80 MHz, 10 V.</td>
</tr>
</tbody>
</table>
### Table 6–3 ACM Environmental Specifications

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature and Humidity:</td>
<td></td>
</tr>
<tr>
<td>Cooling IEC Class</td>
<td>Convection only</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>Bx</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>-25 to 70 °C (-13 to 158 °F), measured 0.25” below rack</td>
</tr>
<tr>
<td>Maximum Moisture Limits</td>
<td>5 to 95% non-condensing</td>
</tr>
<tr>
<td></td>
<td>0.028 lb water/lb air</td>
</tr>
<tr>
<td>Storage Temperature &amp; Humidity:</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>-25 ° to 85 °C (-13 to 185 °F)</td>
</tr>
<tr>
<td>Humidity</td>
<td>0 to 100% condensing</td>
</tr>
<tr>
<td>Allowable Enclosure External Temperature and Humidity:</td>
<td></td>
</tr>
<tr>
<td>External Temperature</td>
<td>-25 to 50 °C (-13 to 122 °F)</td>
</tr>
<tr>
<td>External Humidity</td>
<td>0-100% condensing</td>
</tr>
<tr>
<td>Corrosive Atmosphere</td>
<td>ISA-S71.04 Class G3</td>
</tr>
</tbody>
</table>

### 6.3 Electrical Classification

This section provides certification agency ratings and hazardous locations precautions.

#### 6.3.1 Approvals

Table 6–4 lists agency approvals.

**IMPORTANT**

Before installing, applying power to, or servicing an ACM, see the module’s nameplate for electrical classification.
Table 6–4 Agency Approvals

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>STANDARD</th>
<th>STANDARD TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM</td>
<td>FM Class 3611</td>
<td>FM approved for use in Class I, Division 2, Groups A,B,C,D Hazardous Locations, Temperature Code T4A @ 70°C</td>
</tr>
<tr>
<td>CSA</td>
<td>C22.2 No.213</td>
<td>CSA Certified for use in Class I, Division 2, Groups A,B,C,D Hazardous Locations, Temperature Code T4A @ 70°C</td>
</tr>
<tr>
<td>UL</td>
<td>UL508</td>
<td>Listed Industrial Control Equipment</td>
</tr>
</tbody>
</table>

CE marked

ABS Type Approved

6.3.2 CSA Hazardous Locations Precautions

This section provides CSA hazardous location precautions that should be observed by the user when installing or servicing the equipment described in this Instruction. These statements supplement those given in the preceding section.

DANGER

Explosion hazard

Will cause death, serious injury or property damage

- In potentially hazardous atmosphere, remove power from equipment before connecting or disconnecting power, signal, or other circuit, or extracting/inserting module.
- Observe all pertinent regulations regarding installation in hazardous area.
- Ensure all devices are rated for hazardous (classified) locations.
6.3.2.1 Precautions - English

For Class I, Division 1 and Class I, Division 2 hazardous locations:

Use only factory-authorized replacement parts. Substitution of components can impair the suitability of this equipment for hazardous locations.

For Division 2 hazardous locations:

When the equipment described in this Instruction in installed without safety barriers, the following precautions should be observed. Switch off electrical power at its source (in non-hazardous location) before:

- Connecting or disconnecting power, signal, or other wiring
- Replacing a fuse, circuit board, or any other component connected to the electrical circuit

6.3.2.2 Précautions - Français

Emplacements dangereux de classe I, division 1 et classe I, division 2:

Les pièces de rechange doivent être autorisées par l'usine. Les substitutions peuvent rendre cet appareil impropre à l'utilisation dans les emplacements dangereux.

Emplacement dangereux de division 2:

Lorsque l'appareil décrit dans la notice ci-jointe est installé sans barrières de sécurité, on doit couper l'alimentation électrique a la source (hors de l'emplacement dangereux) avant d'effectuer les opérations suivantes:

- Branchement ou débranchement d'un circuit de puissance, de signalisation ou autre
- Replacement d'un fusible, d'une carte de circuit imprimé ou de tout autre élément connecté au circuit électrique.

6.4 Electromagnetic Compatibility (EMC)

This product has been tested per the European Union’s EMC Directive. See the Declaration of Conformity statement at the back of this Instruction. Refer to Section 2.2.1 for considerations affecting EMC compliance.
EC Declaration of Conformity

Manufacturer: Siemens Energy & Automation, Inc.
Address: 1201 Sumneytown Pike, Spring House, PA 19477
Product: ACM3 Advanced Controller Module
CCM3 Critical Controller Module

The product described above, when marked with the CE mark, is in conformity with the provisions of the following European Directives:


Spring House, 22 January 2004

[Signature]
John J. Sweeney, Approvals Coordinator

[Signature]
Peter F. Schiano, Manager, PAS R & D, Spring House, PA

Annex A is part of this declaration
Annex A to the EC Declaration of Conformity

Conformance to the directives indicated on page 1 is assured through the application of the following standards, certifications and assessments.

**Directive 89/336/EC  Electromagnetic Compatibility**

Conformance to directive 89/336/EC is based on conformance with the following standards:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 50081-2</td>
<td>1993</td>
<td>Electromagnetic compatibility - Generic emission standard – Part 2: Industrial environment</td>
</tr>
<tr>
<td>EN 61000-6-2</td>
<td>2001</td>
<td>Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments</td>
</tr>
</tbody>
</table>