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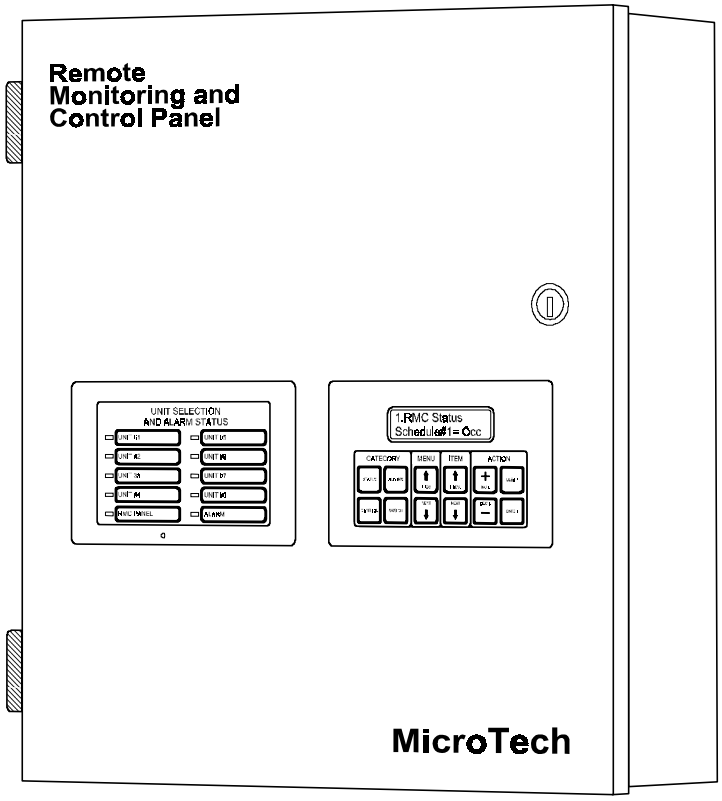
Group: **Controls**

Part Number: **573384Y**

Date: **February 1998**

MicroTech®
Remote Monitoring and Control Panel

Applied Rooftop and Self-contained Air Conditioning Systems
For Use With McQuay Models RPS, RFS, RCS, RDT, RHS, RWS, RAH, SWP & SWT



a0177

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Introduction

This manual provides information about the MicroTech® Remote Monitoring and Control (RMC) Panel for McQuay RoofPak® applied rooftop systems and McQuay self-contained air conditioning (SCAC) systems. It describes the RMC Panel's components, field wiring requirements, network commissioning procedures, and service procedures.

Table 1. MicroTech Unit Controller Installation Literature

Unit Type	Installation & Maintenance Data Bulletin Number
Applied Rooftop	IM 483
SCAC	IM 608

Table 2. MicroTech Unit Controller Operation Literature

Unit Type	Unit Control Configuration	Operation Manual Bulletin Number
Applied Rooftop	Variable Air Volume	OM 108
	Constant Air Volume, Zone Temperature Control	OM 109
	Constant Air Volume, Discharge Temperature Control	OM 110
SCAC	Variable Air Volume & Constant Air Volume, Discharge Temperature Control	OM 123
	Constant Air Volume, Zone Temperature Control	OM 124

For a description of operation and information on using and programming the MicroTech RMC Panel, refer to Bulletin No. OM 121, *MicroTech Remote Monitoring and Control Panel*. For specific information about the MicroTech unit controllers, refer to the appropriate MicroTech unit controller installation or operation manual (see Tables 1 and 2). For installation and commissioning instructions and general information on a particular unit, refer to its model-specific installation manual (see Table 3).

Table 3. Model-Specific Unit Installation Literature

Unit Model	Installation & Maintenance Data Bulletin Number
RPS (45–135 Tons)RFS (45–135 Tons)RCS (45–135 Tons)	IM 485
RDT	IM 486
RAH	IM 487
RPS (18–40 Tons)RFS (18–40 Tons)RCS (18–40 Tons)RWSRHS	IM 157
SWP	IM 550
SWT	IM 623

⚠ WARNING

Electric shock hazard. Can cause personal injury or equipment damage.

This equipment must be properly grounded. Connections and service to the MicroTech control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

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⚠ CAUTION

Static sensitive components. A static discharge while handling electronic circuit boards can cause damage to the components.

Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

⚠ CAUTION

Unit isolation dampers required. Can cause improper system operation.

VAV units connected to a common supply duct must be isolated from the system with isolation dampers when their fans are off. If this is not done, air can flow back through a disabled unit, reducing duct pressure and potentially reducing or increasing the supply air temperature enough to cause operational units to shut down.

NOTICE

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense. **McQuay International disclaims any liability resulting from any interference or for the correction thereof.**

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General Description

The MicroTech Remote Monitoring and Control (RMC) Panel is a microprocessor-based controller designed to provide remote monitoring and multiple-unit control for up to eight MicroTech-equipped applied rooftop or self-contained air conditioning (SCAC) units via network communications. The RMC Panel's multiple-unit control capabilities include common duct static pressure control and common Control Temperature distribution for groups of two to eight units. (The Control Temperature can be either space or return temperature.) The RMC Panel also includes four schedules, which can be individually assigned to any single unit or combination of units.

A 12-key keypad and a 2-line by 16-character display give you access to the RMC controller's status information, setpoints, control parameters, alarm messages, and schedules. With a special keystroke combination, the RMC Panel's keypad/display can emulate any unit's keypad/ display. The controller includes password protection to protect against unauthorized or accidental setpoint or parameter changes.

The RMC Panel and its associated units can operate together in a complete, "stand-alone" network, or they can be incorporated into a larger network that includes a MicroTech Network Master Panel (NMP) and other MicroTech controllers. In either case, an IBM® compatible computer containing MicroTech Monitor™ software can be connected to give you full-screen monitoring and control capability. The computer can be connected directly or remotely via telephone lines with an optional modem.

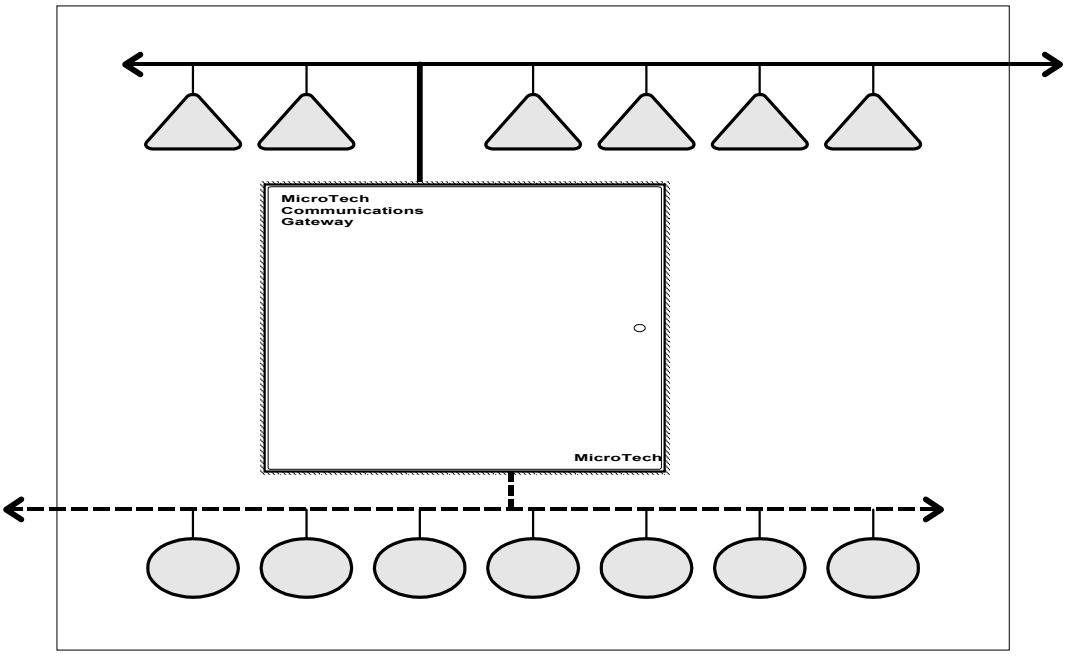
Note: As used throughout this manual, the term "RMC network" denotes the RMC Panel and its associated applied rooftop or SCAC units; it would not include, for example, a MicroTech-equipped reciprocating chiller that is on the same MicroTech network. Therefore, an "RMC network" could be either a self-contained network (typical) or a part of a larger MicroTech network.

Component Data

The control panel layout for the RMC Panel is shown in Figure 1. The main components of the system are the Microprocessor Control Board (MCB), the Keypad/Display Board (KDB), and the LED Status Board (LSB). These components are mounted inside a standard NEMA 1 enclosure and interconnected by ribbon cables, shielded multi-conductor cables, or discrete wiring. Power for the system is provided by transformers T1 and T2.

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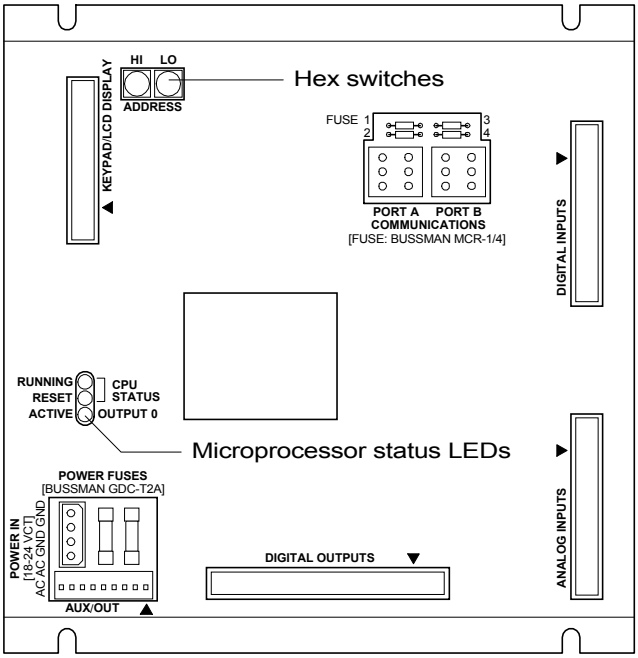
Figure 1. Control Panel Layout



Microprocessor Control Board

The Microprocessor Control Board (MCB) is shown in Figure 2. It contains a microprocessor that is preprogrammed with the software required to monitor and control up to eight units. The MCB coordinates all communications between the RMC controller and the unit controllers. The various MCB connections and components are described below.

Figure 2. Microprocessor Control Board (MCB)



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Digital Outputs Connection

After processing all network data, the MCB sends the appropriate output signals to the LED Status Board through the Digital Outputs port via a plug-in ribbon cable.

Aux/Out Terminal Strip

The Aux/Out terminal strip provides 12 Vdc power to the LED Status Board and 5 Vdc power to the back light on the Keypad/Display Board. Refer to the panel's wiring diagram or Figure 13 for more information.

Power In Terminal Strip

The MCB receives 18 Vac, center-tapped power from transformer T2 through the Power In terminal strip. This power drives all logic and communications circuitry, the Aux/Out terminal strip, the LED Status Board, and the Keypad/Display Board. Refer to the panel's wiring diagram or Figure 13 for more information.

Power Fuses

Two identical 2-amp fuses are located to the right of the Power In terminal strip. These fuses are in the MCB power supply circuit.

Microprocessor Status LEDs

The green, red, and amber LEDs on the MCB provide information about the operating status of the microprocessor. The amber LED also indicates the existence of alarm conditions in the RMC network. (The Alarm LED on the LSB board also does this.)

Following is the normal start-up sequence that the three status LEDs should follow when power is applied to the MCB:

1. The red ("Reset") LED turns on and remains on for approximately 5 seconds. During this period the MCB performs a self-test.
2. The red LED turns off and the green ("Running") LED turns on. This indicates that the microprocessor has passed the self-test and is functioning properly.
3. The amber ("Active") LED remains off continually if no alarm conditions exist in the RMC network. If alarm conditions exist, the amber LED will flash as shown in Table 5.

If the above sequence does not occur after power is applied to the controller, there is a problem with the MCB or its power supply. For more information, refer to the "Test Procedures" section of this manual, which is under "Service Information."

Tables 4 and 5 summarize the green, red, and amber status LED indications.

Table 4. Green and Red Status LED Indication

Green LED State	Red LED State	Indication
Off	Off	No power to MCB
Off	On*	Self-test failure or power supply problem
On	Off	MCB operating normally

* For longer than 5 seconds.

Table 5. Amber Status LED Indication

Amber LED State	Indication
Off	Normal operation
On 1/2 second; Off 1/2 second	Alarm condition

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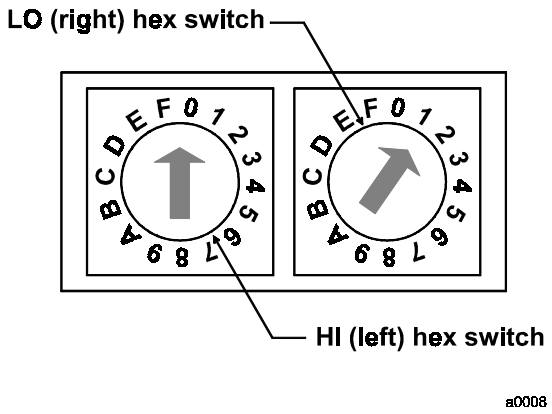
Keypad/LCD Display Connection

The MCB receives input commands and operating parameters from the keypad and sends requested information to the display through the Keypad/LCD Display port via a plug-in ribbon cable.

Hex Switches

The MCB includes two hex (hexadecimal) switches that are used to set the RMC controller's network address.

Figure 3. Hex Switches



The HI and LO hex switches are shown in Figure 3. A "hex switch setting" is defined as the HI switch digit followed by the LO switch digit. For example, a hex switch setting of 2F would have the HI switch set to "2" and the LO switch set to "F." Typically, the RMC controller's hex switch setting should be 00. Refer to "Addressing the Controllers" in the "Network Commissioning" section of this manual for more information.

Note: You can change the setting of a hex switch with a slotted-blade screwdriver that has a $^{3}/_{32}$-inch tip. If a hex switch setting is changed, power to the MCB must be cycled in order to enter the new setting into memory. This can be done by opening and then closing the push button circuit breaker (CB1) in the panel.

Communication Ports

The MCB has two communication ports: port A and port B. Each port has six terminals and is set up for both the RS-232C and RS-485 data transmission interface standards. The male and female connectors for these ports are manufactured by AMP. Therefore, they are referred to as "AMP plugs" or "AMP connectors" throughout this manual. Socketed fuses located next to the ports protect the communications drivers from voltage in excess of ±12 V. Following are brief descriptions of each port's function.

Port A: Port A is for communications with an IBM compatible PC using the RS-232C interface standard. The PC can be directly connected, over a limited distance, with a twisted, shielded pair cable, or it can be remotely connected via phone lines with a modem. (Port A can also be used to connect a licensed building automation system to the MicroTech network via Open Protocol.) The default communications rate is 9600 bps. For more information, see "PC Connection" in the "Field Wiring" section of this manual.

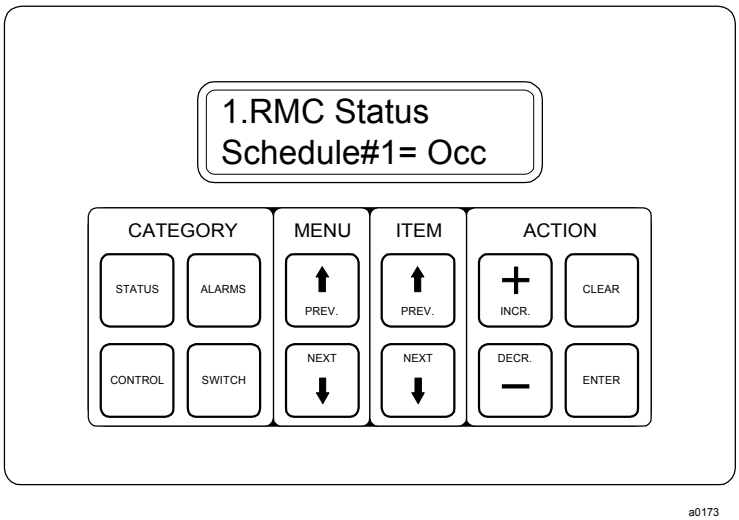
Port B: Port B is for MicroTech network communications using the RS-485 interface standard. A twisted, shielded pair cable should be connected to port B via terminals B+, B–, and GND on terminal block TB2. The communications rate is 9600 bps. For more information, see "Network Communications" in the "Field Wiring" section of this manual.

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Keypad/Display Board

The Keypad/Display Board (KDB) gives you a local interface with the RMC controller and a remote interface with the unit controllers. All operating conditions, system alarms, control parameters, and schedules can be monitored from the display. If the password has been entered, any adjustable parameter or schedule can be modified with the keypad. Because the display is backlit, the liquid-crystal characters are highly visible regardless of the ambient light level. You can adjust the display contrast with a small pot located on the back of the board (see Figure 1). For information on using the keypad/display, refer to the "Getting Started" portion of Bulletin No. OM 121, *MicroTech Remote Monitoring and Control Panel*.

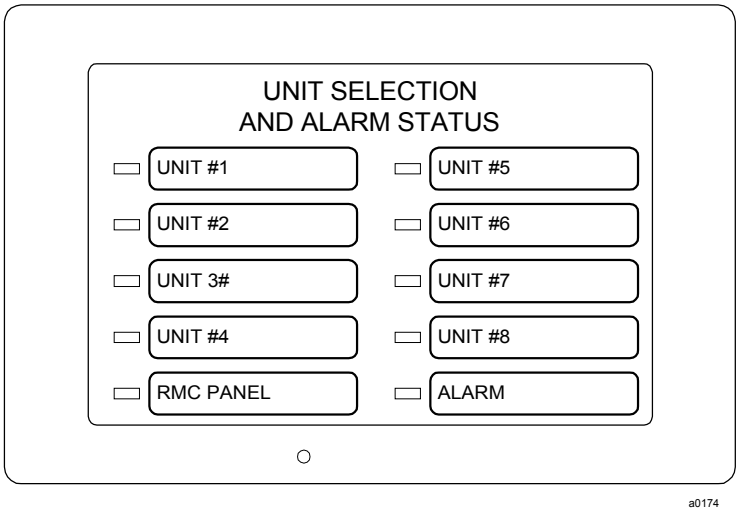
Figure 4. Keypad/Display Board (KDB)



LED Status Board

The LED Status Board (LSB), which includes 10 LEDs and an alarm horn, shows you at a glance which controller the keypad/display is interfaced with and whether any alarms exist in the network. It is shown in Figure 5.

Figure 5. LED Status Board (LSB)



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Unit Selection Indicators

Nine Unit Selection LEDs clearly indicate which controller in the network the RMC Panel's keypad/display is interfaced with. For example, if the "Unit #1" Unit Selection LED is lit, the RMC Panel's keypad/display will act exactly as if it were the keypad/display at Unit #1. A special combination of keystrokes allow you to change controllers.

Alarm Status Indicator

The red "Alarm" LED blinks whenever there is an alarm in the RMC Panel or any of its associated units. This occurs regardless of the current unit selection.

Alarm Horn

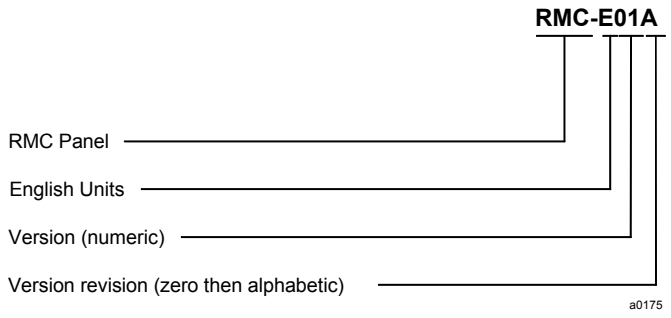
If it is enabled, the piezo alarm annunciator (alarm horn) sounds whenever an alarm occurs in the RMC Panel or any of its associated units. This occurs regardless of the current unit selection. To silence the alarm horn, press the ALARMS key while the RMC Panel is the selected controller. You can adjust the alarm horn's volume with a small pot located on the LSB board. You can also set up the horn so that it sounds only when certain types of alarms occur (comm loss, faults, problems, or warnings). For more information, refer to the "Alarm Monitoring" section of Bulletin No. OM 121, *MicroTech Remote Monitoring and Control Panel*.

Note: Silencing the alarm horn does not clear an alarm. To clear an alarm from the RMC Panel you must first select the unit with the alarm and then clear it. For more information, refer to the "Alarm Monitoring" section of Bulletin No. OM 121.

Software ID

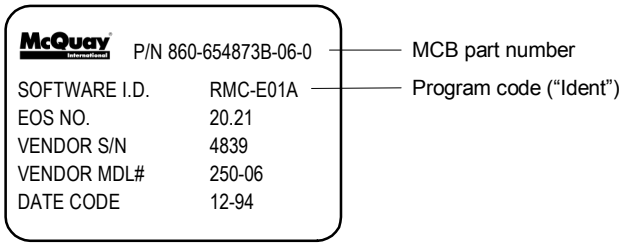
MicroTech RMC controller software is factory installed and tested in each panel prior to shipment. The software is identified by a program code (also referred to as the "Ident"), which is printed on a small label affixed to the MCB. An example of this label is shown in Figure 6. The program code is also encoded in the controller's memory and is available for display on menu 16 of the keypad/display or a PC equipped with Monitor software. Using menu 16 or Monitor software is the most reliable way of determining the controller's program code.

RMC controller program codification is as follows:



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Figure 6. Software ID Tag



Software Compatibility

This edition documents revision A of the standard RMC software (RMC-E01A) and all subsequent revisions of version 01 until otherwise indicated. If your software has a later revision code (for example, RMC-E01B), some of the information in this manual may not apply to your software. However, since revisions are minor software changes, the differences should be insignificant.

In its default configuration, this software is *not* compatible with some earlier versions of MicroTech applied rooftop and SCAC controller software. The current software compatibility for the default configuration is summarized in Table 6. The wildcard character (∗) can be any letter.

If you want to use an RMC Panel with older units that have incompatible software, the unit controller software must be upgraded. However, there is one exception: If the units are older applied rooftop units that have incompatible software *and they do not need the RMC Panel's common duct static pressure control feature*, you can either (1) upgrade the unit controller software or (2) set the RMC controller's Configuration parameter to "ALL RTU."

Note: When the Configuration parameter is set to "ALL RTU," the RMC controller's software becomes compatible with all applied rooftop software and incompatible with all SCAC software. For more information, refer to the "RMC and Unit Controller Setup" section of Bulletin No. OM 121, *MicroTech Remote Monitoring and Control Panel*.

If you have a version of applied rooftop or SCAC software that is later than the compatible programs shown in Table 6, it is likely that program RMC-E01A is compatible with it; however, it may not be. To find out for sure, contact McQuayService.

Table 6. Program Code RMC-E01A Software Compatibility

Unit Application	Unit Type	Compatible Programs	Incompatible Programs
VAV, using the RMC Panel's common duct static pressure control feature	Applied Rooftop	950164-040	950164 03∗ and earlier
		950314-020	950314-01∗
		950162-040	950162-03∗ and earlier
		950313-020	950313-01∗
	SCAC	950600-02C	950600-02B and earlier
VAV, not using the RMC Panel's common duct static pressure control feature; CAV, all applications	Applied Rooftop	950164-03J to -03K950164-040	①950164 03I and earlier
		950314-01G to -01H950314-020	①950314 01F and earlier
		950162-03J to -03K950162-040	①950162 03I and earlier
		950313-01F to -01G950313-020	①950313 01E and earlier

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Unit Application	Unit Type	Compatible Programs	Incompatible Programs
		950163-03H to -03J950163-040	①950163 03G and earlier
		950315-01E to -01F950315-020	①950315 01D and earlier
		950166-03G to -03H950166-040	①950166 03F and earlier
		950316-01E to -01F950316-020	①950316 01D and earlier
	SCAC	950600-020 to -02C	950600 01∗

Notes:

1. These applied rooftop programs can be made compatible with RMC-E01A by setting the RMC Panel's Configuration parameter to "ALL RTU."

MicroTech Monitoring and Networking Options

PC Monitoring

A PC (personal computer) equipped with the appropriate Monitor software can be used to provide a high-level interface with a MicroTech network (see PC specification below). Monitor software features a Windows™-based display, multilevel password access, and advanced trend-logging. The PC can be connected to the RMC controller either directly, via a single twisted, shielded pair cable, or remotely, via phone lines with an optional modem. For more information on connecting the PC to the controller, refer to "PC Connection" in the "Field Wiring" section of this manual.

For the most convenience and best operation, the PC should be considered dedicated to the MicroTech system. However, you can exit the Monitor program to perform other tasks without affecting equipment control. Refer to the Monitor user's manual for additional information.

PC Specification

A direct or remotely connected computer can be used for monitoring RMC Panel and unit operation, changing setpoints, scheduling, trend logging, downloading software, and diagnostics. The PC must be an IBM or 100% true compatible. Table 7 shows the preferred and minimum PC specifications.

Network Master Panel

The MicroTech Network Master Panel (NMP) incorporates the RMC controller and its associated units into a building-wide network with other MicroTech unit and auxiliary controllers. With a PC and Monitor software, it gives the building operator the capability to perform advanced equipment control and monitoring from a central or remote location. The following features are provided by the optional NMP: (For further information, contact your McQuay sales representative.)

- Remote unit monitoring
- Advanced scheduling features
- Advanced alarm management
- Global operator override by unit type
- Demand metering
- Historical electrical data logging

Open Protocol

MicroTech Open Protocol™ provides an interface between the RMC Panel and the building automation system of one of many participating manufacturers. With Open Protocol, the building automation system can do the following:

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- Monitor RMC schedule states, group Control Temperatures, group duct static pressures, and group supply fan speed/vane position setpoints
- Monitor most controller setpoints, parameters, and alarms
- Set most controller setpoints and parameters
- Set up multiple-unit control groups

In an Open Protocol application that includes an RMC Panel, the MicroTech Open Protocol Master (OPM) Panel is not required because the RMC Panel performs its functions. For further information, contact your McQuay sales representative.

Table 7. PC Specification

Preferred Configuration	Minimum Configuration
486DX processor, 66MHz or better	386SX processor, 16 MHz
8 MB of RAM or better	4 MB of RAM
120 MB hard disk drive or better	60 MB hard disk drive
3½" floppy disk drive	3½" floppy disk drive
Serial port (9 pin male; Com1 or Com2)	Serial port (9 or 25 pin male; Com1 or Com2)
Parallel port	–
Internal time clock, battery backed	Internal time clock, battery backed
Super VGA graphics capability	VGA graphics capability
Super VGA monitor	VGA monitor
Printer	–
Bus mouse or trackball	Serial mouse or trackball*
101 enhanced keyboard	101 enhanced keyboard
9600 bps modem, compatible with the AT command set (optional)	1200 bps modem, compatible with the AT command set (optional)
MS-DOS® 6.2 or higher	MS-DOS® 5.0
Microsoft® Windows™ 3.1 or higher	Microsoft® Windows™ 3.1
MicroTech® Monitor™ *for Windows* software	MicroTech® Monitor™ *for Windows* software

* If a serial pointing device is used, there must be another serial port (Com1 or Com2) available for connecting the PC to the MicroTech controller.

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Panel Location and Mounting

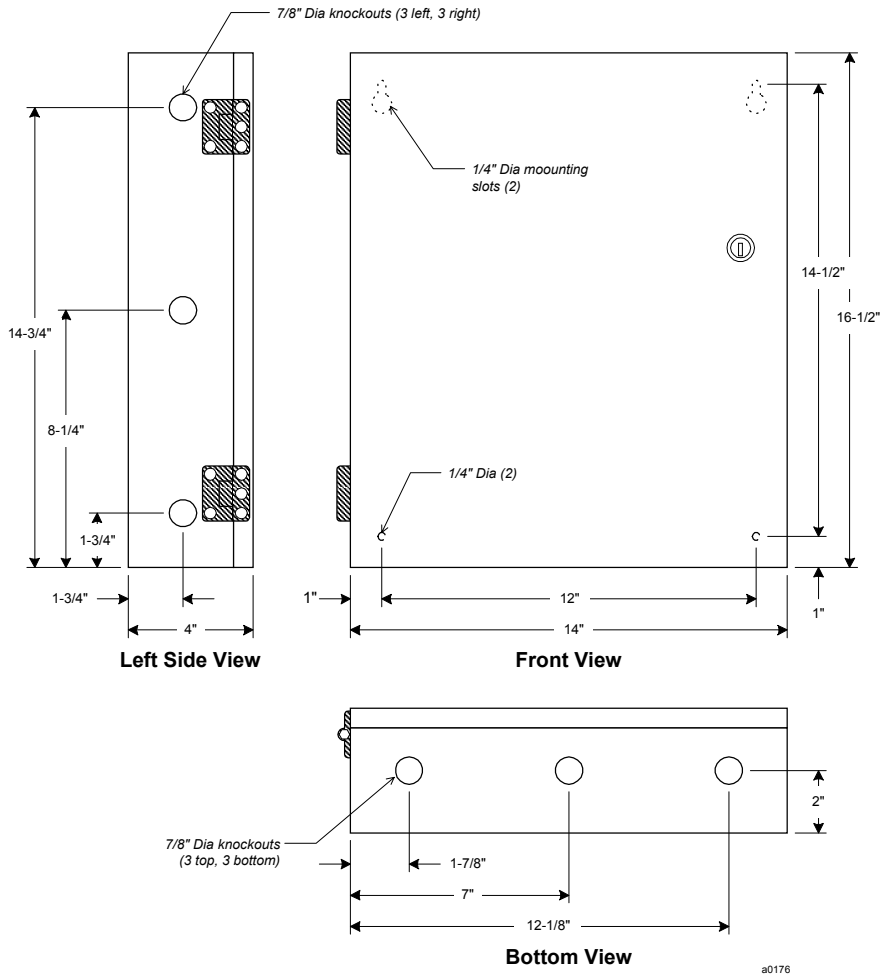
The RMC Panel is suitable for indoor use only. Table 8 lists the allowable temperature and humidity ranges. Locate the panel at a convenient height for operation of the keypad/ display, and allow adequate clearance for the door swing. Mount the panel to the wall with screws or bolts. It weighs 40 pounds. Four 1/4-inch openings are provided at the corners of the panel. Panel dimensions are shown in Figure 7.

The RMC Panel is equipped with special door hinges that have a friction adjustment screw. By adjusting this screw you can prevent the panel door from swinging open or closed unexpectedly.

Table 8. RMC Panel Environmental Specifications

Panel State	Temperature	Relative Humidity
Operating	32 – 100°F	0 – 95%(noncondensing)
In storage	–40 – 140°F	0 – 95%(noncondensing)

Figure 7. RMC Panel Dimensions



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Field Wiring

Following are descriptions of the various field wiring requirements and options. All possible field wiring connections are shown in Figure 8.

Note that the panel is divided into high and low voltage sections by a sheet metal barrier. The power wiring should enter the high voltage section, and the communications wiring should enter the low voltage section. Wiring penetrations must be made only through the 7/8-inch knockouts provided.

The typical application includes either all applied rooftop units or all SCAC units; however, as shown in Figure 8, the RMC Panel can monitor and control a mixture of these unit types.

Note: Wiring must comply with the National Electrical Code and all local codes and ordinances. The warranty is void if the field wiring is not in accordance with these instructions.

Power

⚠WARNING

Electric shock hazard. Can cause personal injury or death.

This equipment must be properly grounded.

All protective deadfront panels must be reinstalled and secured when power wiring is complete.

The RMC Panel requires a 115 Vac power supply, which should be connected to terminals L1 and L2 in the high voltage section of the panel. The panel must be properly grounded by connecting the ground lug (GRD) to earth ground. Refer to Figure 8. Power wiring must be rated at 5 amps.

To gain access to the high voltage section, remove the deadfront barrier. It is attached to the panel with two 5/16-inch hex screws. Replace this deadfront when the wiring is complete.

The panel is internally protected with a 0.5-amp circuit breaker (CB1), which is located inside the panel on the underside of the high voltage section (see Figure 1). This push-button circuit breaker can also be used as an on-off switch for the panel. When the push button is in, the panel is on. When the push button is out, the panel is off. A white ring on the switch shaft is visible when the push button is out.

Network Communications

For network communications to occur, a twisted, shielded pair cable must be connected between the RMC Panel, its associated units, and any other MicroTech unit or auxiliary controllers. This interconnecting, "daisy-chain" wiring is shown in Figure 8. Network communications is accomplished using the RS-485 interface standard at 9600 bps.

The typical network configuration, shown in Figure 8, consists of the RMC Panel and up to eight applied rooftop or SCAC units. Unusual applications may include other MicroTech controllers; for example, a Network Master Panel, Application Specific Controllers, or Unit Ventilator Controllers.

About MicroTech Network Architecture

All controllers in a MicroTech network are assigned a "level": level 1, level 2, or level 3. All networks must have one level-1 controller to coordinate communications. Multiple level-2 controllers can be connected to the level-1 controller with a communications "trunk," an isolated section of the daisy-chained network wiring. (The network wiring between all controllers shown in Figure 8 is a trunk.) Multiple level-3 controllers can be connected to a level-2 controller with a separate trunk. *The maximum allowable length of a communications trunk is 5000 feet.*

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For the typical network in which there is one RMC Panel and no Network Master Panel, the RMC Panel is the level-1 controller and its associated applied rooftop or SCAC units are level-2 controllers (this is the default factory setup). If a Network Master Panel is included in the network, it is the level-1 controller and the RMC Panel and its associated units are level-2 controllers. Unless there are many water source heat pumps or unit ventilators in the network, there usually are not any level-3 controllers.

Cable Specification

The network communications cable must meet the following minimum requirements: twisted, shielded pair with drain wire, 300 V, 60°C, 20 AWG, polyethylene insulated, with a PVC outer jacket (Belden 8762 or equivalent). Some local codes or applications may require the use of plenum rated cable. Do not install the cable in the same conduit with power wiring.

Note: Ideally, one continuous piece of cable should connect any two controllers. This reduces the risk of communications errors. If the cable must be spliced, use crimp-type butt connectors (good) or solder (best). Do not use wire nuts.

Wiring Instructions

Regardless of whether the RMC controller is level 1 or level 2, the network connection to the RMC and unit controllers is at port B on their MCB boards. As shown in Figure 8, field wiring to port B on these controllers can be accomplished by connecting the network cable to terminals B+, B–, and GND in the RMC Panel; terminals 128, 129, and 130 in each rooftop unit panel; and terminals B+, B–, and GND in each SCAC unit panel.

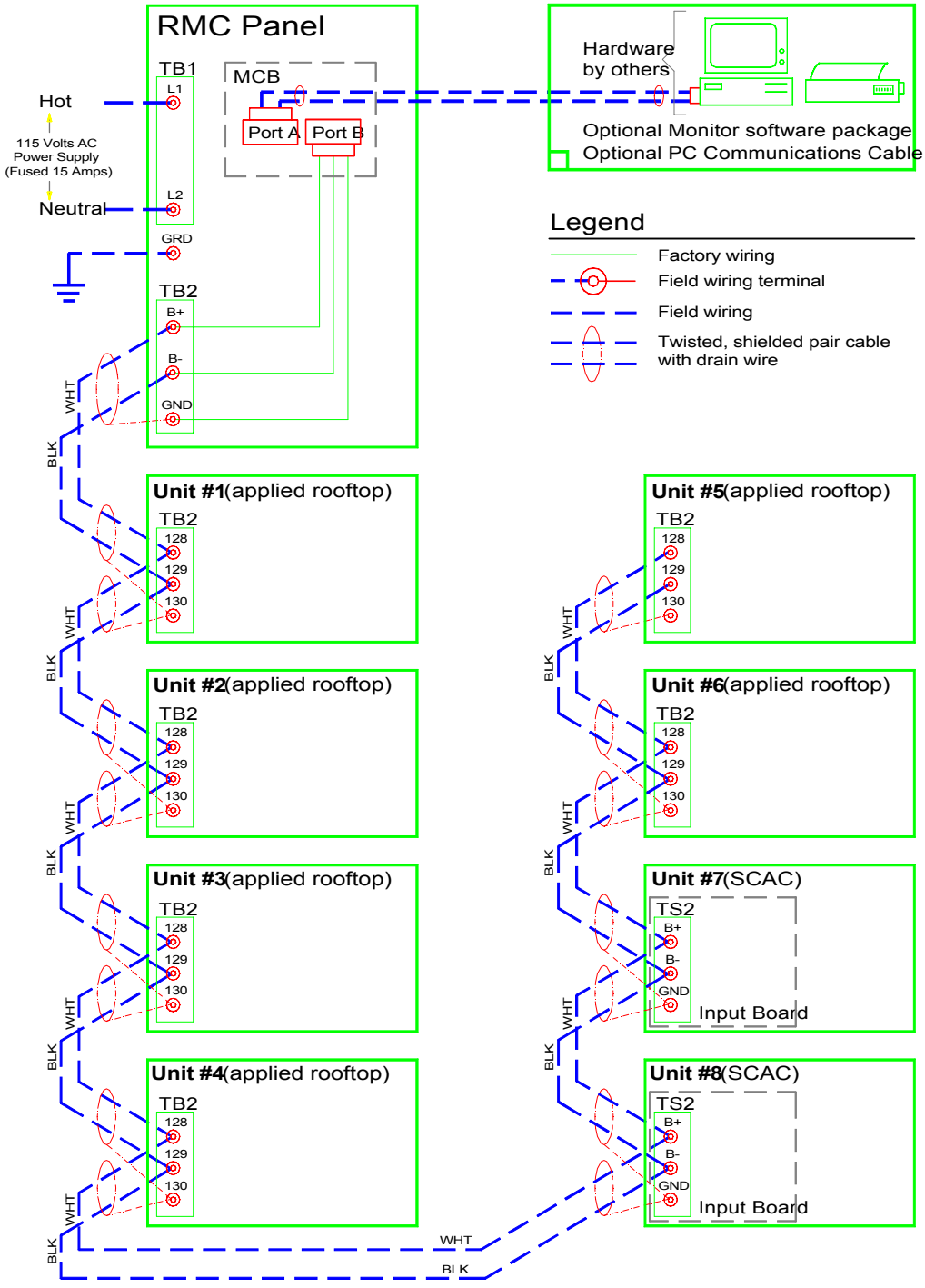
The unit designations shown in Figure 8 (“Unit #1” through “Unit #8”), are established by the network address, not the physical position of the unit in the daisy chain. The networked controllers can be wired in any order. For example, the RMC controller could be connected between Unit #1 and Unit #2. *It is highly recommended that the installing contractor keep track of the physical order of the controllers on the daisy-chained trunk*. This facilitates troubleshooting any network communications problems that may occur. For more on the network address, see “Addressing the Controllers” in the “Network Commissioning” section of this manual.

Use the following procedure to perform the network wiring:

1. Before beginning, verify that the port B plug is disconnected from every controller on the communications trunk being wired. These plugs are connected during the commissioning procedure. This is a precaution to prevent stray high voltage from damaging the controllers. Any voltage in excess of 12 V can damage the board’s communications drivers.
2. Connect the network cable in a daisy-chain manner as shown in Figure 8. Use caution to assure that the correct polarity is maintained at each controller. Be sure to connect each cable’s shield to the controllers as shown in the figure. Like the positive (+) and negative (–) conductors, the shield (ground) conductor must be continuous over the trunk.
3. If a Network Master Panel is included in the network, connect its B port to the trunk in a similar fashion.

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Figure 8. Typical Field Wiring Schematic



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PC Connection

Regardless of whether the PC is connected directly or remotely via phone lines, the connection to any MicroTech controller is at port A on the MCB. It is best to connect a PC to the level-1 controller because faster data transmission results; however, a PC can be connected to any level-2 controller that does not have level-3 controllers associated with it. Either way, the PC has access to the entire network (see note below). In the typical application, the RMC controller is level 1, the unit controllers are level 2, and there are no level-3 controllers. See "Network Communications" above for more on network architecture.

It is possible to connect two or more PCs to the network, but only one PC can be connected to any one controller. The PC that is used most often should be connected to the level-1 controller for better performance. For example, you may have one PC that you use at the building during the week and another PC that you use at home on weekends. In this situation, you may want to connect the on-site PC to the level-1 controller and the modem for the off-site PC to a level-2 controller.

The RMC controller's default port A communications rate is 9600 bps; however, it can be changed. For more information, see the "RMC and Unit Controller Setup" section in Bulletin No. OM 121, *MicroTech Remote Monitoring and Control Panel*.

Note: If a PC is connected to a level-2 controller, a level-1 RMC Panel must be set up to poll that level-2 controller so that the PC has access to the entire network. You can do this at the RMC keypad/display by adjusting the Total Slaves parameter, which is located under menu 16, "Service." See the "RMC and Unit Controller Setup" section in Bulletin No. OM 121 for more information.

Direct Connection

An RS-232 communications cable kit that allows a PC to be directly connected to any MicroTech controller is available from McQuay International. The part number is 0057186802. The cable has a female DB-9 connector for connection to the PC's 9-pin serial port. (If the PC has a 25-pin serial port, obtain an adapter.) The cable length is 12 feet. If more length is required, a twisted, shielded pair cable can be spliced into the kit cable (see "Cable Specification for Direct PC Connection" below). If this is done, splice the conductors with crimp-type butt connectors (good) or solder (best). Do not use wire nuts.

The maximum allowable cable length for direct connection between the PC and a controller is 50 feet. If the desired length is over 50 feet, the MicroTech RS-232 Cable Extension Kit is required. This kit can extend the maximum allowable distance between the PC and the controller to 4000 feet. The part number is 0065487001.

Remote Connection

A voice quality, direct-dial telephone line is required for remote or off-site PC access to the network. The phone line should be terminated with a standard RJ-11 modular phone plug. A modem enables a remote or off-site PC to communicate with the networked controllers via phone lines.

A modem is a standard unit option, but it is not an RMC Panel option. However, a modem that can be field installed in the RMC Panel (or any unit) is available from McQuay International. The kit comes complete with a 14,400 bps modem (set up for 9600 bps) and a wiring harness. If a remote PC connection is required, it is recommended that the modem at the MicroTech controller be supplied by McQuay International.

Installation and wiring instructions for the MicroTech Modem Kit are included in installation manual for the modem.

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Cable Specification for Direct PC Connection

A properly terminated, twisted, shielded pair cable is required to directly connect a PC to a MicroTech controller. The cable must meet the following minimum requirements: twisted, shielded pair with drain wire, 300 V, 60°C, 20 AWG, polyethylene insulated, with a PVC outer jacket (Belden 8762 or equivalent). It must also be properly terminated to an AMP plug on one end and a female DB-9 or DB-25 connector on the other. See Figures 9 and 10 for cable pinouts. The AMP part numbers for the AMP connector shown in these figures are as follows: 1-480270-0 (plug) and 60617-1 (female pin terminals). This AMP plug can be connected to an RMC controller, an applied rooftop or SCAC unit controller, or any other MicroTech controller that has the same type of AMP socket. The DB-9 or DB-25 connector is for connection to a 9-pin or 25-pin serial port on the PC. Note that some local codes or applications may require the use of plenum rated cable. Do not install the cable in the same conduit with power wiring.

Note: A factory-assembled cable that meets this specification is part of the PC Communications Cable Kit, which is available from McQuay International. This cable has a DB-9 connector. The kit part number is 0057186802.

Figure 9. RS-232 Cable Pinouts for 9-Pin Serial Ports

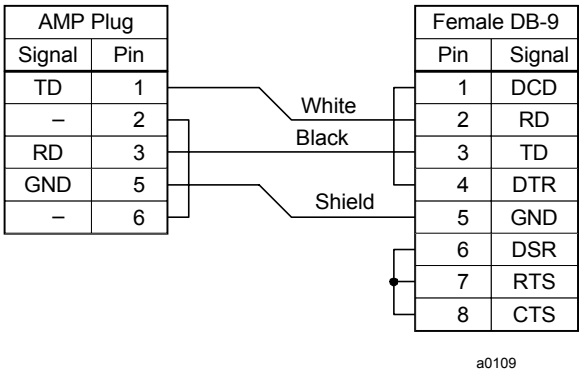
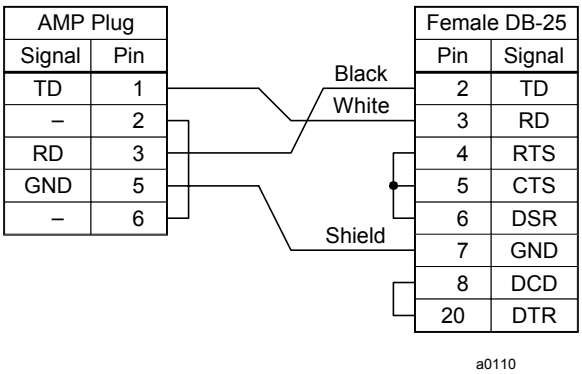


Figure 10. RS-232 Cable Pinouts for 25-Pin Serial Ports



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Network Commissioning

The purpose of network commissioning is to establish and verify communications between the RMC Panel and its associated applied rooftop or SCAC units. (It is not to establish and verify unit *operation*.) Network commissioning can be done independently of unit commissioning; however, *if it is done before the units are commissioned, care should be taken to assure that the units do not start.* The following instructions describe how to do this. To commission the network, you must be familiar with the operation of the keypad/display. For information, see the "Getting Started" portion of Bulletin No. OM 121, *MicroTech Remote Monitoring and Control Panel.*

Before any unit is allowed to operate, it must be commissioned in accordance with the instructions in the MicroTech unit controller installation literature and the model-specific unit installation literature (see Tables 1 and 3). In addition, the RMC Panel and its associated unit controllers must be set up so that they work properly together. This setup, which can be done before or after the network is commissioned, is described in Bulletin No. OM 121.

A PC is not required to commission networks that include only RMC Panel(s) and applied rooftop or SCAC unit(s) because communications can be verified by using the RMC Panel's keypad/display. However, if you want to use a PC to verify network communications, you can. The PC must be equipped with MicroTech Monitor software.

Addressing the Controllers

For network communications to occur, each controller in the network must have a unique network address. A controller's hex switch setting defines its network address. An applied rooftop or SCAC controller's hex switch setting also defines its unit designation, which is listed on the LED Status Board; for example, "Unit #1." For more on hex switch settings, see "Microprocessor Control Board" in the "Component Data" section of this manual.

After changing a hex switch setting, power to the MCB must be cycled to set the new address into memory. In the RMC Panel, you can do this by opening and then closing circuit breaker CB1. In the unit controllers, you can do this by opening and then closing switch S1.

The hex switches are set differently depending on whether or not there is a Network Master Panel (NMP) or more than one RMC Panel in the network. Following are instructions on how to set them.

Note: If a unit is running, you should shut it down before removing power from its controller. Do this by changing its control mode to "Manual Off."

The Typical Network

The typical network includes one RMC Panel and one to eight applied rooftop or SCAC units. It may also include other level-2 unit or auxiliary controllers that could be accessed with a PC via network communications. In this case, the RMC controller is the level-1 controller and the unit controllers are level-2 controllers. Since the RMC Panel is level 1, its hex switch setting must be 00. The hex switch settings of the level-2 controllers must start at 01 and continue consecutively to a maximum of 40 (decimal 64). There must be no gaps in the sequence and no duplicate settings. As long as these rules are followed, a level-2 controller's hex switches can be set to any value. To keep the system simple, you should consider addressing the applied rooftop and SCAC units according to their designations.

For example, assume that a MicroTech network includes an RMC Panel, four rooftop units, and one reciprocating chiller. One possible addressing scheme is as follows:

Hex Switch Setting	Controller
00	RMC Panel
01	Unit #1
02	Unit #2
03	Unit #3

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Hex Switch Setting	Controller
04	Unit #4
05	Reciprocating chiller (PC accessible only)

Note: If a PC or modem is connected to a level-2 controller, that controller should have as low an address as possible. This improves the performance of network communications because it reduces the required value of the RMC controller's Total Slaves parameter and thus the amount of polling. For example, if a modem is connected to Unit #3, you should consider setting Unit #3's hex switches to "01." See the "RMC and Unit Controller Setup" section in Bulletin No. OM 121 for more information.

Networks With an NMP

If an RMC Panel is included in a network that has an NMP, the NMP must be the level-1 controller. In this case, an RMC Panel is a level-2 controller and the unit controllers are also level-2 controllers. Since the NMP is level 1, its hex switch setting must be 00. The hex switch settings of the level-2 controllers must start at 01 and continue consecutively to a maximum of 40 (decimal 64). There must be no gaps in the sequence and no duplicate settings. As long as these rules are followed, a level-2 controller's hex switches can be set to any value. Two or more RMC Panels and multiple units are possible in this type of network.

For example, assume that a MicroTech network includes an NMP, an RMC Panel, two rooftop units, and one screw chiller. One possible addressing scheme is as follows:

Hex Switch Setting	Controller
00	NMP
01	RMC Panel
02	Screw chiller (PC accessible only)
03	Unit #1
04	Unit #2

Networks With Two or More RMC Panels and No NMP

If two or more RMC Panels are included in a network that does not include an NMP, one of the RMC Panels must be the level-1 controller. In this case, the other RMC Panels are level-2 controllers and the unit controllers are also level-2 controllers. The level-1 RMC Panel's hex switch setting must be 00. The hex switch settings of the level-2 controllers must start at 01 and continue consecutively to a maximum of 40 (decimal 64). There must be no gaps in the sequence and no duplicate settings. As long as these rules are followed, a level-2 controller's hex switches can be set to any value.

For example, assume that a MicroTech network includes two RMC Panels, and ten SCAC units. Each RMC Panel will control and monitor five units. One possible addressing scheme is as follows:

Hex Switch Setting	Controller
00	RMC Panel "A"
01	RMC Panel "B"
02	Unit #1 for RMC Panel "A"
03	Unit #2 for RMC Panel "A"
04	Unit #3 for RMC Panel "A"
05	Unit #4 for RMC Panel "A"
06	Unit #5 for RMC Panel "A"
07	Unit #1 for RMC Panel "B"

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Hex Switch Setting	Controller
08	Unit #2 for RMC Panel “B”
09	Unit #3 for RMC Panel “B”
0A	Unit #4 for RMC Panel “B”
0B	Unit #5 for RMC Panel “B”

Note: The only advantage to creating a network like this is to allow a PC access to all networked controllers. If there is no PC, each RMC Panel should be set up as a level-1 controller in a separate network as described above in “The Typical Network.”

Note: If a PC or modem is connected to a level-2 controller, that controller should have as low an address as possible. A level-2 RMC Panel should also have as low an address as possible. This improves the performance of network communications because it reduces the required value of the level-1 RMC controller’s Total Slaves parameter and thus the amount of polling. For example, if a modem is connected to Unit #2 for RMC Panel “B” in the above example, you should consider setting the hex switches for RMC Panel “B” to “01” and the hex switches for its Unit #2 to “02.” See the “RMC and Unit Controller Setup” section in Bulletin No. OM 121 for more information.

Unit Controller Setup

The applied rooftop or SCAC unit controller setup that results by following these instructions is the minimum required for commissioning the network. Further setup is likely necessary to adapt the unit controllers to your particular application’s requirements. For complete information on how to do this, see the “RMC and Unit Controller Setup” section in Bulletin No. OM 121.

Control Mode

If any units have not been commissioned, it is recommended that they be manually shut down during this network commissioning process to ensure that they do not start when communications begin. One way to manually shut down a unit is to set its control mode to “Manual Off.” At the unit controller’s keypad/display, the control mode is the first item under menu 11, “Control Mode.” You can get to it quickly by pressing the CONTROL key.

You can set the control modes for units that have been commissioned as desired during network commissioning (see note below). The units can be either on or off. (If a unit is off, it must have power.) *Note that a unit that is off can start up when communications begin if an occupied RMC schedule is assigned to it.* A unit that is on cannot be shut down by the RMC Panel when communications begin.

Note: If any units are part of a multiple-unit control group, you should consider keeping them manually shut down until their controllers and the RMC controller are set up properly. This is a precaution to ensure that simultaneous heating and cooling and erratic duct static pressure control does not occur.

RMC Controller Setup

The RMC controller setup that results by following these instructions is the minimum required for commissioning the network. Further setup is likely necessary to adapt the RMC controller to your particular application’s requirements. For complete information on how to do this, see the “RMC and Unit Controller Setup” section in Bulletin No. OM 121.

Number of Units

The RMC controller needs to know how many applied rooftop or SCAC units are connected to it. You set this value at the keypad/display with the “Nmbr of Units=” item under menu 16, “Service.”

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Unit Address

The RMC controller needs to know the network addresses of its associated units. You set these values at the keypad/display with the "Unit #∗ Addr=" items under menu 16, "Group Assign." (The wildcard character in the item name could be a number from 1 to 8.) The value of each of these parameters must match the hex switch setting at the corresponding unit. For example, if the hex switch setting at Unit #3 is 01, the "Unit #3 Addr=" item must be set to 01. If there are less than eight units associated with the RMC, set the unused Unit #∗ Address parameters to "NA" (default).

Controller Level

The RMC controller needs to know whether it is a level-1 or level-2 controller. You set the level at the keypad/display with the "Level=" item under menu 16, "Service" (default is level 1).

▶ **To change the controller level**

1. Set the hex switches as required. A level-2 controller's hex switch setting cannot be 00. A level-1 controller's hex switch setting must be 00.
2. At the keypad/display, set the "Level=" item to "1" or "2" as required. When the ENTER key is pressed, the RMC controller automatically corrects its checksums and reset itself. It also changes the Total Slaves parameter to "0" (see below).

Total Slaves

A level-1 RMC controller needs to know how many level-2 controllers (slaves) it needs to poll. (When a level-1 controller polls one of its level-2 slaves, it actively "asks" the slave if it has any requests for information from other controllers.) The Total Slaves parameter defines this number. You can set the Total Slaves parameter at the keypad/display with the "Total Slaves=" item under menu 16, "Service" (default is 0). A level-2 RMC Panel's Total Slaves parameter should always be set to "0."

In most cases, the Total Slaves parameter must be changed only if there is (1) a level-2 RMC Panel or (2) a PC connected to a level-2 controller. In the typical network, which includes one RMC Panel (level 1) and no PC, the Total Slaves parameter should be set to "0" (default).

If a level-2 controller needs to be polled, set the Total Slaves parameter just high enough to include that controller. For example, assume there are nine level-2 controllers connected to a level-1 RMC Panel; the controller at address 02 is another RMC Panel; and the controller at address 06 has a modem connected to it. In this case, the Total Slaves parameter should be set to "6."

Connecting the Communications Trunk

Use the following two procedures to connect the RMC controller and unit controllers to the network. You must complete the first procedure before beginning the second.

Communications Cable and Port B Check

The network communications cable should have been installed in accordance with the instructions in the "Field Wiring" section of this manual. This procedure verifies (1) that there are no shorts or stray voltages anywhere in the communications trunk and (2) that port B in each controller is intact. It must be performed once at every controller on the trunk before going on to the following "Verifying Communications" procedure. You can start at any controller and proceed in any order.

Before beginning, verify that the port B connectors are disconnected from every controller on the trunk. On the RMC, applied rooftop, and SCAC controllers, the port B connector is an AMP plug.

1. Verify that there is no voltage between any conductor and ground:

   Use a voltmeter to test for voltage at the network communications field wiring terminal block. With one lead on the control panel chassis (ground), check for voltage at the "+," "–," and "ground" terminals. Table 9 summarizes the terminal labels for the various controllers. There should be no AC or DC voltage.

   If you get a 2 or 3 Vdc reading, it indicates that one or more powered controllers are connected to the trunk. These controllers should be located and disconnected.

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Note: The first check should test for voltage throughout the entire trunk; however, it is important that it be done at every controller. Cables look similar and can easily become crossed.

2. Verify that there are no shorts between any two conductors:

   Use an ohmmeter to test for shorts at the network communications field wiring terminal block. For the three combinations of conductor pairs, there should be infinite resistance between the conductors (see Table 9).

   If you find a resistance that is high but less than infinite, it indicates that one or more nonpowered controllers are connected to the trunk. These controllers should be located and disconnected.

Note: The first check should test for shorts throughout the entire trunk; however, it is important that it be done at every controller. Breaks in the trunk may exist.

3. Plug the network communications connector into the B port.
4. Verify that there is power to the MCB and then check for proper port B voltage levels:

   Use a DC voltmeter to test for proper voltages at the network communications field wiring terminal block. With one lead on the control panel chassis (ground), check the voltage at the "+," "–," and "ground" terminals (see Table 9). The proper voltages are shown in Table 10. Note that the port B terminal labels in Table 10 are for the AMP-type connectors used on the RMC, applied rooftop, and SCAC controllers. Figure 11 shows the terminal configuration for this AMP connector's socket, which is mounted on the MCB board. (The terminals are labeled on both the socket and the plug, but they're hard to see.)

   For communications to occur, each networked controller must have proper voltages at its port B terminals. When there is only one controller connected to the trunk (as in this check), the measured voltages are for port B on that controller.

   If no voltage or improper voltages are found, check the wiring between the port terminals and the field terminals. Using Table 10 and Figure 11, verify that the three conductors are properly terminated in the AMP plug. Remove and check the two fuses above the B port. If there is still a problem, it is likely that the communications driver in the MCB is defective.
5. Unplug the network communications connector from the B port.
6. Go to the next controller and repeat steps 1 through 5.
7. After finishing the last controller, do the following "Verifying Communications" procedure.

Table 9. Network Communications Field Wiring Terminals

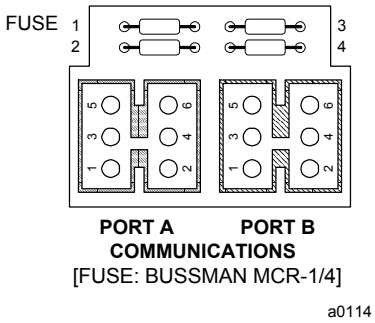
	Network Comm. Field Terminal		
Controller	**+**	**–**	**Ground**
RMC Panel	TB2-B+	TB2-B–	TB2-GND
Applied Rooftop	TB2-128	TB2-129	TB2-130
SCAC	TS2-B+(Input Brd.)	TS2-B–(Input Brd.)	TS2-GND(Input Brd.)

Table 10. Port B Voltages (AMP Type)

Port B (RS-485)		
Signal	**Terminal**	**Acceptable Voltage Reading**
+	4	3.0 ± 0.3 Vdc
–	3	2.0 ± 0.3 Vdc
Ground	5	0.0 ± 0.2 Vdc

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Figure 11. AMP Connector Terminal Configuration



Verifying Communications

This procedure verifies that proper communications have begun for each controller as it is connected to the network. The procedure begins with the level-1 controller because it coordinates network communications. After connecting it, you should connect any level-2 RMC Panels and then the unit controllers. You can connect the unit controllers in any order; however, it is better to follow the daisy-chain as you proceed. This makes troubleshooting easier if communications problems occur. For the typical network in which there is no Network Master Panel, the RMC Panel is the level-1 controller and the units are level-2 controllers.

As a result of the previous procedure, the network communications connector are disconnected from the B port at every controller on the trunk. Be sure that this is true before beginning this procedure.

1. Verify that the level-1 controller has a hex switch setting of 00. See "Addressing the Controllers" above for more information.
2. Plug the level-1 controller's network communications AMP connector into the B port. Verify that there is power to the level-1 controller and then go to the first level-2 controller.
3. Verify that the controller has the correct level-2 network address. See "Addressing the Controllers" above for more information.
4. With the controller's B port disconnected, check for proper communications trunk voltage levels:
   a. Use a DC voltmeter to test for proper voltages at the network communications field wiring terminal block. With one lead on the control panel chassis (ground), check the voltage at the "+," "–," and "ground" terminals (see Table 9). The proper voltages are shown in Table 10. Note that voltage fluctuation within the acceptable range is normal.
   b. If no voltage or improper voltage levels are found, verify that the level-1 RMC Panel or NMP is energized and that the communications trunk wiring is intact.
5. Verify that there is power to the MCB and then plug the network communications connector into the B port.
6. Verify that network communications have begun:
   a. Go to the RMC Panel's keypad/display and select the unit just connected. (If the controller you just connected is a level-2 RMC Panel, go to step 7.) To do this, press the SWITCH key and then quickly press the NEXT key in the Menu key group. Repeat this keystroke combination as necessary to get the desired unit. The Unit Selection LED for the selected unit will illuminate. The keypad/ display should show the unit controller's data.
   b. If communications do not exist, the message "Communications lost w/ unit" appears in the display. In this case, check the terminations between the B port and the field terminal block at the unit and, if no other units are communicating, its RMC Panel. If the unit controller just connected is associated with a level-2 RMC Panel, make sure that this RMC Panel's level was changed from 1 to 2.

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Note: If the level-2 controller is not an RMC, applied rooftop, or SCAC unit controller, you need a PC to verify communications. Refer to the user's manual provided with the Monitor software for more information.

7. Go to the next controller and repeat steps 3 through 6.
8. If the units have been commissioned, set up the RMC and unit controllers as desired for normal operation.

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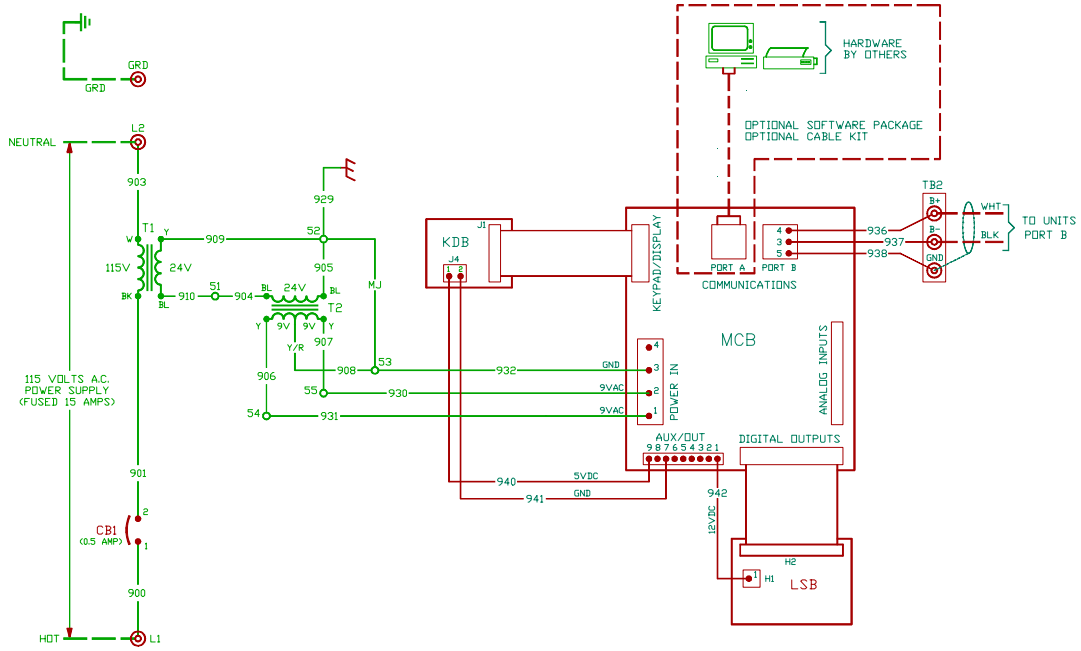
Wiring Diagram

The following wiring diagram is identical to the one in the RMC Panel. It is reproduced here for your convenience. The legend is shown in Figure 12.

Figure 12. RMC Panel Schematic Legend

Component Designation	Description
CB1	Circuit Breaker
KDB	Keypad/Display Board
LSB	LED Status Board
MCB	Microprocessor Control Board
T1	Transformer: 115/24 Vac
T2	Transformer: 24 Vac/18 Vac-CT
TB1	Terminal Block: High Voltage Section
TB2	Terminal Block: Low Voltage Section
—911—	Factory Wire Number
—o—	Factory Wiring Terminal
-◎-	Field Wiring Terminal
- - -	Field Wiring
	Printed Circuit Board Terminal
	Twisted, Shielded Pair Cable

Figure 13. RMC Panel Schematic



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Test Procedures

A listing of MicroTech related part numbers is included in the "Parts List" section of this manual. If the MCB must be replaced, refer to the "MCB Replacement" section of this manual.

Status LED Diagnostics

The MCB status LED indications can aid in controller diagnostics. If the status LEDs do not operate normally as described in the "Component Data" section of this manual (see Table 4), there is a problem with the MCB. Following are troubleshooting procedures for the various symptoms.

Red LED Remains On

If the red LED remains on after the 5-second self-test period, it is likely that the MCB is defective. However, this can also occur in some instances if there is a power supply problem. Refer to "Troubleshooting Power Problems" below.

Red and Green LEDs Off

If the red and green LEDs do not turn on after power is applied to the controller, there is likely a defective component or a problem in the controller's power distribution circuits. Refer to "Troubleshooting Power Problems" below.

Troubleshooting Power Problems

The MCB receives 18 Vac, center-tapped power from transformer T2. It then distributes both 5 Vdc and 12 Vdc power to the various MicroTech components. A problem that exists in any of these components can affect the MCB and thus the entire control system. Power problems can be caused by a external short, which can blow a fuse, or a defective component, which can either blow a fuse or create an excessive load on the power supply. An excessive load can lower the power supply voltages to unacceptable levels. Use the following procedure to isolate the problem. Note that this procedure may require two or three spare MCB fuses (see parts list). Refer to the panel wiring diagram or Figure 13 as you proceed.

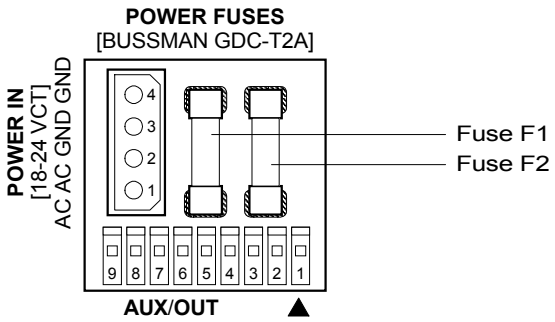
Verify that circuit breaker CB1 is closed.

1. Remove the MCB Power In terminal strip connector and check for 9 Vac between the terminals on the plug corresponding to terminals 2 and 3 on the board (see Figures 2 and 14). Then check for 9 Vac between the terminals on the plug corresponding to terminals 1 and 3 on the board. (Readings of 9–12 Vac are acceptable.)
   a. If 9 Vac is present between both sets of terminals, go to step 3.
   b. If 9 Vac is not present between both sets of terminals, check transformers T2 and T1 and all wiring between the 115 Vac source and the Power In plug.
2. Remove power from the controller by opening circuit breaker CB1. Check the MCB power supply input fuses (F1 and F2) with an ohmmeter. See Figure 14. A good fuse has negligible resistance through it (less than 2 ohms).
   a. If either or both fuses are blown, replace them. Go to step 4.
   b. If the fuses are intact, the MCB is defective.
3. Reconnect the Power In plug and disconnect all other connectors on the MCB. Cycle power to the controller (close and then open CB1) and check the power fuses.
   a. If both fuses are intact, go to step 5.
   b. If either fuse blows, the MCB is defective.
4. Reconnect the keypad/display ribbon cable. Cycle power to the controller and check the power fuses.
   a. If both fuses are intact, go to step 6.
   b. If either fuse blows, check the keypad/display and the connecting ribbon cable for shorts. Either one may be defective.

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5. Reconnect the Aux/Out connector plug to the MCB. Disconnect the 12 Vdc power plug from the LSB. Cycle power to the controller and check the power fuses.
   a. If both fuses are intact, go to step 7.
   b. If either fuse blows, it is likely that the keypad/display is defective.
6. Reconnect the digital output ribbon cable to the MCB. Reconnect the 12 Vdc power plug to the LSB. Cycle power to the controller and check the power fuses.
   a. If both fuses are intact, the problem is indeterminate. Obtain factory service.
   b. If either fuse blows, check the LSB board and the connecting ribbon cable for shorts. Either one may be defective.

Figure 14. MCB Power Supply Terminals



Troubleshooting Communications Problems

If a network communications problem exists, an alarm message on menu 18 of the keypad/display indicates which unit(s) the RMC Panel has lost communications with. Troubleshooting this type of problem is limited to the following:

- Checking the port B voltages
- Checking the port B fuses
- Checking the network wiring integrity
- Checking the network addressing

The best way to accomplish these checks is to perform the start-up procedures in the "Network Commissioning" section of this manual. If these procedures have been performed and the problem persists, obtain factory service.

Troubleshooting the LED Status Board

The LED Status Board is connected to the MCB via a 26-conductor cable and discrete wiring for the 12 Vdc power. The MCB provides operating voltages and control signal outputs for the LEDs.

Board Component Defective

If one of the LEDs, the alarm horn, or the alarm volume trim pot is bad, the LSB board must be replaced.

All LEDs Out

If there is power to the panel, one of the Unit Selection LEDs should always be lit. If the green status LED on the MCB is lit, but no LEDs on the LSB are lit, perform the following procedure:

1. Check the ribbon cable and connections between the LSB and the MCB. Look for bent pins.
2. Check for 12 Vdc at terminal 1 on the H1 plug on the LSB. Refer to the panel wiring diagram or Figure 13. To take the voltage reading, pull the plug back about one-eighth of an inch and place the test lead against the exposed pin. Place the other lead on chassis ground.

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a. If there is no voltage, go to step 3.
b. If there is 12 Vdc, the LSB is probably defective.

3. Check the wiring and connections between the Aux/Out terminal strip and the LSB. If the wiring is intact, the MCB is probably defective.

Troubleshooting the Keypad/Display Board

The Keypad/Display Board is connected to the MCB via a 26-conductor ribbon cable and discrete wiring for the back light. The MCB provides operating voltages, control signal outputs for the display, and input conditioning for the keypad inputs.

Display is Hard to Read

The clarity of the LCD display can be affected by ambient temperature. Typically, less contrast results with cooler temperatures. If the display is difficult to read, adjust the contrast trim pot, which is located on the back of the keypad/display assembly (see Figure 1).

Back Light Not Lit

The Keypad/Display Board supplied with the RMC Panel is equipped with a back light. If the light does not come on, check for 5 Vdc at terminal 1 on the J4 plug on the KDB. Refer to the panel wiring diagram or Figure 13. Note that this terminal is the one closest to the ribbon cable connector. To take the voltage reading, pull the plug back about one-eighth of an inch and place the test leads against the exposed pins. If there is no voltage, check the wiring and connections between the Aux/Out terminal strip and the KDB. If the wiring is intact, the MCB is probably defective.

Display is Blank or Garbled

If the MCB appears to be functioning properly and the display is completely blank or garbled, perform the following procedure:

1. Try cycling power to the controller by opening and then closing circuit breaker CB1 (see note below).
2. Try adjusting the contrast trim pot, which is located on the back of the keypad/display assembly (see Figure 1). If the contrast trim pot has no effect, it is likely that either the keypad/display or its ribbon cable is defective.
3. After removing power from the controller, check the ribbon cable and connections between the keypad/ display and the MCB. Look for bent pins. Restore power after reconnecting the cable.
4. Try swapping a known good ribbon cable and keypad/ display. (These may come, for example, from a unit controller. The keypad/display does not need a back light.) Swap these components separately to isolate the problem. Remove power from the controller before disconnecting the suspect component, and restore power after connecting the replacement component. If the problem persists, it is likely that the MCB is defective.

Note: The keypad/display and MCB must be powered up together; otherwise, the display will be blank. Therefore, if the keypad/display is ever disconnected from the MCB and then reconnected, power to the controller must be cycled to restore the display.

MCB Replacement

If an MCB board is defective and must be replaced, the proper controller software must be loaded into the replacement MCB. This can be done either at the factory or at the building site—if a PC equipped with appropriate Monitor software is available.

The factory downloads the proper controller software into a replacement MCB board before it is shipped if you include the RMC controller's program code with the replacement MCB part order. If the program code is not provided, the MCB board is shipped without software.

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Job-specific Monitor software includes each unit and auxiliary controller's program. Therefore, it is possible to download the proper controller software to a replacement MCB at the building site if a PC equipped with that job's Monitor software is available. In addition, if the controller's configuration data was stored on the PC hard drive prior to the MCB failure, the exact configuration data (including all keypad programmable setpoints and parameters) can be restored. Refer to the user's manual supplied with the Monitor software for more information.

Parts List

Component Designation	Description	Part No.
MCB	① ②Microprocessor Control Board	654873B-06
KDB	Keypad/Display Board	654972B-02
LSB	LED Status Board	664011A-01
T1	Transformer: 115/24 Vac	606308B-01
T2	Transformer: 24/18 Vac, Center Tapped	467381B-14
CB1	Circuit Breaker	350A733H03
–	Ribbon Cable Assembly: 26-Conductor, MCB to LSB	664012B-01
–	Ribbon Cable Assembly: 26-Conductor, MCB to KDB	654997B-05
–	Fuse: MCB Input Power, 2 Amp (Bussman No. GDC-2A)	658220A-01
–	Fuse: MCB Communication Ports, 0.25 Amp	658219A-01
–	PC Communications Cable Kit	0057186802
–	RS-232 Cable Extension Kit	0065487001
–	Modem Kit	0072140601

Notes:

1. If desired, the factory can download the correct software into the replacement MCB prior to shipment. See the "MCB Replacement" section above for more information.
2. MCB part number 654873B-06 includes a high memory chip. In addition to itself, this part replaces MCB boards with part numbers 654873B-01 and 654873B-03.

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