

# Intelligent Rack Adapter

*Model RAK-1*

•

**for Remote Facilities Controller model RFC-1/B**

**– INSTALLATION AND OPERATION –**

*This documentation is valid for  
Intelligent Rack Adapter hardware version 1.01*



*Nashville, Tennessee • 615-228-3500*

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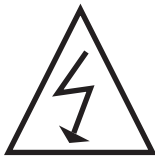
## Section I — Safety Information



### **WARNING!**

*The RAK-1 Intelligent Rack Adapter should be installed only by qualified technical personnel. An attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the RAK-1 or other equipment. Please ensure that proper safety precautions have been made before installing this device.*

*Before connecting AC power to the RAK-1, verify that the internal power supply is configured for the appropriate voltage. Do not remove or defeat the ground prong of the the AC plug. The RAK-1 is designed for indoor use in a dry location. Installation and operation in other locations could be hazardous.*



### **High Voltage!**

*Since the RAK-1 operates on 120/240 volts AC, dangerous and potentially lethal voltages will be present if the cover is removed while it is connected to AC power. For this and other reasons, service should be performed only by a qualified technician.*

*If the fuse in the RAK-1 is replaced, the new fuse should be of the same type and rating as the original fuse. This is indicated on the rear panel.*

*The RAK-1, as any electronic device, can fail in unexpected ways and without warning. Do not use the RAK-1 in applications where a life-threatening condition could result if it were to fail.*

## Section 2 — FCC Information

### 2.1 Part 68 Compliance

The RAK-1 Intelligent Rack Adapter complies with Part 68 of the FCC rules. On the rear panel of the Rack Adapter is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN) for this equipment. If requested, this information must be provided to the telephone company.

The REN is used to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in devices not ringing in response to an incoming call. In most areas, the sum of the RENs should not exceed 5.0. Contact the local telephone company to determine the maximum REN for the calling area.

The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the RAK-1. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications to maintain uninterrupted service.

Please contact Sine Systems, Inc., for repair and/or warranty information if you suspect that the RAK-1 has malfunctioned. If a defective device is causing harm to the telephone network, the telephone company may request you remove that device from the network until the problem is resolved.

The RAK-1 cannot be used on public coin service lines provided by the telephone company. Connection to Party Line Service is subject to state tariffs. Contact your state public utility commission, public service commission, or corporation commission for information.

The RAK-1 is registered with the Federal Communications Commission and is certified to meet specific safety requirements. It is extremely important that the Rack Adapter not be modified in any way. Modification of this equipment will void the FCC certification, void the warranty, and perhaps pose a hazard to the user of this equipment or to maintenance personnel of your local telephone company.

Service should be performed only by qualified technical personnel who are familiar with the implications of FCC Part 68 registration. Extreme caution should be used if the RAK-1 chassis is opened while still connected to the telephone line. High voltages may be present on telephone lines.

## Section 3 — System Descriptions

### 3.1 General Description

The Intelligent Rack Adapter model RAK-1 is designed for use with the RFC-1/B Remote Facilities Controller. The RAK-1 adds front panel indicators, modem, parallel printer port, battery backed power supply and telephone line surge suppression to the RFC-1/B. The unit can operate on either 120 volts or 240 volts AC. It is set for 120 volt AC operation when shipped from the factory.

The RAK-1 is housed in a standard EIA single space (1U) 19 inch rack mounted case. There are no front panel switches or selectors. System status is given through LED's visible through the front panel. There are indicators for power and battery, system online and various other elements of system activity and behavior.

The rear panel holds all the connections to the RAK-1. There are connections for power supply, parallel printer, relay panels, telephone and telephone line. The power supply fuse is accessible from the rear panel and a single switch to enable or disable the battery backup system is available.

The main circuit board from a Remote Facilities Controller model RFC-1/B mounts inside the RAK-1 chassis. This board is responsible for the control and telemetry functions of the system. Installed inside the RAK-1 is a board with new interface hardware, indicators and power supply circuitry.

### 3.2 System Requirements

For systems that were not purchased with the RFC-1/B already installed, the RFC-1/B must have firmware version 4.00 or later--this is also referred to as software in our documentation. An upgrade kit model SU-5 is available for older systems that do not meet this requirement. To determine the firmware version, connect to the RFC-1/B and give the command '78'. The system will respond with 'Software Version' followed by the version number.

The RAK requires a single grounded power supply outlet. It replaces the 12 volt AC wall plug transformer that the RFC-1/B uses in a 'stand-alone' installation.

At least one RP-8 Relay Panel is required for system operation. The RP-8 supplies eight channels of telemetry and control I/O. If the RAK-1 is installed as an upgrade to an previously functioning RFC-1/B system, an RP-8 is already in service.

A single telephone line terminated in a standard modular (RJ11C) type connector is necessary for communications. This line will be used for both voice and data communications. A single line telephone is required for programming and local control of the RFC-1/B. Speaker phones are not recommended.

### 3.3 Front Panel Indicators

The front panel of the RAK-1 Intelligent Rack Adapter contains nine status indicators for various system functions. These indicators are grouped by function.



Figure 3.1; Front panel indicators

- Power Supply Voltage indicates when main AC supply is present.
- Battery Charging indicates that the battery charging system is enabled and that the batteries are charging.
- Voice/DTMF and Serial Data indicate what communications mode is currently active. Only one of these indicators will be illuminated at a time.
- DTMF Detect and Serial Tx/Rx indicate data transmission by the appropriate method of communication. In voice mode, DTMF detect indicates the system has detected a telephone keypress. In data mode, Serial Tx/Rx indicates that serial data has been transmitted or received.
- Off (Lower) and On (Raise) indicate that a control relay is activated.
- Online (Ring Indicate) indicates when the system is online in local mode. When the incoming telephone line is ringing, this LED flashes with the ring. This is useful for troubleshooting.

### 3.4 Rear Panel Switches and Connections

The rear panel of the RAK-1 contains all the I/O connections to the device, the power supply protection fuse and a battery charge switch.

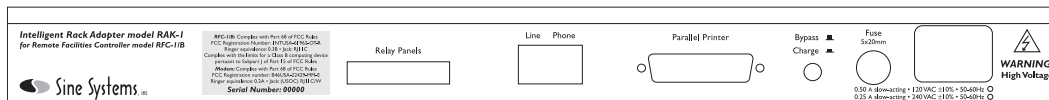


Figure 3.2; Rear panel connectors

- Relay Panels is a 16 conductor pin/plug type connector. A flat (ribbon) cable connects the RAK-1 to the RP-8 Relay Panels.
- Telephone Line/Phone are RJ11C modular connectors. These are standard telephone line connectors for POTS type telephones and telephone lines.
- Parallel Printer is a 25 pin female 'D' type connector. This is standard parallel printer connector commonly associated with PC's.
- Battery Bypass/Charge is a latching toggle switch. The switch enables and disables the internal battery backup system. When the switch is in the pressed position the backup battery is active.

- Fuse is a twist-release type connector. A 5 x 20 mm fuse is installed inside this connector. The fuse value is indicated on the rear panel.
- Power Supply is a standard three prong AC supply inlet as found on PC's and most other modern commercial electronic devices.

## **3.5 Electrical Functions and Description**

The RAK-1 provides the RFC-1/B with several extra features in a compact chassis. While all of these features are available separately, the RAK-1 is cost efficient and a particularly elegant solution. Furthermore, the RAK-1 is the only way to connect both a modem and a parallel printer the RFC-1/B at the same time.

### **3.5.1 Modem**

The RAK-1 contains a 2400 baud 'AT' command set compatible modem. The modem allows the RFC-1/B to be polled for telemetry data and controlled by an external computer at a remote site. The RFC-1/B can also log telemetry data and place alarm calls through the modem. The modem uses the same telephone line that is used for voice/DTMF operation. The RFC-1/B manuals provide information on setting the system up to use this option. (Note: while 2400 baud may seem slow by current data transmission standards, data transfer within the RFC-1/B is relatively slow and it would not take advantage of a high speed data connection if it were available.)

### **3.5.2 Printer Port**

The Parallel Printer port allows an inexpensive parallel printer to be attached to the RAK/RFC system so that telemetry readings and/or system alarms can be logged to a local printer. The RFC-1/B manuals provide information on setting the system up to use this option. The printer must be a true parallel printer and not a 'Windows Printer' that uses a parallel interface. Windows Printers lack some of the necessary intelligence to handle simple printing tasks. They do not work outside of the Microsoft Windows® environment.

### **3.5.3 Battery Backup**

There is a set of rechargeable batteries inside the RAK-1 that will automatically power the system when AC power fails. When AC power returns, the batteries are recharged. The RFC-1/B memory is non-volatile and is not effected when there is no power. The time and date are the only data that is lost. Among other things, the batteries allow the RFC-1/B to continue to operate so that it can place a call to warn an operator of the power loss.

### **3.5.4 Surge Suppression**

The RAK-1 includes surge suppression on the AC power and battery charging circuits, and on both the local and remote telephone lines. A combination of fuses, varistors, gas arrestors and polyswitches are used to protect these circuits. The printer data connections are optically isolated and a pair of fuses protect the printer interface power supply. Telemetry inputs should be protected with our SP-8/TO Surge Protector.

## Section 4 — Installation



### **WARNING!**

*The RAK-1 Intelligent Rack Adapter should be installed only by qualified technical personnel. An attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the RAK-1 or other equipment. Please ensure that proper safety precautions have been made before installing this device.*

*Before connecting AC power to the RAK-1, verify that the internal power supply is configured for the appropriate voltage. Do not remove or defeat the ground prong of the AC plug. The RAK-1 is designed for indoor use in a dry location. Installation and operation in other locations could be hazardous.*

### **4.1 System Includes**

The RAK-1 Intelligent Rack Adapter package contains these items:

- Intelligent Rack Adapter model RAK-1
- rechargeable batteries (installed)
- 16 pin ribbon cable jumper
- 16 pin DIP connector jumper
- telephone and line jumpers
- rack mounting hardware
- board mounting hardware
- power cable and fuse for use in the US
- operation manual

The system may be ordered with a new RFC-1/B pre-installed at the factory, otherwise it is not included. At least one RP-8 Relay Panel is required but is not included unless specified. Our SP-8 Surge Protector is not included but strongly recommended as a means of protecting telemetry inputs.

### **4.2 Installing the Unit**

The RAK-1 is housed in a standard EIA single space (1U) 19 inch rack mounted case. There are no front panel switches or selectors. The system generates little heat and can be installed in most any convenient rack space.



### 4.2.1 Power Supply Adjustment

The RAK-1 can operate on either 120 volts or 240 volts AC. It is set for 120 volt AC operation when shipped from the factory. Inside the unit are a set of jumpers that determine the input supply voltage. If the unit is to be powered by 240 volts AC, change the jumpers as shown in Figure 4.1.

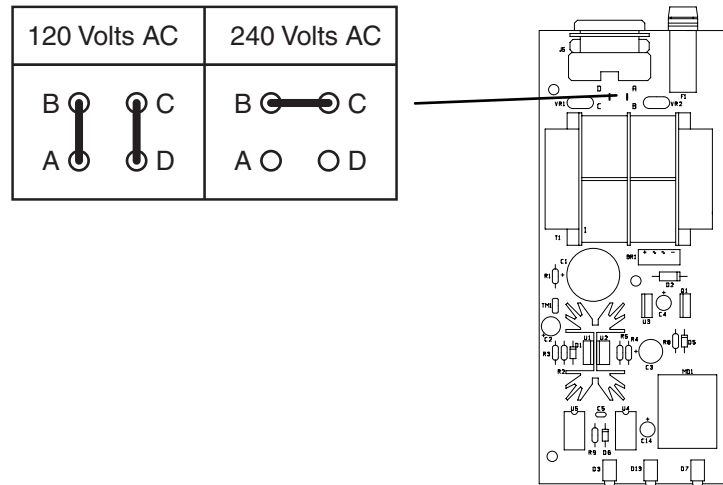


Figure 4.1; Power supply jumper select

The main supply is fuse protected. The fuse that is installed at the factory is suitable for U.S. installations. It is not necessary to remove the cover to replace the fuse should this become necessary. The fuse rating is given on the rear panel of the RAK-1.



### **WARNING!**

***Do not make any attempt to bypass the fuse. If fuse replacement becomes necessary, use one of the specified type and rating. Failure to follow these instructions could result in a hazardous condition to the installer or other personnel, and/or damage to the RAK-1 or other equipment. Please ensure that proper safety precautions have been made before installing this device.***

### 4.2.2 Installing the RFC-1/B Main Board

A large cutout area in the main board of the RAK-1 accommodates the circuit board from a Remote Facilities Controller model RFC-1/B. These items may be preassembled at the factory if they are ordered together, however the RAK-1 is often ordered as an upgrade. Upgrade installation is not difficult, and is easily installed in the field.

To install the RFC-1/B main board into the RAK-1 rack adapter, disconnect all cables from the RFC-1/B. It is not necessary to disconnect the cables from the RP-8 Relay Panel. Then remove the two screws from either end of the RFC-1/B and slide the RFC-1 main board out of the case. The original panels and case will not be reused but it is probably a good idea to save these items.

Open the RAK-1 case by removing the two retaining screws from the rear panel of the case and sliding the top out from the rear.

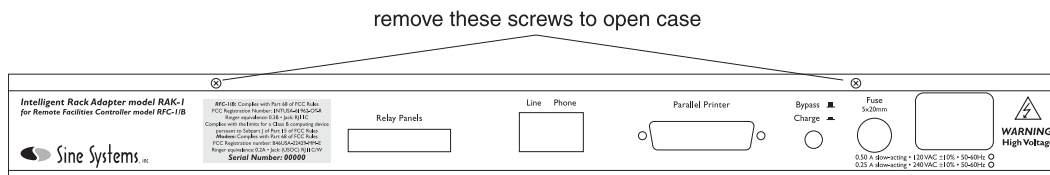


Figure 4.2; Remove RAK-1 top

Place the RFC-1 inside the cut-out in the RAK-1 board as shown below.

Install the 16 pin DIP jumper connector between J4 on the RFC-1/B and J9 on the RAK-1. It does not matter which way the jumper is installed as long as all the pins are in place.

Install the short 16 pin flat cable jumper from the J3 on the RFC-1/B to header J6 on the RAK-1.

Connect the jumper for the local phone between J2 on the RFC-1/B and J8 on the RAK-1. Likewise, connect the jumper for the telephone line between J1 on the RFC-1/B and J7 on the RAK-1.

Secure the RFC-1/B main board in place by using the four 4-40 screws and nylon washer supplied. Use the washers and do not overtighten the screws. Excessive force can stress the board or damage the protective layer on the pc board that protects it electrically from short circuits.

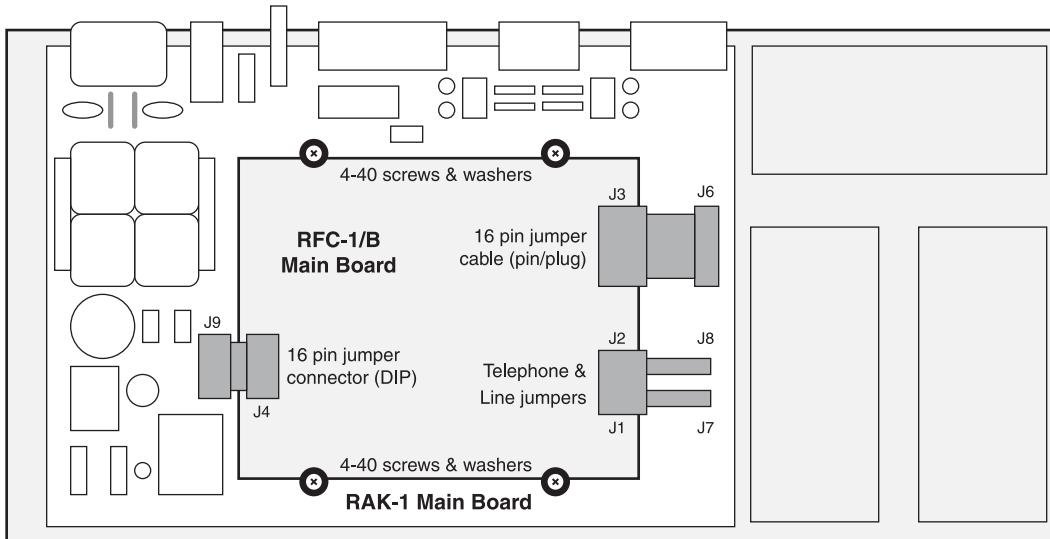


Figure 4.3; Installing the RFC-1/B main board

Now that the RFC-1/B is secure, replace the top panel of the RAK-1 case and fasten it with the two screws removed earlier. Install the RAK-1 Intelligent Rack Adapter in the rack along with the RP-8 Relay Panel.

### **4.2.3 Connecting the Relay Panels**

RP-8 Relay Panels attach to the RAK-1 on the 16 conductor pin/plug type connector labeled 'Relay Panels'. If the RAK is being installed as an upgrade to an existing installation, *disconnect the 12 volt AC power supply from the RP-8 and remove it from service!* This power supply is replaced by the battery backed supply in the RAK-1.

Simply press the flat cable connector into the 'Relay Panels' connector on the RAK-1 taking notice to orient the keyed portions of the connectors appropriately. The latches will close in on the sides of the cable connector as it is inserted. Gently snap the latches into their locked position to secure the cable into the connector.

### **4.2.4 Connecting the Telephone Line and Local Phone**

The RAK-1 uses standard RJ11C modular type jacks for the telephone and line connections. The two jacks are located at the center of the rear panel of the RAK-1. Insert the telephone line into the side labeled 'Line' and the local telephone into the side labeled 'Phone'. Keep these lines as short as possible to minimize the potential for lightning damage through the telephone system.

### **4.2.5 Connecting a Parallel Printer**

A parallel printer can be connected directly to the connector labeled 'Parallel Printer' with the appropriate cable-- typically a 25 pin male D to Centronics. The RFC-1/B manuals provide information on setting the system up to use this option.

The printer must be a true parallel printer and not a 'Windows Printer' that uses a parallel interface. Windows Printers lack some of the necessary intelligence to handle simple printing tasks. They do not work outside of the Microsoft Windows® environment.

The RFC-1/B thinks that all printers are continuous feed dot matrix parallel printers. Until recently, most inexpensive parallel printers were continuous feed, dot matrix. Currently, the RFC-1/B does not know that it should send page feeds to a printer. It sends a continuous stream of data with carriage returns and line feeds. Usually this is not a problem. Some printers refuse to dump the final data from the buffer because a page feed is received. For these printers, there may be an option in the printer setup that will force it to print the final data from buffer without a page feed.

### **4.2.6 Connecting AC Power**

The power cable that comes with the RAK-1 is suitable for U.S. installations. Simply attach the lead into the AC power inlet on the rear panel of the RAK-1 and connect the plug into any standard 120/240 volt power source. The system should now be active and the power supply indicator(s) on the front panel will illuminate. The RAK-1 does not have a main power switch. To kill the power to the system, unplug the main power supply and set the battery backup switch to the 'Bypass' position.

## 4.3 Modem Operation

Using the RAK-1 modem, the RFC-1/B can be operated via a modem with commands sent from a personal computer. The RFC-1/B should communicate with any terminal program (on any computing platform) capable of sending and receiving ASCII data over an RS-232 serial data stream. In data mode the RFC-1/B responds to the same commands that it does in voice mode from a remote telephone.

RFC-1/B operating information is contained in the RFC-1/B documentation.

### 4.3.1 Remote Logging Options

Remote logging is possible using the RAK-1 modem to connect to another modem at a distant location that logs data to a printer or to a computer data file. There are two common, cost-effective options for devices at the printer side. Use a computer with a modem and printer that runs a terminal program that echoes data to the printer or to a file. Or, use a serial printer connected directly to a modem that will send all received data to the printer.

In the first scenario the RFC-1/B can call the computer and send data to the computer or the terminal program can run a script that will allow it to call the RFC-1/B and download data automatically. If data is being logged from only one site, it may be easier to program the RFC-1/B to call. But if data is to be collected from multiple sites, having the computer call the remote sites eliminates the possibility of two systems calling the computer at the same time. Using a scriptable terminal program definitely allows more flexibility in the system but it is a little more time-consuming to set up initially.

The second scenario uses a printer and a modem to build a simple but effective uni-directional terminal. In this scenario the printer must be a serial printer (or a parallel printer with a serial to parallel data converter) because it must accept data RS-232 serial data directly from the modem. Many printers that were once used by news wire services have a serial interface. When configured properly and connected directly to a modem, the printer will print any data received by the modem. Enable auto answer on the modem so it will automatically connect when called.

### 4.3.2 Remote Logging--RFC-1 Initiates Call

*Information presented in this section assumes that you have functional knowledge of the RFC-1/B and that you are familiar with its programming mode. Programming instructions are in the RFC-1/B documentation. Additional programming information and assistance is available at <http://www.sinesystems.com>.*

Setting up the RFC-1/B to call a remote location and send the channel readings involves programming:

- an action sequence that causes the RFC-1/B to place the call and send the data
- a trigger for the action sequence
- the telephone number that will be called
- the communication speed and protocol
- the Autoscan stop channel

The instruction for remote printing is "8-9" and it can be used in an action sequence by itself or placed in an action sequence that performs other tasks. Be aware that if it is placed after an instruction that involves voice telephone calls the user may terminate the alarm before the print sequence is triggered.

Transmitter readings can be logged at specified intervals during the day by programming the appropriate Date/Time Triggers in memory that trigger an action sequence that contains the remote print instruction "8-9". For instance, to log readings at hourly intervals every day requires programming 24 date/time triggers to the action sequence--one for each hour of the day. Two hour intervals requires programming 12 date/time triggers, etc.

Transmitter readings can be logged when a telemetry alarm event occurs by adding the remote print instruction to the action sequence that is triggered by the alarm. In the factory settings all alarms trigger Action Sequence 1 which tells the system to call all available telephone numbers in voice mode. Change this to trigger the action sequence that contains the remote print instruction to have the alarm print a set of channel readings when the alarm occurs.

When the RFC-1/B encounters the remote print instruction it automatically dials the telephone number stored at location F. This telephone number begins at address 0710 in memory. The call mode for telephone number F (address 0722) should be changed from the factory default 0 to the value 1. The number of attempts (address 0723) is ignored when triggered by the remote print instruction. However, if the number at location F is dialed through the normal calling instructions, the calling mode and number of attempts will be used so it is probably a good idea to set these items appropriately when the telephone number is programmed.

When placing a call in data mode the RFC-1/B uses the baud rate indicated by the data at address 1005. The factory setting is 2400 baud. Settings are available for baud rates from 300 to 9600 baud but the RAK-1 hardware is currently limited to 2400 baud. Speed is not usually an issue since the data rate out of the RFC-1/B is limited and the system transmits relatively small amounts of data. The data protocol is fixed at 8 data bits, no parity, 1 stop bit (8,N,1).

The Autoscan stop channel is programmed at addresses 1010-1011. The RFC-1/B prints all channels from 00 to the channel programmed at these locations. The factory setting is 0-7 for channels 00-07 inclusive.

### **4.3.3 Remote Logging--Host Computer Initiates Call**

*Information presented in this section assumes that you have functional knowledge of the RFC-1/B and that you are familiar with its programming mode. Programming instructions are in the RFC-1/B documentation. Additional programming information and assistance is available at <http://www.sinesystems.com>.*

With the RAK-1 the RFC-1/B can be called from a remote computer in data mode and polled for channel readings. Operation in data mode is not limited to taking channel readings since the RFC-1/B will respond to any commands just as if it were on a voice call from a remote telephone.

Setting up the RFC-1/B to be contacted from a remote computer involves programming:

- the communications mode
- the baud rate

The communications mode determines if the RFC-1/B answers an incoming call in voice mode or data mode. To make the system more flexible, the system can attempt to answer a call in one mode and transfer to the other if the first mode fails. This option is controlled by programming at address 1002. See the RFC-1/B manual for more information.

If the RFC-1/B is set to connect in voice mode before data mode, the calling modem may need to be set to wait *at least 40 seconds* for a carrier signal before timing out. Many modems default to 30 seconds which may not allow enough time for call connection the voice mode attempt. Additionally, many of the newer high speed modems take more time after connection trying to negotiate error correction and data compression. The command "ATS7=060" makes the modem wait 60 seconds before timing out. Many communication programs allow you to modify the modem setup string to include this information.

When receiving a call in data mode the RFC-1/B uses the baud rate indicated by the data at address 1005. The factory setting is 2400 baud. Settings are available for baud rates from 300 to 9600 baud but the RAK-1 hardware is currently limited to 2400 baud. Speed is not usually an issue since the data rate out of the RFC-1/B is limited and the system transmits relatively small amounts of data. The data protocol is fixed at 8 data bits, no parity, 1 stop bit (8,N,1).

#### 4.3.4 Modem Connection Issues

Compared to a PC, the RFC-1/B is an unsophisticated device. It cannot negotiate error correction and data compression. The key to successful connections is to disable as many of these features in the calling modem as possible. Lock the calling modem in at the desired baud rate and disable these high speed connection features (the commands vary among modem chipsets). More often than not they will cause the connection to the RFC-1/B fail.

### 4.4 Printer Setup

Using the RAK-1 parallel printer port allows the RFC-1/B to automatically log readings to a locally connected printer. Printing can occur as a result of a telemetry alarm or at programmed intervals by the clock/calendar.

#### 4.4.1 Local Printer Logging

*Information presented in this section assumes that you have functional knowledge of the RFC-1/B and that you are familiar with its programming mode. Programming instructions are in the RFC-1/B documentation. Additional programming information and assistance is available at <http://www.sinesystems.com>.*

Setting up the RFC-1/B to print channel readings to a local printer involves programming:

- an action sequence that causes the RFC-1/B send the data to the printer
- a trigger for the action sequence
- the communication speed
- the Autoscan stop channel

The instruction for local printing is “8-8” and it can be used in an action sequence by itself or placed in an action sequence that performs other tasks. Be aware that if it is placed after an instruction that involves voice telephone calls the user may terminate the alarm before the print sequence is triggered.

Transmitter readings can be logged at specified intervals during the day by programming the appropriate Date/Time Triggers in memory that trigger an action sequence that contains the print instruction. For instance, to log readings at hourly intervals every day requires programming 24 date/time triggers to the action sequence--one for each hour of the day. Two hour intervals requires programming 12 date/time triggers, etc.

Transmitter readings can be logged when a telemetry alarm event occurs by adding the remote print instruction to the action sequence that is triggered by the alarm. In the factory settings all alarms trigger Action Sequence 1 which tells the system to call all available telephone numbers in voice mode. Change this to trigger the action sequence that contains the remote print instruction to have the alarm print a set of channel readings when the alarm occurs.

The RFC-1/B sends a serial data stream to the print interface of the RAK-1 which then converts the data stream to the appropriate parallel data format. The RAK-1 printer interface expects to see the incoming data at 2400 baud--the same speed as the internal modem of the RAK-1. The factory baud rate setting for the RFC-1/B is 2400 baud. It is programmed at address 1005. Settings are available from 300 to 9600 baud but the print interface only recognizes 2400 baud and 300 baud. A jumper change is necessary to set the print interface to 300 baud.

The Autoscan stop channel is programmed at addresses 1010-1011. The RFC-1/B prints all channels from 00 to the channel programmed at these locations. The factory setting is 0-7 for channels 00-07 inclusive.

## Section 5 — Troubleshooting and Repair

### 5.1 Common Problems and Possible Solutions

*Problem:* The RAK-1 does not power up.

*Solutions:* Check that the fuse and internal jumpers are set for the appropriate voltage. Make sure that the fuse is intact. Check power cord for shorts or worn spots.

*Problem:* The RAK-1 appears to power up but behaves erratically. In some cases the Serial Data Mode LED stays illuminated all the time but the system is set for voice mode operation and/or the system freezes.

*Solutions:* Check internal jumper cables. Make sure that the DIP jumper that connects J4 on the RFC-1 and J9 on the RAK-1 is installed so that all pins mate properly and are seated fully in the expansion sockets.

*Problem:* The RAK-1 appears to power up but there is no response in the local phone when the 'Local Control' button is pressed.

*Solutions:* Verify that the flat cable jumper connector from J3 on the RFC-1/B to J6 on the RAK-1 is installed correctly. Test the jumper cable for shorts or open connections. Verify that the telephone and line jumpers are connected from J2 on the RFC-1/B to J8 on the RAK-1 and from J1 on the RFC-1/B to J7 on the RAK-2. Also, verify that the local telephone and telephone line are plugged into the correct positions of the connector on the rear panel of the RAK-1. These connections are not identical and they should not be swapped.

*Problem:* There is a dialtone in the local phone but, when the 'Local Control' button is pressed, the dialtone goes away and nothing else happens.

*Solutions:* Verify that the telephone and line jumpers are connected from J2 on the RFC-1/B to J8 on the RAK-1 and from J1 on the RFC-1/B to J7 on the RAK-2. Also, verify that the local telephone and telephone line are plugged into the correct positions of the connector on the rear panel of the RAK-1. These connections are not identical and they should not be swapped.

*Problem:* When the RAK-1 loses power, the time and date are lost in the internal clock.

*Solutions:* Check the position of the battery charge switch on the rear panel of the RAK-1. This switch should be in the 'Charge' position for the battery backup to function properly. The batteries are rechargeable 6 VDC 1.2 Ah NiCad batteries and will fail over time as will all batteries of this type. Replacement batteries are available through Sine Systems or most any vendor of batteries or alarm systems.

*Problem:* A printer is attached but there are no readings or all calls are answered in voice mode but I want to use a computer.

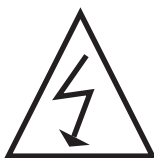
*Solutions:* The system has not been setup to recognize and use these hardware accessories. Also the baud rate of the RFC-1/B and the printer must both be set to 2400. See the RFC-1/B system manuals for instructions on setting up the system to use these features.

## 5.2 Repair Safety Warnings



### **WARNING!**

*The RAK-1 Intelligent Rack Adapter should be installed or repaired only by qualified technical personnel. An attempt to repair this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the RAK-1 or other equipment. Please ensure that proper safety precautions have been made before installing or repairing this device.*



### **High Voltage!**

*Since the RAK-1 operates on 120/240 volts AC, dangerous and potentially lethal voltages will be present if the cover is removed while it is connected to AC power. For this and other reasons, service should be performed only by a qualified technician.*

## 5.3 Factory Service Policy

These policies are effective August 1999 and are subject to change without prior notice.

### 5.3.1 Factory Warranty

Sine Systems, Inc. guarantees our products to be free from manufacturing defect for a period of one year from the original date of purchase from Sine Systems, Inc. This warranty covers the parts and labor necessary to repair the product to factory specifications. This warranty does not cover damage by lightning, normal wear, misuse, neglect, improper installation, failure to follow instructions, accidents, alterations, unauthorized repair, damage during transit, fire, flood, tornado, hurricane or acts of God and/or nature.

### 5.3.2 Factory Return Policy

The factory return policy only applies to equipment purchased directly from Sine Systems, Inc. Equipment purchased through a third party (dealer) is subject to the return policy of the dealer and arrangements for return or exchange must be handled through the dealer.



Sine Systems policy on returns and exchanges with the factory is broken down according to the following schedule:

*30 days “no questions asked”*

During the first thirty days from the date that equipment ships from our factory we will accept it back for a full refund less shipping charges provided that the equipment is still in new, resellable condition with no cosmetic damage. This does not constitute an evaluation program. It is for legitimate purchases only.

*less than 60 days, may be returned less 15% restocking fee*

Between 31 and 60 days from the time we ship the equipment, we will accept unmodified equipment back for a refund less shipping charges and 15% of the invoice cost. This is to cover the cost of restocking the items which must then be sold at a discount as reconditioned instead of new.

*no return after 60 days*

We will recondition the equipment for you according to our repair rates but we will not accept it for refund or exchange after 60 days from the initial purchase.

### **5.3.3 Factory Service Policy**

Sine Systems is proud to offer same day repair service on all of our products. When we receive damaged equipment, we will repair it and ship it back the same day it arrives. Because we offer immediate service, we do not send loaner equipment. If we cannot immediately repair equipment and return it, we may ship a loaner unit at our discretion.

While we do not require prior authorization on repairs, we suggest that you verify our shipping address before returning equipment for repair. Sine Systems is not responsible for items lost in transport or delivered to the wrong address. Emergency service may be made available on weekends or holidays, at our discretion, if arrangements are made with us in advance.

### **5.3.4 Warranty Service**

There is no charge for repair service on items covered under warranty. You are responsible for shipping charges to return damaged equipment to us for repair. Damage due to negligence, lightning or other acts of nature are not covered under warranty.

### **5.3.5 Service Rates**

For service not covered under warranty we have a flat rate repair fee. Flat rate repairs cover only components that fail electrically. Mechanical damage will be assessed on a per repair basis. Repair charges typically fall into one of these categories. Shipping fees are not covered in the repair rate.

*Minor programming adjustments or no damage, \$50 plus shipping*

Sometimes a system works exactly like it is supposed to when we get it or it can be fixed through a simple adjustment in firmware. We will do our best to identify intermittent hardware problems and correct them. The fee covers the time it takes our technician to thoroughly inspect and test the equipment.

*Minor repairs are up to \$150 plus shipping*

Five or fewer defective components are replaced in a minor to moderate repair. This accounts for most of our repairs. These repairs may cost less depending on the components replaced and the amount of time required to complete the repair.

*Moderate repairs are \$250 plus shipping*

Six to ten defective components are replaced in a major repair. Again, we may charge less depending on the components replaced and the amount of time required to complete repairs.

*Major repairs cost more than \$250 plus shipping*

This occurs rarely but it can happen. If the equipment has blown traces and scorch marks from burned components, it's a safe bet that it will take several components and quite a bit of bench time to repair. We assess this type of repair on a per incident basis.

*Damaged beyond recognition, assessed on a per case basis*

Hopefully you have insurance. In cases where the board is so badly damaged that it is not worth repairing we may, at our discretion, offer to replace the destroyed circuit board. The options and costs vary widely in these cases so we will call with options.

All repairs must be billed to a credit card or shipped COD. Specify which you prefer with your request for service. At your request, we will call with the total amount of the repair (including applicable shipping charges) so that suitable payment can be arranged before a COD shipment. If you need a COD total, do not forget to include a telephone number where you can be contacted.

### **5.3.6 Instructions for Factory Service**

Please include a note with any specific information available about the equipment failure as an aid to our technicians. Pack equipment carefully to avoid further damage in shipping. We are not responsible for damage during transport.

When returning a system with multiple components, we strongly suggest that you return the entire system. We will repair the parts that are returned but lightning is rarely selective enough to damage only a single part of a system.

Be sure to include a street address for return shipping by UPS. The repair will be delayed if you neglect to give us enough information to return your equipment--this actually happens! If you prefer a carrier other than UPS or wish us to bill to your shipping account, we can usually accommodate these requests. Many carriers do not accept COD shipments so credit card billing may be required for carriers other than UPS. If you do not specify otherwise, return shipments will be made by the UPS equivalent of the received shipping method (i.e. Ground shipment, 2nd Day, Overnight).

We suggest that you verify our shipping address before sending equipment for repair. Same day service does not apply if you ship to an incorrect address and/or the carrier delivers the equipment too late in the day for repairs to be completed. Sine Systems is not responsible for equipment that is not delivered to our factory. It will be your responsibility to contact the carrier to retrieve your improperly delivered equipment.

## Section 6 — Specifications

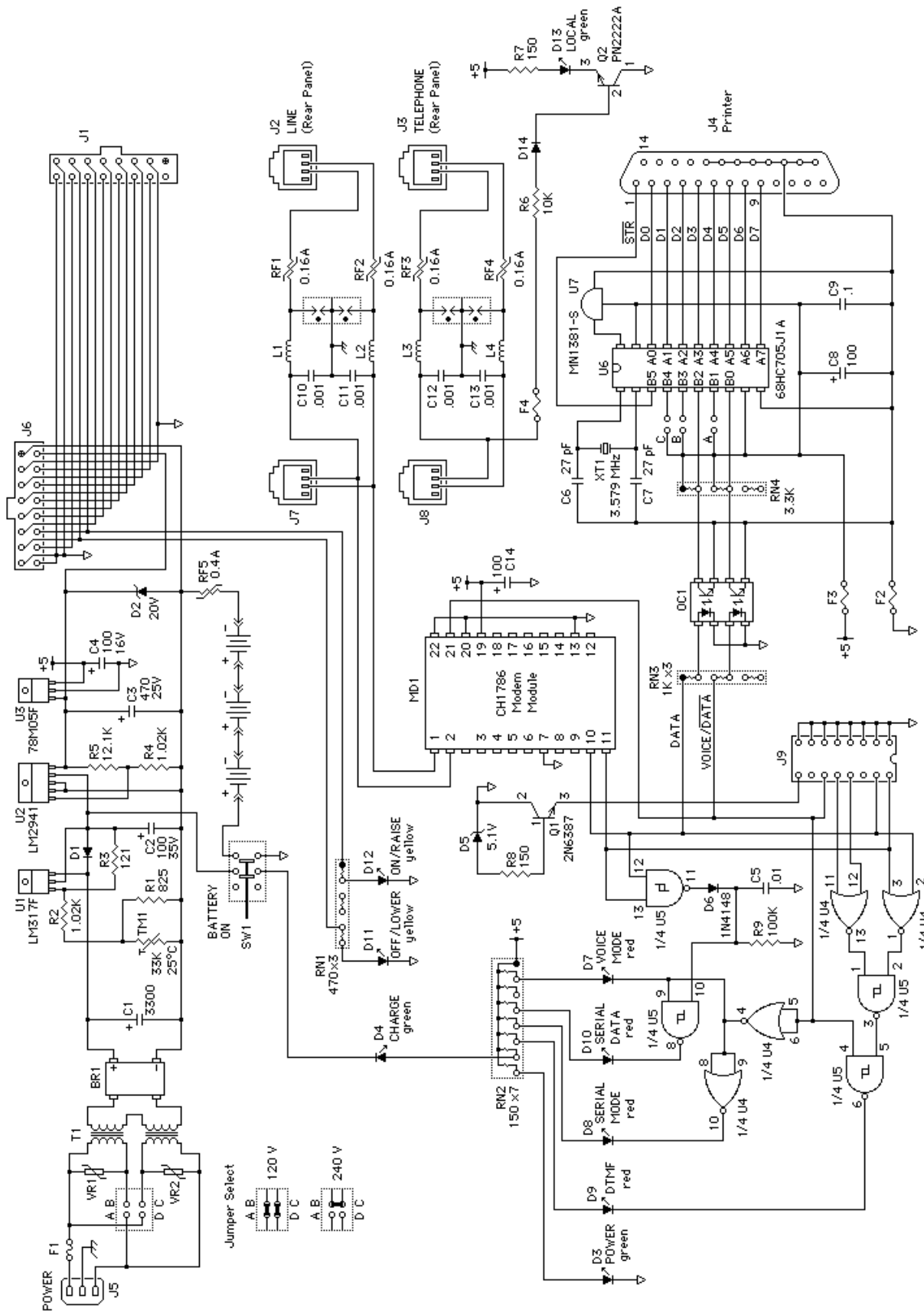
### 6.1 Electrical Specifications

Specifications for the RFC-1/B and RP-8 are given in the RFC-1 hardware manual.

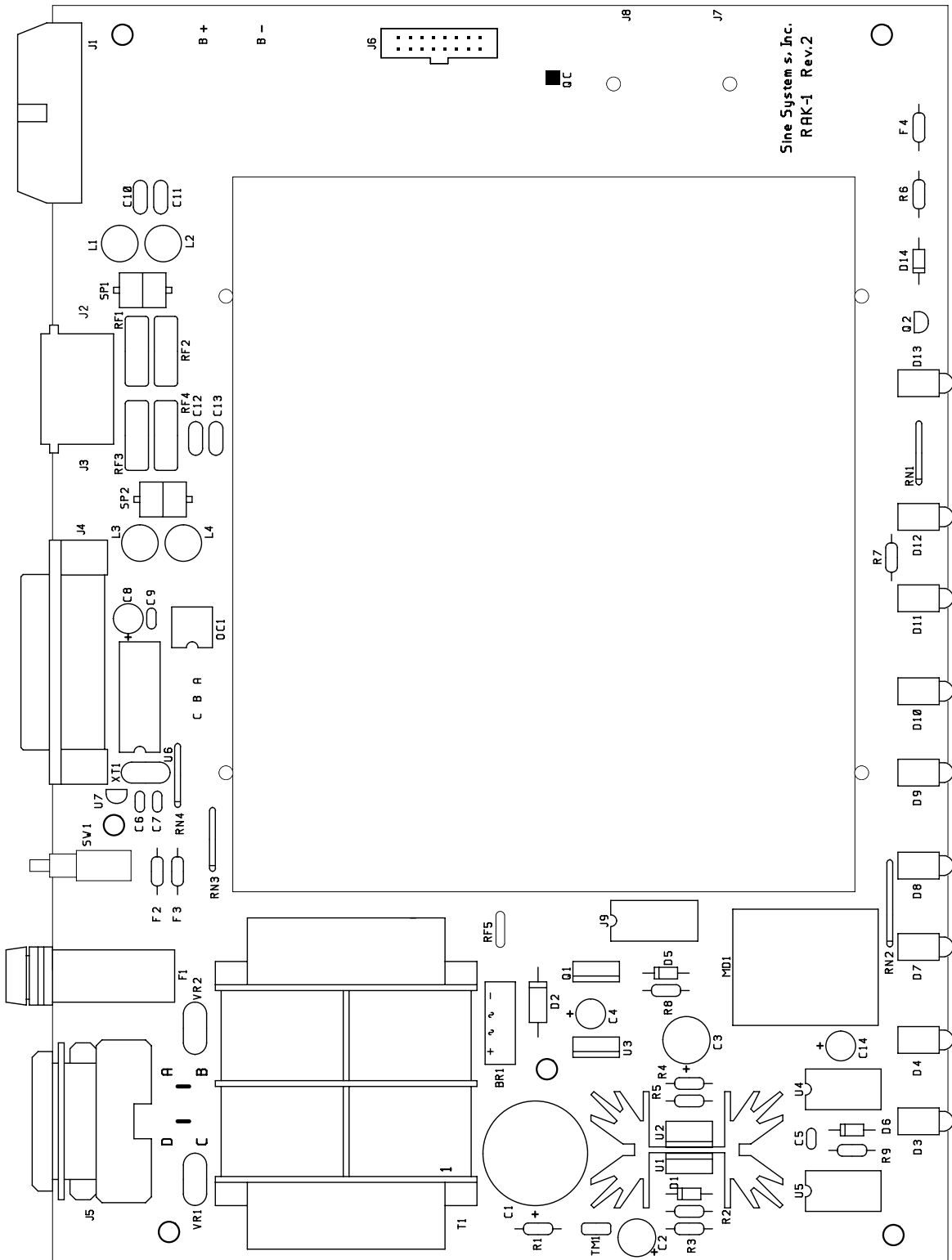
<i>Ports</i>	Relay Panels (16 conductor pin/plug type) Telephone Line/Phone (RJ11C modular) Parallel Printer (25 pin 'D' type) AC Power (consumer type grounded)
<i>Switches</i>	Battery Charge/Bypass (latching toggle)
<i>LED Indicators</i>	Supply Voltage (green) Battery Charging (green) Voice/DTMF (red) Serial Data (red) DTMF detect (red) Serial Tx/Rx (red) Off/Lower (yellow) On/Raise (yellow) Online/Ring Indicate (green)
<i>Modem</i>	2400 baud, 'AT' command set Complies with Part 68 of FCC Rules
<i>Printer</i>	Parallel, 8 data bits, uni-directional
<i>AC Power</i>	100-240 Volts AC, 50-60 Hz
<i>Fuse</i>	120 VAC, 0.50 A slow-acting (120 Volt installations) 240 VAC, 0.25 A slow-acting (240 Volt installations)
<i>Batteries</i>	6 Volt DC, 1.2 Ah NiCad
<i>Interference</i>	Complies with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC Rules

### 6.2 Mechanical Specifications

<i>Dimensions</i>	16.75" (w) x 8.5" (d) x 1.75" (h) mounts in standard 19" EIA rack
<i>Weight</i>	8 lbs. (including batteries)



## 6.4 Component Layout



## 6.5 Parts List (hardware revision 1.01)

<u>Part Description and Value</u>	<u>Quantity</u>
battery, sealed lead-acid, 6V, 1.2AH	3
board, PC, RAK-1, Rev. 2	1
cable, flat, 16, gray	3
cable, power, AC, black	1
cable, telephone jumper, 2 conductor, 2"	2
capacitor, aluminum, radial, 100 $\mu$ F, 16v/short	3
capacitor, aluminum, radial, 100 $\mu$ F, 35v	1
capacitor, aluminum, radial, 3,300 $\mu$ F, 50v	1
capacitor, aluminum, radial, 470 $\mu$ F, 25v	1
capacitor, ceramic disc, 0.001 $\mu$ F/1000 pF, 1KV	4
capacitor, monolythic ceramic, 0.01 $\mu$ F, .1" spacing	1
capacitor, monolythic ceramic, 0.1 $\mu$ F, .1" spacing	1
capacitor, monolythic ceramic, 27 pF, .1" spacing	2
connector, AC inlet, no fuses, PCB, 90°	1
connector, D, female, 25, PCB, 90°	1
connector, DIP, male, 16, IDC	2
connector, faston, female, 0.187", 1, crimp, insulated	6
connector, fuseholder, plastic socket, 5 x 20 mm, PCB, 90°	1
connector, modular, dual, 2/6, PCB, 90°	1
connector, pin-plug, female, 0.1", 16, IDC	2
connector, pin-plug, male, 0.1", 16, PCB, 90°	1
connector pins, pin-plug, male, 0.1", 40 x 2, 0.23 gold up/.015 tin dn	8
crystal, 3.579 MHz, 18 pF series, HC-49/U	1
diode, bridge rectifier, 200 V/2 A,	1
diode, general purpose, 100 V/0.5 A, 1N4148	2
diode, general purpose, 600 V/1 A, 1N4005	1
diode, zener, 5.1 V/1 W, 1N4733A	1
enclosure part, bottom cover, P series GrayBox, 8.0" for RAK-1	1
enclosure part, front panel, P1 GrayBox, 1.75" for RAK-1	1
enclosure part, overlay, lexan, printed for RAK-1	1
enclosure part, rack ears, clear, handles, P1 GrayBox, 1.75"	1
enclosure part, rear panel, P1 GrayBox, 1.75" for RAK-1	1
enclosure part, side panel, P series GrayBox, 1.75" x 8.0"	2
enclosure part, top cover, aluminum, P series GrayBox, 8.0"	1
fuse, 5 x 20 mm, 0.5A, slow	1
fuse, fast-acting, pico fuse, 0.125A, 125 V	3
fuse, polyswitch, resettable, 0.16 amp, 600 V	4
fuse, polyswitch, resettable, 0.4 amp, 60 V	1
hardware, jackscrew, 0.312", silver	2
hardware, nut, locknut, hex, 4-40, stainless	1
hardware, screw, pan head, 4-40 x 1/2", stainless	1
hardware, screw, pan head, 4-40 x 1/4", stainless	12
hardware, standoff, round, swage, 4-40 x 0.1875", clear	10

<u>Part Description and Value</u>	<u>Quantity</u>
hardware, washer, flat, 0.171 ID X 0.380 OD (M4), nylon	4
heatsink, TO-220, 1.0" x 1.65" x 1.0", vert, solder	1
inductor, 1.0 mH, 5 ohms/150 mA, radial	4
integrated circuit, logic, quad 2-input NAND, Schmitt trigger, 74HC132,	1
integrated circuit, logic, quad 2-input NOR, 74HC02,	1
integrated circuit, low voltage interrupt, MN1381-S, CMOS output	1
integrated circuit, microprocessor, MC68HC705J1ACP,	1
integrated circuit, modem module, 2400 baud, CH1786LC	1
integrated circuit, optocoupler, unipolar, single transistor	1
integrated circuit, voltage regulator, LM317F, +adjustable/1.5 A	1
integrated circuit, voltage regulator, LM78M05FA, +5V DC/0.5 A	1
integrated circuit, voltage regulator, low drop, LM2941T, +adjustable/1 A	1
LED, 5mm; short, green, 90°	3
LED, 5mm; short, red, 90°	4
LED, 5mm; short, yellow, 90°	2
miscellaneous, label, white polyester, laser printable, 1" x 2"	1
miscellaneous, tape, double-sided, 1" x 432 feet, 3M #4950	12
miscellaneous, tape, Polyimide, 3/8" diameter, Kapton	6
resistor, carbon film, 1/4W, 10K, 5%	1
resistor, carbon film, 1/4W, 150, 5%	2
resistor, metal film, 1/4W, 1.02K, 1%	2
resistor, metal film, 1/4W, 100K, 1%	1
resistor, metal film, 1/4W, 12.1K, 1%	1
resistor, metal film, 1/4W, 121, 1%	1
resistor, metal film, 1/4W, 825, 1%	1
resistor, SIP, 3 x 1K, isolated	1
resistor, SIP, 3 x 3.3K, isolated	1
resistor, SIP, 3 x 470, isolated	1
resistor, SIP, 7 x 150, common	1
resistor, thermistor, 33K at 25°C, -5.1%/°C	1
socket, DIP, 14,	2
socket, DIP, 16,	1
socket, DIP, 20,	1
surge protector, gas arrestor, 3 terminal, short leads	2
surge protector, solid state supressor, 1.5KE20AMSCT,	1
switch, cap for C&K latched pushbutton, black (large), round	1
switch, pushbutton, latched, DPDT, PCB, 90°	1
transformer, power, 16V@1.5A/8V@3A, PC mount, low profile	1
transistor, NPN, PN2222A, TO-92	1
transistor, NPN, darlington, 2N6387, TO-220	1
varistor, metal oxide, 170 VDC, 130 VAC	2