# Kramer Electronics, Ltd.

# USER MANUAL

## Model:

**PL-18**

***Control Port Expander***

## Contents

## Figures



## Tables

# 1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 11 groups[1] that are clearly defined by function.

Thank you for purchasing the Kramer TOOLS **PL-18** *Control Port Expander*, which is ideal for:

- Controlling multimedia rooms, such as classrooms, auditoriums, conference rooms, and so on

Each package includes the following items:

- The **PL-18** *Control Port Expander*
- Windows®-based Kramer control software and Kramer RC-SV Configuration software
- Power adapter (5V DC input)
- This user manual[2]

# 2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high-performance high-resolution cables[3]

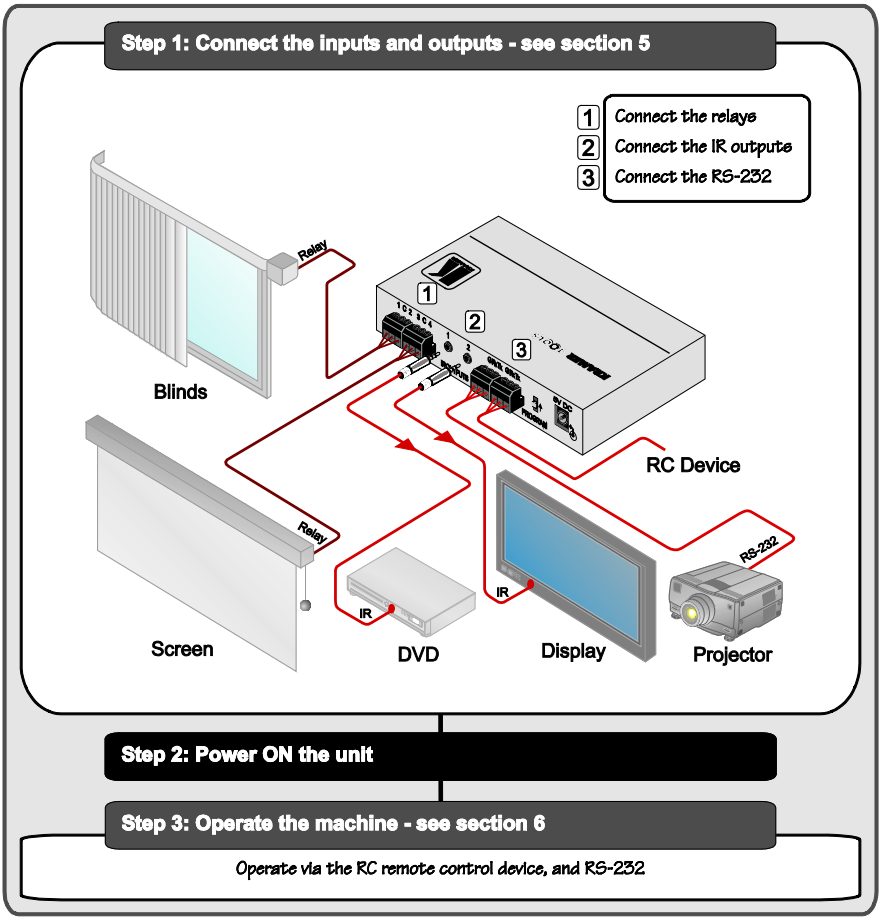
1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Products

2 Download up-to-date Kramer user manuals from our Web site at http://www.kramerelectronics.com

3 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

## 2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.



# 3 Overview

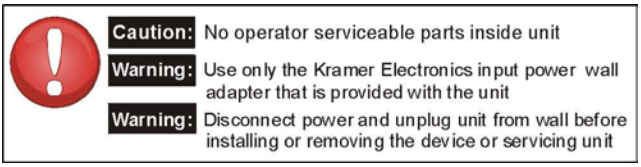
The **PL-18** is a highly versatile port expander that adds RS-232, IR and relay ports to an RS-232 controller, especially a Kramer RC device such as **RC-2**, **RC-2C** or **RC-62/RC-63**. It acts as an all-in-one extended remote control panel for control of A/V equipment—especially projectors and associated equipment—in any room (such as classrooms, boardrooms, or auditoriums).

The **PL-18** *Control Port Expander* features:

- One bi-directional serial port for controlling RS-232 based devices (for example, projectors) on RS-232/1
- One bi-directional port for receiving control commands from a PC, touch screen, other serial controller or an RC series device on RS-232/2
- Four relays for the simplified and centralized control of room functions (such as lighting, closing blinds, screen settings, and so on)
- Two IR output ports for IR control
- A USB port for firmware upgrade

To achieve the best performance:

- Use only good quality connection cables[1] to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **PL-18** away from moisture, excessive sunlight and dust




1 Available from Kramer Electronics on our Web site at http://www.kramerelectronics.com

# 4 Your PL-18 Control Port Expander

Figure 1 and Table 1 define **PL-18**.

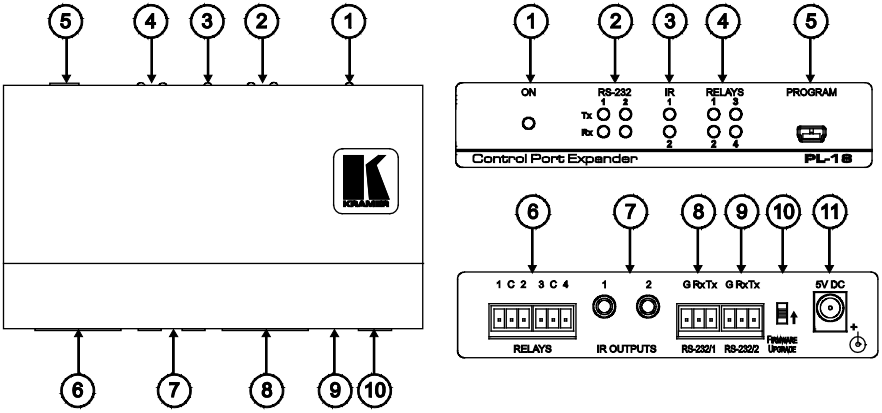



*Figure 1: PL-18 Control Port Expander*

*Table 1: PL-18 Control Port Expander Functions*

| # | Feature | Function |
|---|---|---|
| 1 | *ON* LED | Illuminates green when receiving power |
| 2 | *RS-232 Tx/Rx* LEDs | Illuminate red while transmitting and green while receiving data on an RS-232 port |
| 3 | *IR* LEDs | Illuminate green when an IR port is active |
| 4 | *RELAY* LEDs | Illuminate green when an relay is active (from 1 to 4) |
| 5 | *PROGRAM* USB Connector | Connects to a computer to upgrade firmware |
| 6 | *RELAY* Terminal Blocks | Connect to relay-driven devices (from 1 to 4) |
| 7 | *IR OUTPUT* 3.5mm Mini Jacks | Connect to IR emitter cables (from 1 to 2) |
| 8 | *RS-232/1* Terminal Block | Connects to an RS-232 device that is controlled |
| 9 | *RS-232/2* Terminal Block | Connects to an external controller (PC, touch screen or RC device) |
| 10 | *PROGRAM* Switch | For factory use only. Do not operate during firmware upgrade |
| 11 | *5V DC* | +5V DC connector for powering the unit |

# 5 Connecting the PL-18 Control Port Expander

To connect the **PL-18**, as the example in Figure 2 illustrates, do the following[1]:

1. Connect the RS-232 ports as follows:
   - Connect RS-232/1 to a projector
   - Connect RS-232/2 to a PC, touch screen or an RC device
2. Connect the RELAY[2] terminal block connectors as follows:
   - Connect RELAYS 1 and 2 to window blinds
   - Connect RELAYS 3 and 4 to a screen
3. Connect the IR OUTPUTS as follows:
   - Connect IR OUTPUT 1 to a DVD
   - Connect IR OUTPUT 2 to a display

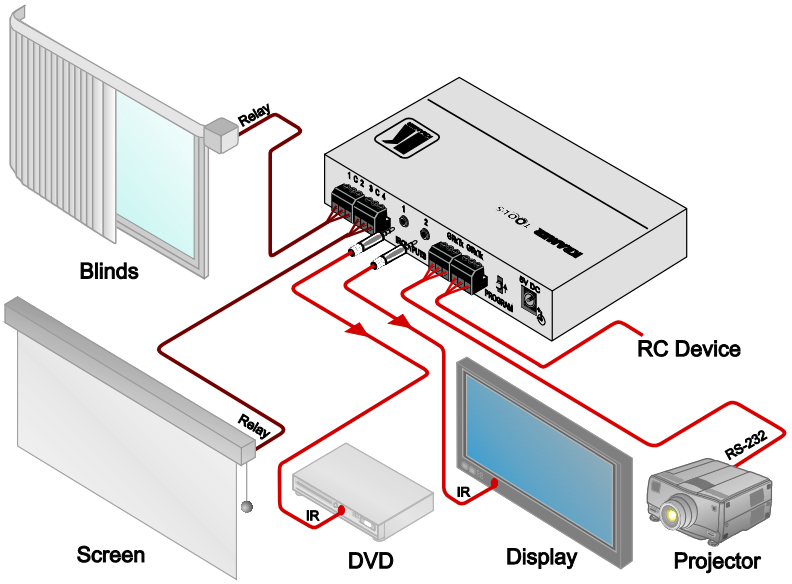



*Figure 2: Connecting the PL-18 Control Port Expander*

1 Switch OFF the power on each device before connecting it to your PL-18. After connecting your PL-18, switch on its power and then switch on the power on each device

2 On each 3-pole terminal block connector, connect either: C to NO, or C to NC (C is common, NO is normally open and NC is normally closed)

# 6 Operating the PL-18 Control Port Expander

The **PL-18** is typically used to expand the number of ports available to an RC series remote control device. The combined RC[1] and **PL-18** are configured from the RC device using RC-SV software that can be downloaded from the Kramer Web site[2].

The **PL-18** can also be operated directly from a PC, touch screen system, or other serial controller using the serial commands of Kramer's Protocol 3000. For an explanation of all control commands, see section 9.

In addition to operating the **PL-18**, machine software can be upgraded, and device parameters can be accessed and changed using P3K Wizard software also available from the Kramer Web site[2] (see section 10).

# 7 Technical Specifications

The **PL-18** technical specifications are shown in Table 2:

*Table 2: PL-18 Control Port Expander Technical Specifications*[3]

| | |
|---|---|
| PORTS: | 2 bi-directional RS-232 ports on terminal block connectors; 1 USB |
| OUTPUTS: | 4 relays on terminal block connectors, 36V AC or DC, 1A, 60V AC max on non-inductive load; 2 IR outputs on 3.5mm mini jack connector |
| LED INDICATORS: | ON (green), RS-232 (Tx - red and Rx - green), IR (green), relays (green) |
| POWER SOURCE: | 5V DC, 260mA |
| DIMENSIONS | 12cm x 7.6cm x 2.4cm (4.72" x 2.97"x 0.96") W, D, H |
| WEIGHT: | 0.6kg (1.4lbs) |
| ACCESSORIES: | Power supply 5V DC |
| OPTIONS: | 15 meter and 20 meter IR emitter extension cables |

1 When configuring an RC-2 to work with the PL-18, the RC-SV software version must be at 2.1.2.32 or higher and the RC-2 firmware version must be at 1573 or higher

2 At www.kramerelectronics.com

3 Specifications are subject to change without notice

# 8 PL-18 Commands in Protocol 3000

This section describes all commands sent to the **PL-18**. For an explanation of the syntax and use of Protocol 3000, see section 9

## 8.1 Operating Commands

Following are the specific commands that the controller (RC device) sends to the **PL-18** on RS-232/2 to operate the external devices connected to RS-232/1, the IR ports and relays.

| Command | Syntax | Response |
|---|---|---|
| Relay control | RELAY PORT_NUM , STATE | RELAY PORT_NUM , STATE RESULT |

**Parameter Description:**
PORT_NUM = 1 to 4
STATE = Relay state:
'0' or 'close' to close the relay
'1' or 'open' to open the relay

| Generic Binary Port Configuration Command | | |
|---|---|---|
| Config binary port | CBIN PORT_TYPE, PORT_NUM[, [1]CFG_VAL1] [, CFG_VAL2][, CFG_VAL3] [, CFG_VAL4][, CFG_VAL5] [, CFG_VAL6][, CFG_VAL7] [, CFG_VAL8] | CBIN PORT_TYPE, PORT_NUM [, CFG_VAL1] [, CFG_VAL2] [, CFG_VAL3] [, CFG_VAL4] [, CFG_VAL5] [, CFG_VAL6] [, CFG_VAL7] [, CFG_VAL8] RESULT |

PORT_TYPE = "UART", "ETH", "IR"

PORT_NUM = IR: 1 or 2; UART: 1 (RS-232/1); The port number is written over the physical port (see Figure 1)

BAUD = 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

DATA_BITS = 5 to 8 inclusive

PARITY = "NONE", "ODD", "EVEN", "MARK", "SPACE" or first letter of those words

STOP_BITS = 1 or 2

DUTY_CYCLE = 1 to 99 inclusive

START_TOKEN = **CR** followed by "[" that is, 2 bytes in hex representation = 0x0D and 0x5B

END_TOKEN = "]"

1 CBIN is a generic command, thus CFG_VAL parameters are a generic representation of the specific configuration parameters, for instance, CFG_VAL1 and CFG_VAL2 represent CARRIER_FREQ and DUTY respectively in case PORT_TYPE = "IR"

| **Explicit Binary Port Configuration Command** | | |
|---|---|---|
| Config Serial port (RS-232/1) | UART-CFG PORT_NUM, BAUD, DATA_BITS, PARITY, STOP_BITS[, FLOW_CONTROL] | UART-CFG PORT_NUM, BAUD, DATA_BITS, PARITY, STOP_BITS [, FLOW_CONTROL] RESULT |
| Config IR out port | IR-CFG PORT_NUM, CARRIER_FREQ, DUTY_CYCLE | IR-CFG PORT_NUM, CARRIER_FREQ, DUTY, RESULT |
| **Binary Data Send/Receive** | | |
| Emit raw data via a pre-configured binary port | BIN PORT_TYPE, PORT_NUM, RAW_DATA_SIZE START_TOKEN RAW_DATA END_TOKEN [1] | BIN PORT_TYPE, PORT_NUM, RAW_DATA_SIZE [ ] RESULT |
| Convey raw data received through a preconfigured binary port | RBIN PORT_TYPE, PORT_NUM, RAW_DATA_SIZE START_TOKEN RAW_DATA END_TOKEN [1] | RBIN PORT_TYPE, PORT_NUM, RAW_DATA_SIZE [ ] RESULT[2] |

Factory default values of binary ports:
IR1, IR2: Carrier frequency – 38000; duty cycle – 33
RS-232-1: 9600 baud, 8 data bits, parity NONE, 1 stop bit

**Configuration and Operation Examples**

A binary port must be configured properly **before** using it to send or receive binary data. The port may be used in static or dynamic port scenarios:

- *Static binary port scenario* – A specific binary port controls one specific external device (e.g. one RC button opens a projector; another RC button closes it using the same serial binary port). The port is configured only once at installation and the value is stored in the non-volatile memory of the **PL-18**. Thereafter, when the RC button is pressed it only invokes the configured BIN commands on the **PL-18**.
- *Dynamic binary port scenario* – A specific binary port controls various external devices (e.g. one RC button opens a TV, another RC button opens a DVD, and both use the same IR binary port with a dual IR emitter cable). The binary port must be reconfigured before issuing the BIN command to a different device. At each RC button press, a CBIN command is sent to the **PL-18** before sending a BIN command.

Binary port configuration examples:
Configure UART (RS-232) port 1, with "9600,8,n,1" serial port configuration parameters:
**#cbin uart, 1, 9600, 8, n, 1 <CR>**
or
**#uart-cfg 1, 9600, 8, n, 1 <CR>**

Configure IR port 2, with "38000,33" as infrared configuration parameters:
**#cbin ir, 2, 38000, 33 <CR>**
or
**#ir-cfg 2, 38000, 33 <CR>**

1 As opposed to any other P3000 command, CR cannot be added after the END_TOKEN

2 The RC responds with this command

Using the binary port to send binary data:
Emit via serial port 1 four bytes – the binary representation of P2000 "all-in 2" serial command:
**#bin uart, 1, 4 <CR> "[" $01 $82 $80 $81 "]"**

Emit via IR port 2 forty-two bytes – the binary representation of Kramer signal "button-1":
**#bin ir, 2, 42 <CR> "[" $FF $01 $8F $69 $67 $65 $66 $69 $66 $6C $63 $66 $C9 $68 $C8 $66 $CB $66 $C8 $CE $FF $01 $BC $69 $66 $66 $C8 $69 $66 $69 $66 $66 $66 $69 $66 $69 $65 $67 $65 $FF $EF $26 "]"**

Using the binary port to receive and convey binary data:
Convey four binary bytes received on serial port 1 – these four binary bytes are the binary representation of the P2000 "all-in 2" serial command:
**#rbin uart, 1, 4 <CR> "[" $01 $82 $80 $81 "]"**

## 8.2 Help Commands

| Command | Syntax | Response |
|---|---|---|
| Protocol handshaking | #CR | ~OK CRLF |

## 8.3 Result and Error Codes

| Result/Error | Syntax |
|---|---|
| Command ran successfully, no error. | COMMAND PARAMETERS OK |
| *Protocol Errors:* | |
| Syntax error | ERR001 |
| Command not available for this device | ERR002 |
| Parameter is out of range | ERR003 |
| Unauthorized access (command run without the matching login). | ERR004 |

## 8.4 Identification Commands

| Command | Syntax | Response |
|---|---|---|
| Protocol handshaking | #CR | ~OK CRLF |
| Read device model | MODEL? | MODEL MACHINE_MODEL |
| Read device serial number | SN? | SN SERIAL_NUMBER |
| Read device firmware version | VERSION? | VERSION MAJOR .MINOR .BUILD .REVISION |
| Set machine name | NAME MACHINE_NAME | NAME MACHINE_NAME RESULT |
| Read machine name | NAME? | NAME MACHINE_NAME |
| Reset machine name to factory default* | NAME-RST | NAME-RST MACHINE_FACTORY_NAME RESULT |
| Visual identification | IDV | IDV OK |

***Note**: The machine name is not the same as the model name. The machine name is used to identify a specific machine or a network in use (with DNS feature on).
MACHINE_NAME = Up to 14 alphameric chars.
* **Machine factory name =** Model name + last 4 digits from serial number.

## 8.5 Machine Information Commands

| Command | Syntax | Response |
|---|---|---|
| Execute firmware upgrade* | UPGRADE | UPGRADE OK |
| Firmware usually uploads to a device via a command like LDFW. The device may need to be reset to complete the process. | | |
| Reset to factory default configuration | FACTORY | FACTORY RESULT |

## 8.6 Reset Command

| Command | Syntax | Response |
|---|---|---|
| Reset device | RESET | RESET OK |

# 9 Protocol 3000 Syntax

Protocol 3000 is used to control the **PL-18** via the RS-232/2 connection using an RC-type controller or a PC, touch screen, other serial controller.

## 9.1 RS-232/2 Settings

| Port | RS-232/2 |
|---|---|
| Baud Rate: | 115,200 |
| Data Bits: | 8 |
| Stop Bits: | 1 |
| Parity: | None |
| Command Format: | ASCII |

## 9.2 Host Message Format

| Start | Address (optional) | Body | Delimiter |
|---|---|---|---|
| # | *Destination_id@* | **Message** | CR |

### 9.2.1 Simple Command

Command string with only one command without addressing:

| Start | Body | Delimiter |
|---|---|---|
| # | **Command** SP *Parameter_1,Parameter_2,…* | CR |

### 9.2.2 Command String

Formal syntax with commands concatenation and addressing:

| Start | Address | Body | Delimiter |
|---|---|---|---|
| # | *Destination_id@* | **Command_1** *Parameter1_1,Parameter1_2,…*\|<br>**Command_2** *Parameter2_1,Parameter2_2,…*\|<br>**Command_3** *Parameter3_1,Parameter3_2,…*\|… | CR |

## 9.3 Device Message Format

| Start | Address (optional) | Body | delimiter |
|---|---|---|---|
| ~ | *Sender_id@* | **Message** | **CR** **LF** |

### 9.3.1 Device Long Response

Echoing command:

| Start | Address (optional) | Body | Delimiter |
|---|---|---|---|
| ~ | *Sender_id@* | **Command** **SP** [*Param1 ,Param2 …*] **result** | **CR** **LF** |

**CR** = Carriage return (ASCII 13 = 0x0D)
**LF** = Line feed (ASCII 10 = 0x0A)
**SP** = Space (ASCII 32 = 0x20)

## 9.4 COMMAND TERMS

**Command**
A sequence of ASCII letters ('A'-'Z', 'a'-'z' and '-').
Command and parameters must be separated by at least one space.

**Parameters**
A sequence of alphameric ASCII characters ('0'-'9','A'-'Z','a'-'z' and some special characters for specific commands). Parameters are separated by commas.

**Message string**
Every command entered as part of a message string begins with a **message starting character** and ends with a **message closing character**.
**Note**: A string can contain more than one command. Commands are separated by a pipe ( '|' ) character.

**Message starting character**
'#' – For host command/query
'~' – For machine response

**Device address** (Optional, for K-NET)
K-NET Device ID followed by '@'

**Query sign**
'?' follows some commands to define a query request.

**All outputs sign**
'*' defines all outputs.

**Message closing character**
CR – For host messages; carriage return (ASCII 13)

CRLF – For machine messages; carriage return (ASCII 13) + line-feed (ASCII 10)

**Command chain separator character**
When a message string contains more than one command, separate each command with a pipe ( '|' ) character.

Spaces between parameters or command terms are ignored.

## 9.5 Entering Commands

You can directly enter all commands using a terminal with ASCII communications software, such as HyperTerminal, Hercules, etc. Connect the terminal to the serial, Ethernet, or USB port on the Kramer device. To enter **CR** , press the Enter key.
( **LF** is also sent but is ignored by command parser).

For commands sent from some non-Kramer controllers like Crestron, some characters require special coding (such as, /X##). Refer to the controller manual.

## 9.6 Command Forms

Some commands have short name syntax in addition to long name syntax to allow faster typing. The response is always in long syntax.

## 9.7 Command Chaining

Multiple commands can be chained in the same string. Each command is delimited by a pipe character ( '|' ). When chaining commands, enter the **message starting character** and the **message closing character** only once, at the beginning of the string and at the end.

Commands in the string do not execute until the closing character is entered.

A separate response is sent for every command in the chain.

## 9.8 Maximum String Length

64 characters

## 9.9 Backward Support

Protocol 2000 is transparently supported by Protocol 3000. You can switch between protocols using a switch protocol command from either platform.

# 10 Using the P3K Wizard

The P3K Wizard is a Kramer software program for:

- Upgrading the machine firmware (see section 10.1)
- Accessing and changing device parameters (see section 10.2).

The P3K Wizard can be downloaded from the Kramer Web site[1].

## 10.1 Updating the PL-18 Firmware

The **PL-18** uses a microcontroller that runs firmware located in FLASH memory. The latest version of firmware can be downloaded from the Kramer Web site and updated in minutes using the PK3 Wizard and the following procedures.

To update the **PL-18** firmware:

- Download the firmware file from the Internet (see section 10.1.1)
- Connect a PC directly[2] to the **PL-18** (see section 10.1.2)
- Update the firmware using the P3K Wizard (see section 10.1.3)

### 10.1.1 Downloading The Firmware

To download the latest firmware file[3] from the Internet:

1. Go to the Kramer Web site at www.kramerelectronics.com.
2. Navigate to SUPPORT / Software Firmware Updates.
3. Click on the link of the firmware that applies to your product. Download it and save it to your disk.
4. Extract the file to a folder (for example, C:\Program Files\Kramer Flash).

### 10.1.2 Connecting a PC to the PL-18

To connect a PC to the **PL-18**:

- Connect a serial cable from an RS-232 9-pin D-sub rear panel port on the PC to the RS-232/2 port of the **PL-18** as explained in section 5, or
- Connect a USB cable from a USB port on the PC to the USB port on the **PL-18**

1 www.kramerelectronics.com

2 You cannot upgrade the firmware of the PL-18 through an RC connection. The PL-18 must be connected directly to a PC

3 The files indicated in this section are given as an example only. File names are liable to change from time to time

### 10.1.3 Updating the Firmware

To update the firmware, perform the following steps:

1. Open the Kramer P3K Wizard[1] by double-clicking the desktop icon **P3K Wizard**.
   The *P3K Wizard* screen appears[2]:

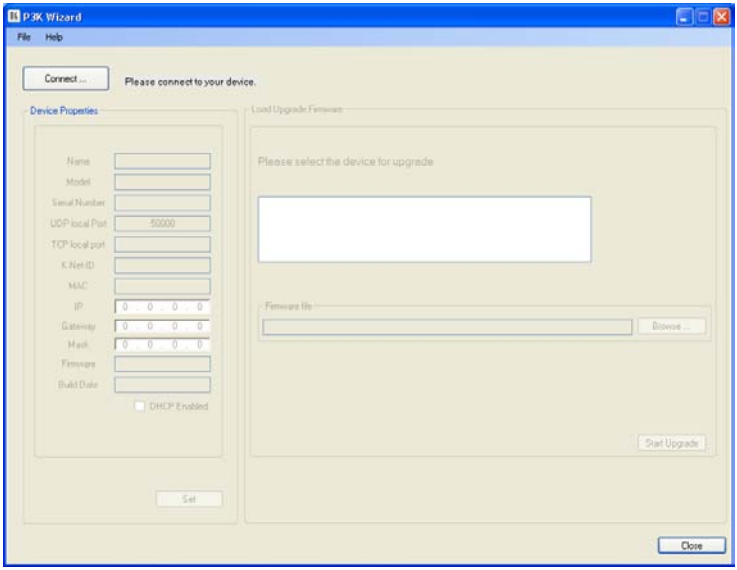



*Figure 3: P3K Wizard Screen*

2. Click the **Connect** button.
   The *Connect Window* appears.

**Note**: The **PL-18** does not have an Ethernet interface. Do not select any of the Ethernet options on the *Connect* window.

1 You can download and install the latest version of the P3K Wizard from www.kramerelectronics.com.

2 The screens appearing in this manual are examples of the process. The actual screens may differ in their content.

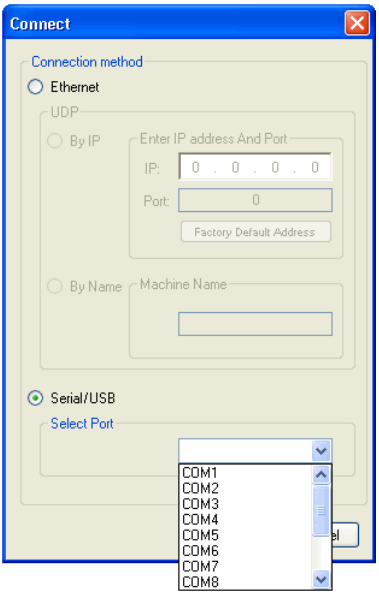



*Figure 4: Connect Serial/USB*

3. To upgrade using an RS-232 or USB connection, click **Serial/USB** (see Figure 4).
   - Click the drop-down box to show the COM ports
   - Select a COM port to connect (from COM1 to COM13) and click OK

**Note**: If you try to connect to a device and it does not respond, the following error message appears. Click **OK**. Verify that the device is powered on, the cable connection is good, and that you are trying to connect by the correct method.

Do not operate the PROGRAM switch on the back panel. It is for factory use only.


*Figure 5: Error Message*

4. After pressing **OK** on the *Connect Window*, the wizard searches the line for connected devices. All detected devices are displayed in the device list box under "*Please select the device for update*":

**Note**: In the *Device Properties* section, you can update any of the active fields that have a white background. After making any changes, click **Set**.

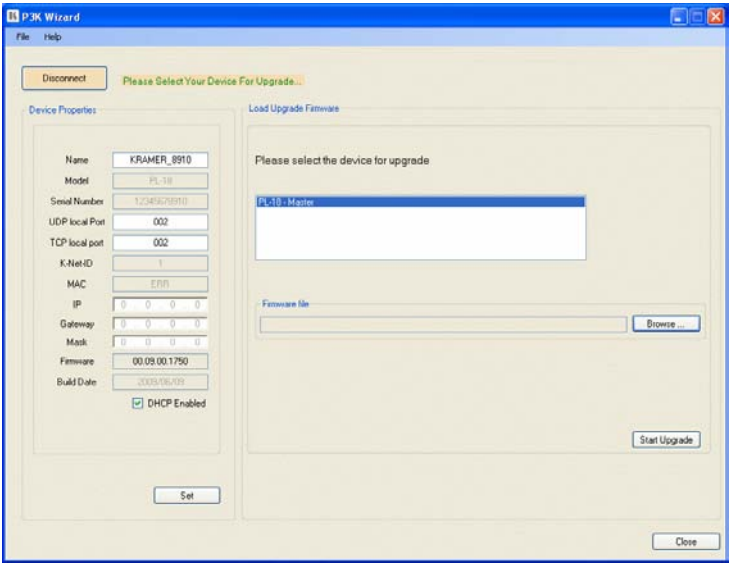



*Figure 6: Device Selection*

5. In the device list box, click to select the target device.
6. Next, select the firmware file to upgrade by clicking **Browse** next to the *Firmware file* box.
   The *Open File* window opens:

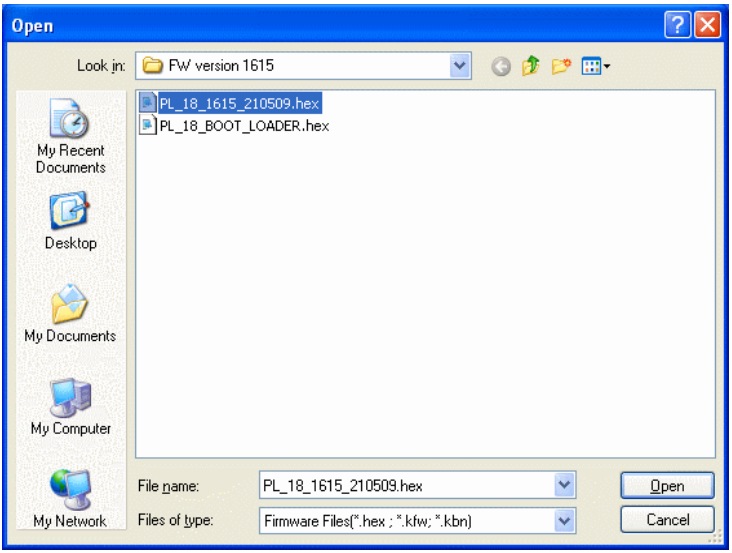



*Figure 7: Open File Window*

7. Navigate to the folder containing the firmware file (for example, C:\Program Files\Kramer Flash).
8. Select the firmware file you downloaded in section 10.1.1 and click **Open**. The firmware file appears in the *Firmware file* box.

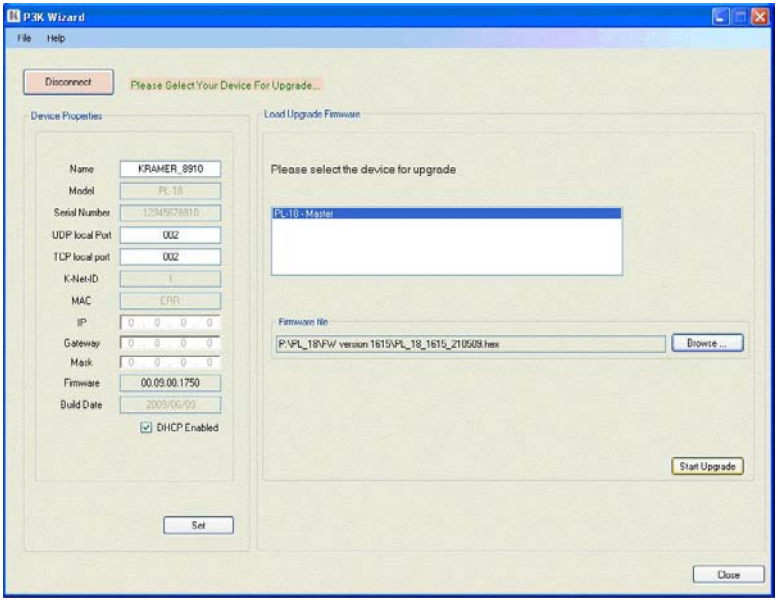



*Figure 8: Device and File Selected*

9. Click the **Start Upgrade** button to begin the file transfer.
   The *Warning* window appears:

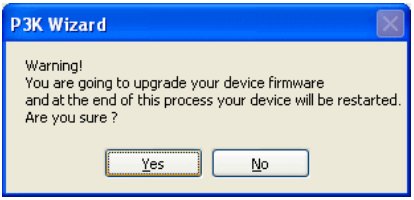



*Figure 9: Warning Window*

10. Click **Yes** to continue.
    *Load Progress* appears in the bottom box:

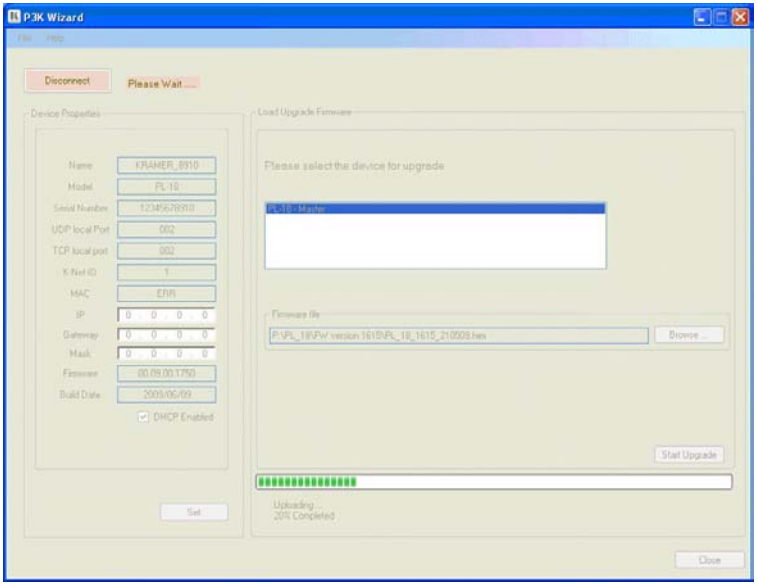



*Figure 10: Load Progress*

11. When the upload is finished, the completion message appears:


*Figure 11: Completion Message*

12. Click **Close** to close the P3K Wizard and remove the cable that connects the **PL-18** to the PC.

## 10.2 Changing the Device Parameters

To change the device parameters, (for example, the K-NET ID) do the following:

1. Connect a PC to the **PL-18** (see section 10.1.2).
2. Open the Kramer P3K Wizard[1] by double-clicking the desktop icon **P3K Wizard**.
   The *P3K Wizard* screen appears (see Figure 3).
3. Click the **Connect** button to open the *Connect* window (see Figure 4).
4. Choose the **SERIAL/USB** connection, and click **OK**.
   The *Connect* window disappears and the Device Properties become visible.
5. Change the parameters as required and click **SET**.

1 You can download and install the latest version of the P3K Wizard from www.kramerelectronics.com

**LIMITED WARRANTY**

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

**HOW LONG IS THE WARRANTY**

Labor and parts are warranted for seven years from the date of the first customer purchase.

**WHO IS PROTECTED?**

Only the first purchase customer may enforce this warranty.

**WHAT IS COVERED AND WHAT IS NOT COVERED**

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

**WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR**

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

**HOW YOU CAN GET WARRANTY SERVICE**

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

**LIMITATION OF IMPLIED WARRANTIES**

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

**EXCLUSION OF DAMAGES**

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

**NOTE:** All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

| | |
|---|---|
| EN-50081: | "Electromagnetic compatibility (EMC);<br>generic emission standard.<br>Part 1: Residential, commercial and light industry" |
| EN-50082: | "Electromagnetic compatibility (EMC) generic immunity standard.<br>Part 1: Residential, commercial and light industry environment". |
| CFR-47: | FCC* Rules and Regulations:<br>Part 15: “Radio frequency devices<br>Subpart B Unintentional radiators” |

**CAUTION!**

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

* FCC and CE approved using STP cable (for twisted pair products)

**For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com where updates to this user manual may be found.**
**We welcome your questions, comments and feedback.**


**Safety Warning**:
Disconnect the unit from the power supply before opening/servicing.

**Kramer Electronics, Ltd.**
Web site: www.kramerelectronics.com
E-mail: info@kramerel.com
**P/N: 2900-000505 REV 3**