

# ELK-MM443

## Magic Module Automation Controller

### Features

- Re-Programmable Logic Controller
- Four (4) supervised inputs with analog or digital sensing.
- Four (4) dry contact SPDT relay outputs.
- Two relay outputs may be jumper programmed for transistor open collector outputs.
- RS-485 four-wire data bus for networking to other Magic Modules, accessories, and personal computer.
- X-10® Power Line Carrier Interface. PL513, PSC04 (Transmit Only), or TW523, PSC05 (Two Way).
- Four (4) Accumulator Counters, range 0 to 255.
- Four (4) Timers, range 1/10 second to over 255 hours.
- 16,384 program bytes using SIMPLE programming language.
- EEPROM “non-volatile” memory maintains program in the event of power loss.
- Analog transmissions between MM443’s and Preset Dim Commands.
- Dallas iButton™ TouchKey Reader with optional ELK-MA290 interface.
- Programs the ELK-MM220 (two inputs, two relay outputs module).
- Emulates ELK-MM220 for code development.
- Mounts to single or double gang electrical box.
- Optional DIN Rail Mounting. PCB mounts into 4 inch SnapTrack.
- Lifetime Limited Warranty.

### Specifications

- Operating Voltage: 9.5 to 15 Volts D.C., well regulated.
- Nominal Current Draw: ~10mA., 130mA Maximum with all relays active.
- Analog Inputs: (4) rated for 0 to 13.6 volts. Optional 2k ohm End-of-line resistor supervision.  
Inputs have selectable pull up or pull down jumper but may be left floating.  
Software programmable high/low threshold levels.
- Analog Input impedance (floating input) - 100K ohms.
- Relay outputs: (4) form “C” relays rated for 10 Amps at 120VAC, 7 Amps at 28VDC.  
Relays 3 & 4 may be configured as open collector transistor outputs, 100 ma. Maximum.
- X-10 or Access Control Interface Connector: Telephone style RJ-11 4-wire female connector is compatible with PL513 and PSC04 1-way modules, TW523 and PSC05 2-way modules, or with MA290 Access Module.
- Accessory Connector (J1), 5 pin male: For optional MC100 Real Time Clock, MT100 Temperature Sensor Module, or connection for programming ELK-MM220 modules.
- RS-485 Data Bus: For connection of up to 31 additional data bus devices.  
Maximum length: 4000 feet w/22 AWG wire.
- Enclosure: White plastic, 6.5”W x 4.375”H x 2”D.

**ELK**  
PRODUCTS, INC.

ELK PRODUCTS, INC.  
PO Box 100 • 3266 US Hwy. 70 West  
Hildebran, NC 28637 • USA  
828-397-4200 • FAX 828-397-4415  
<http://www.elkproducts.com> • Email: [info@elkproducts.com](mailto:info@elkproducts.com)

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## OVERVIEW

The MM443 has virtually no limits and can be used as a stand alone field programmable controller in a vast array of applications from timers, door controllers, simple process controllers, etc. or as a networked controller with other modules connected on a common RS-485 data bus. All data bus modules are assigned a device type and up to 31 of each type may be interconnected together. A telephone style RJ-11 connector allows an X-10 Power Line Interface to be added for transmitting and receiving signals across the AC power line. This same connector can alternately be used with our Access Interface (MA290) for reading Dallas iButton™ ID devices or Proximity cards for identification and access control applications.

The MM443 uses the same programming software as the MM447 and MV480. The software and peripheral components are available in our Programming Kit (MK485) or Starter Development Kit (MK400). Programming is accomplished by way of a Personal Computer (windows based) using ELK's Magic Module Development software. Programs may be written using either the automatic Code Writer or Application Writer interfaces which construct programs from a visual question list into a lower level Intermediate Code. The Intermediate Code, known as **SIMPLE**, is a Basic-like high level language that compiles the Intermediate Code into code byte's. The code is then downloaded from the computer to the MM443 over the data bus using the computer's serial port and a RS-232 to RS-485 converter (MB485 included in the programming kit). The code is stored in Electrically Erasible Programmable Read Only Memory (EEPROM memory). The microprocessor reads out of EEPROM memory and executes the code through a built in operating system. Once programmed, the MM443 may be disconnected from the data bus or the computer may be turned off. The latest updates to the ELK Product's Magic Module Development Software are available at: [www.elkproducts.com](http://www.elkproducts.com).

## INSTALLATION and HOOKUP

**1. Set the RS-485 DATA BUS ADDRESS Jumpers.** Each MM443 must be set to its own individual data bus address. There are 5 plug-on DATA BUS ADDRESS Jumpers located along the top of the board. See Figure 1. Each jumper has a position of [0] or [1] and a binary value (1, 2, 4, 8, 16) which can be read directly above each jumper. The addition of the binary values (sum total) for jumper(s) set to the [1] position determines the data bus address. For example: Data bus address 5 is set by placing jumpers 1 and 4 in the [1] position (1 + 4 = 5). All five jumpers are required to set the address, none can be missing.

**2. Connect the four wires of the RS-485 Data Bus** to any remote or additional modules, or to a RS-232 to RS-485 Data Converter (MB485). For proper operation Data "A" must connect to Data "A" and Data "B" must connect to Data "B" on the other modules. There are two sets of Data Bus connections:

- A. Screw Terminals A & B
- B. Four pin header connector J2 - Pin 3 is Data "A" and pin 2 is Data "B".

**3. Connect the Inputs as needed.** Four analog or digital inputs with programmable low and high level switching thresholds accepting input voltages directly up to 13.6 volts DC are available at terminals 5 thru 10. Higher voltages can be used by using resistors on the input as a voltage divider. Each input is jumper programmable for a 2K ohm input resistor pulled to 12VDC, ground, or no resistor input voltage bias. The input loop response time may be adjusted with the **set INxFilter** command in 1/10-second increments from 100 milliseconds to 25.5 seconds. See Figure 2 for input configurations.

The **Inputs** may be used as:

- A. **Normally Open** (Short to ground). Set **JP1** thru **JP4** jumper (according to the input), to the "1" (+12V) pull up setting.
- B. **Normally Open** (Short to +12VDC). Set **JP1** thru **JP4** jumper (according to the input), to the "0" (GND) pull down setting.
- C. **End Of Line Resistor** (EOLR) at 2000 ohms with **Normally Open** contacts across the resistor and/or **Normally Closed** contacts in series with the resistor. Set **JP1** thru **JP4** jumper (according to the input), to the "1" (+12V) pull up setting.
- D. **Analog Voltage Input** (0 to 13.6 VDC). **Remove** the **JP1** thru **JP4** jumper (according to the input). Use the **if Inx <= value** to select what to do next in the program according to the input voltage level.

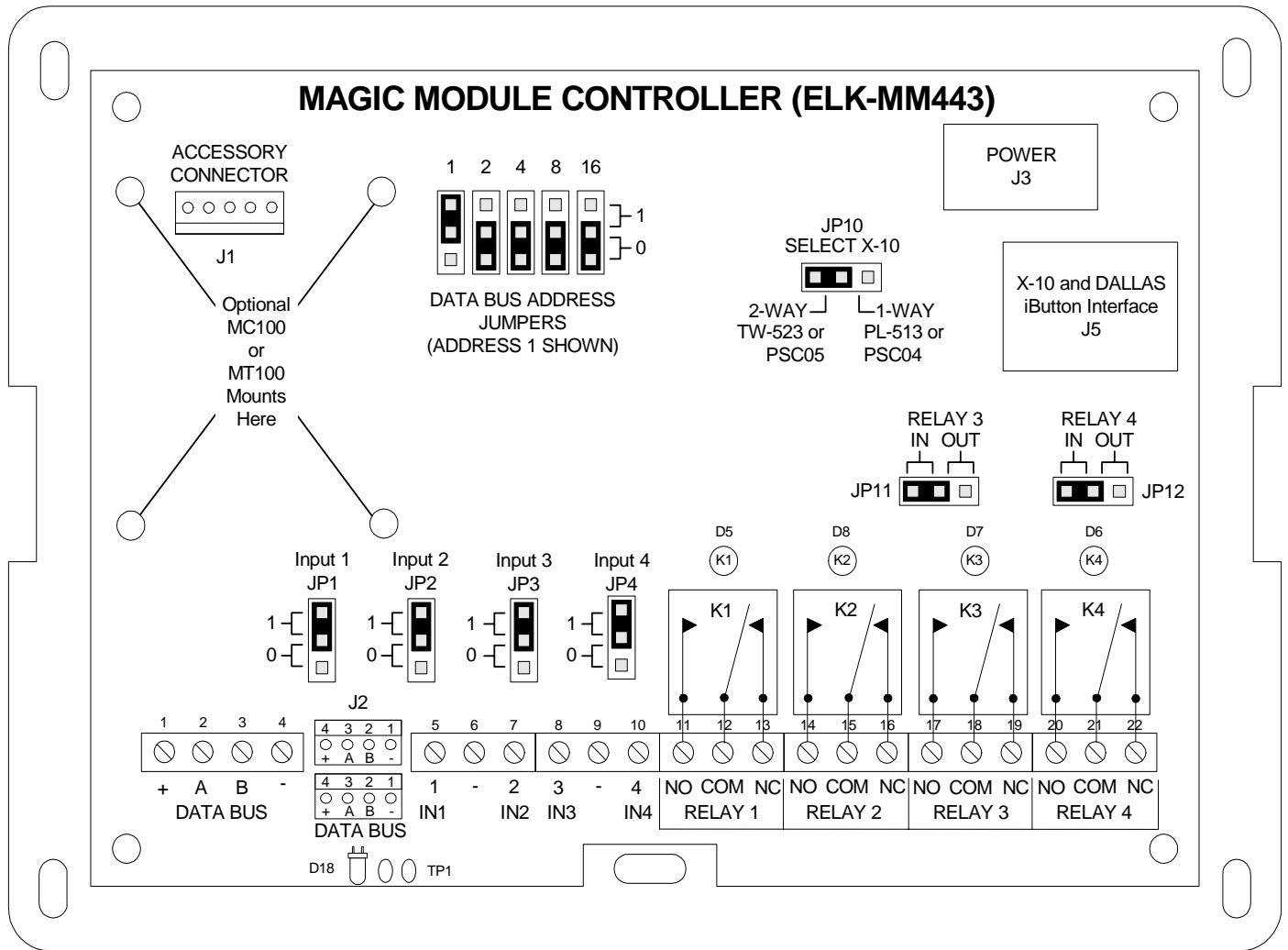
**4. Connect the Relay Outputs as needed.** Four form C relay outputs with contacts rated at up to 10 amps are available at screw terminals 11 thru 22. Two relay outputs are jumper programmable (**JP11** for relay 3 & **JP12** for relay 4) to switch the output through an open collector NPN transistor (100 ma maximum) to the COM terminal instead of through the relay for higher speed applications such as flashing LED's where the click of the relay is not desired.

**5. Connect an X-10 or Access Interface as needed.** To communicate over the AC powerline connect a PL513 or PSC04 X10 module (transmit only), or a TW-523 or PSC05 X10 module (two-way) to connector **J5** using a single RJ-11 four wire telephone cable. Jumper **JP10** selects between the one way or two way modules. Alternatively, for Access control applications you may connect an ELK-290 Proximity/iButton Reader Interface to connector **J5**. The MM443 supports both Proximity Cards and Dallas iButtons. Note: X-10 and Prox/iButton applications cannot be used simultaneously.

**6. Connect Power** from a well regulated 12VDC power source using any of four different locations on the printed circuit board.

- A. **Power Input Jack, J3, (Center Pin is Positive, Barrel is Negative).**
- B. **RS-485 Data Bus** Screw terminals **1(+12V)** and **4(NEG)**.
- C. **RS-485 Data Bus** Four pin header connector, **J2, Pins 4(+)** and **1(-)**.
- D. **X-10 and iButton Interface** Eight pin telco type connector, **J5, Pins 2(+)** and **7(-)**.

**7. The Accessory Connector (J1)** is used to program ELK-MM220 controller modules and for optional components like the ELK-MC100 or ELK-MT100 modules. Note: To program ELK-MM220 modules, the MC100 or MT100 modules must be temporarily removed in order to gain access to J1.



**Terminal Descriptions**

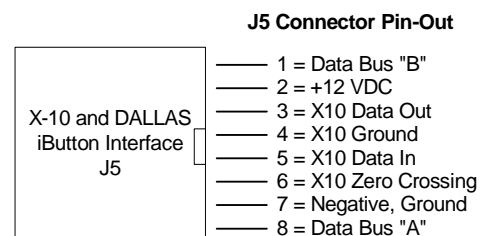
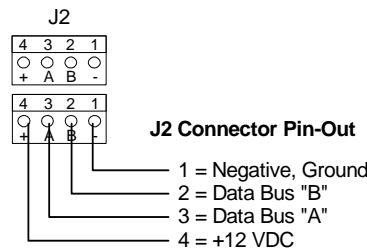
1. **+12VDC** • Positive Power Supply input.
2. **A** • RS-485 data bus. Connect all data bus "A" terminals in together.
3. **B** • RS-485 data bus. Connect all data bus "B" terminals in together.
4. **NEG** • Common Negative/ground Power Supply input.
5. **INPUT 1** • Input 1
6. **NEG** • Common Negative/ground and return on Inputs 1 & 2.
7. **INPUT 2** • Input 2
8. **INPUT 3** • Input 3
9. **NEG** • Common Negative/ground and return on Inputs 3 & 4.
10. **INPUT 4** • Input 4
11. **NO** • Relay 1 Normally Open
12. **COM** • Relay 1 Common
13. **NC** • Relay 1 Normally Closed
14. **NO** • Relay 2 Normally Open
15. **COM** • Relay 2 Common
16. **NC** • Relay 2 Normally Closed
17. **NO** • Relay 3 Normally Open
18. **COM** • Relay 3 Common
19. **NC** • Relay 3 Normally Closed
20. **NO** • Relay 4 Normally Open
21. **COM** • Relay 4 Common
22. **NC** • Relay 4 Normally Closed

**LED Indicators**

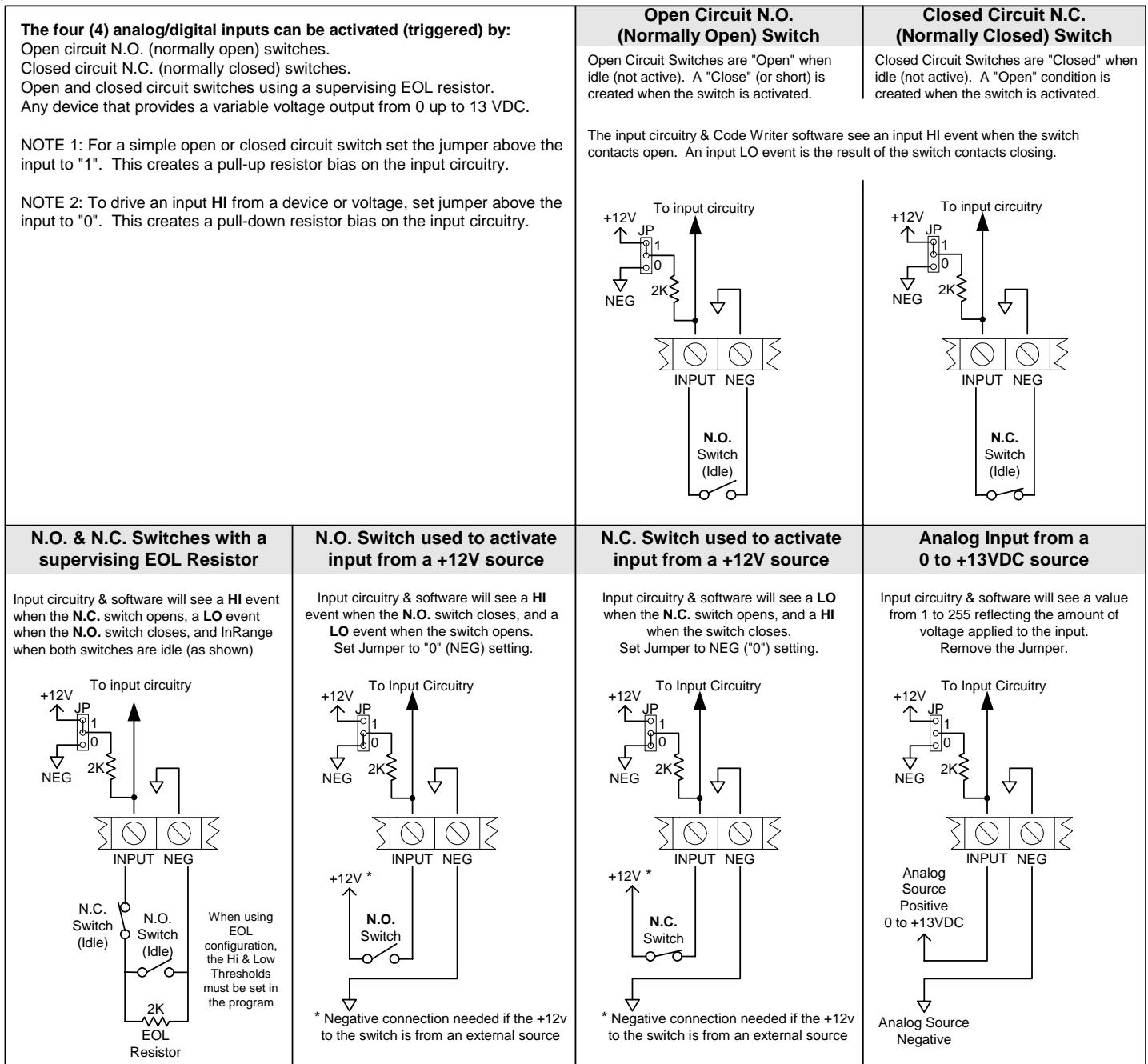
- STATUS (D18)** blinks for normal operation.
- OUT1 (D5)** indicates Output (Relay) 1 is ON.
- OUT2 (D8)** indicates Output (Relay) 2 is ON.
- OUT3 (D7)** indicates Output (Relay) 3 is ON (see JP11 for optional use)
- OUT4 (D6)** indicates Output (Relay) 4 is ON (see JP12 for optional use)

**Plug-on Connectors, Jumpers, etc.**

- J1 ACCESSORY CONNECTOR** for programming of ELK-MM220 modules, and for optional ELK-MC100, & ELK-MT100 modules.
- J2 DATA BUS** Twin connectors for plug-on RS-485 data bus ribbon cables.
- J5 X-10 CONN** for X10 interface or ELK-MA290 Access Reader Interface.
- DATA BUS ADDRESS** jumpers set the MM443's RS-485 bus address.
- JP1** "1" = 2K pull "up" resistor, or "0" = pull "down" resistor on INPUT 1.
- JP2** "1" = 2K pull "up" resistor, or "0" = pull "down" resistor on INPUT 2.
- JP3** "1" = 2K pull "up" resistor, or "0" = pull "down" resistor on INPUT 3.
- JP4** "1" = 2K pull "up" resistor, or "0" = pull "down" resistor on INPUT 4.
- JP10** "1 way" or "2 way" X-10 interface communication on connector J5.
- JP11** "IN" = Relay 3 dry-contacts, "OUT" = Pull to ground transistor output.
- JP12** "IN" = Relay 4 dry-contacts, "OUT" = Pull to ground transistor output.
- TP1, short test pads upon power up to erase the program in EEPROM Memory.



**FIGURE 1. ELK-MM443 Terminals, Indicators, and Jumpers**



**FIGURE 2. Configuration and Connections of Inputs**

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: 1) Reorient or relocate the receiving antenna. 2) Increase the separation between the equipment and receiver. 3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. 4) Consult the dealer or an experienced radio/TV technician for help.

For more information contact your local Distributor or ELK Products, Inc. - PO Box 100 - 3266 US Hwy. 70 West Hildebran, NC 28637 USA - 828-397-4200 FAX 828-397-4415 - <http://www.elkproducts.com>

Note: Specifications and features may change without notice. All rights are reserved by ELK Products, Inc.

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Reference the ELK-MM443 Magic Module Software Development Instruction Manual L391 for additional information.

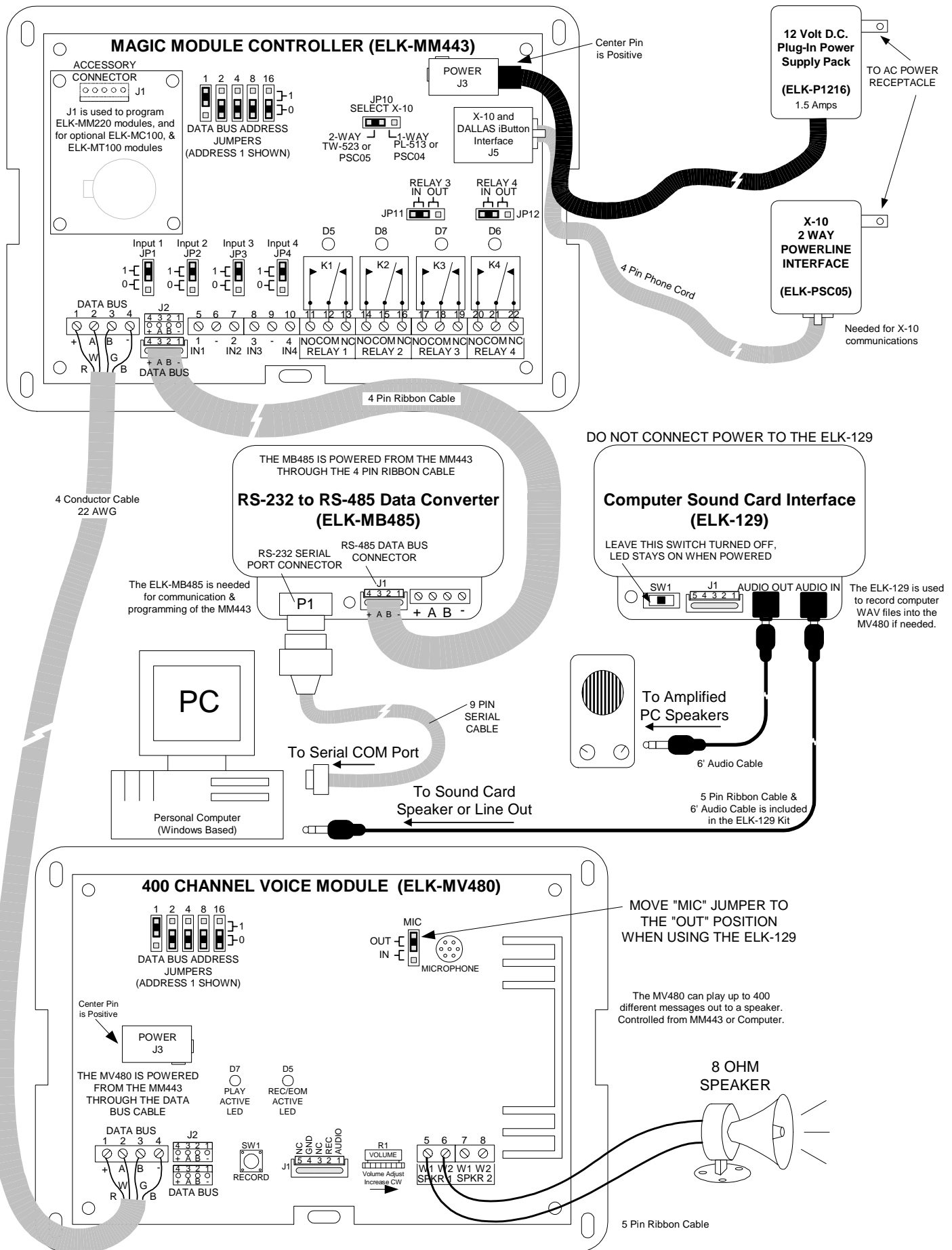


Figure 3. Typical Application with optional ELK-MV480 & ELK-129 Connections