instruction manual

AMX Lighting

PROlink/AXlink Programming

Lighting Control

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AMX Corporation warrants its products to be free of defects in material and workmanship under normal use for three (3) years from the date of purchase from AMX Corporation, with the following exceptions:

- Electroluminescent and LCD Control Panels are warranted for three (3) years, except for the display and touch overlay components that are warranted for a period of one (1) year.
- Disk drive mechanisms, pan/tilt heads, power supplies, MX Series products, and KC Series products are warranted for a period of one (1) year.
- Unless otherwise specified, OEM and custom products are warranted for a period of one (1) year.
- Software is warranted for a period of ninety (90) days.
- Batteries and incandescent lamps are not covered under the warranty.

This warranty extends only to products purchased directly from AMX Corporation or an Authorized AMX Dealer.

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Lighting Sales Information

AMX Lighting products are guaranteed to switch on and off any load that is properly connected to our lighting products, as long as the AMX Lighting products are under warranty. AMX Corporation does guarantee the control of dimmable loads that are properly connected to our lighting products. That includes loads correctly chosen, sized and attached to our dimmers or switches under normal power conditions. Any load that cannot be verified by its manufacturer as rated for dimming is not guaranteed by AMX Corporation to dim properly. This includes various lamps, ballasts and transformers, as well as items no longer covered by warranty.

The dimming of low-voltage lighting requires the use of a dimmable transformer. Transformer manufacturers must verify that the transformer is dimmable according to written or known specifications. Although AMX Corporation will try to discern the dimming capability of a transformer by any manufacturer, it is still the responsibility of the dealer to obtain this information. Therefore, an AMX Corporation dimmer designed for forward-phase dimming should not be connected to a transformer that requires a reverse-phase dimmer.

The dimming of fluorescent lighting requires the use of a dimmable ballast and a dimmable lamp. Ballast manufactures must verify that the ballast is dimmable according to written or known specifications. Although AMX Corporation will try to discern the dimming capability of a ballast from the manufacturer, it is still the responsibility of the dealer to obtain this information. Each dimmable ballast must be connected to the proper AMX Corporation Lighting dimmer and a lamp specified for dimmable operation. We guarantee fluorescent dimming capability when the proper AMX Fluorescent dimmer module is connected to the proper dimming ballast and a verified dimmable lamp.

Lamps must be verified as dimmable to ensure proper dimming. Lamps with integrated ballasts and transformers, as well as other passive or electronic devices attached to the lamps must have written verification from the manufacturer of dimming capability. Fluorescent lamps used for dimming should be operated in a full on condition for approximately four days before the dimming performance stabilizes.

The dimming performance or quality cannot be guaranteed due to the random combinations of a dimmer, a lamp and a ballast or transformer. How well a device dims depends on many factors that cannot be controlled by AMX Lighting. AMX dimmers regulate the voltage to a lamp, ballast or transformer. AMX Corporation does not regulate lumen output performance for a device manufactured by another company.

Table of Contents

Introduction

The AMX Lighting Control System employs a dual-platform programming system using the Axcess and PROlink software programs to control the dimming of electronic ballasts, incandescent lamps, low voltage track lighting, and a host of new transformers. This manual describes connecting and programming a AMX Lighting system.

This section explains PROlink wall panels, programming commands, and lighting curves.

NOTE

This manual refers to AMX Lighting firmware version 2.0 and higher.

PROlink

An AMX Lighting Central Controller has a computer processor attached to a six-channel digital dimming engine. This dimming engine gets its commands from a buffered region called PROlink. The dimming processes generated in the dimming engine can also send both commands and status back to the PROlink buffer. The PROlink buffer in Pack #1 acts as housekeeper for the rest of the PROlink system.

The PROlink buffer allows a maximum of 24 characters. The PROlink programming and operational commands are sent as strings to this buffer before going to the dimming engine. PROlink allows ten 6-channel packs to be connected for a combined system of 60 dimmers. Any preset sent to Pack #1 will be sent to all packs connected on the PROlink bus. There is a DIP switch located on each controller that sets the PROlink Pack number from one to ten, or dimmers 1 through 60. An entire PROlink system consists of 60 channels of dimming or switching. PROlink dimmer numbers are from 1-60; AXlink dimmer numbers are from 1-6.

NOTE

Refer to the Programming Strings section for more information about these strings.

FIG. 1 shows a sample AMX Lighting system using the PROlink mode.

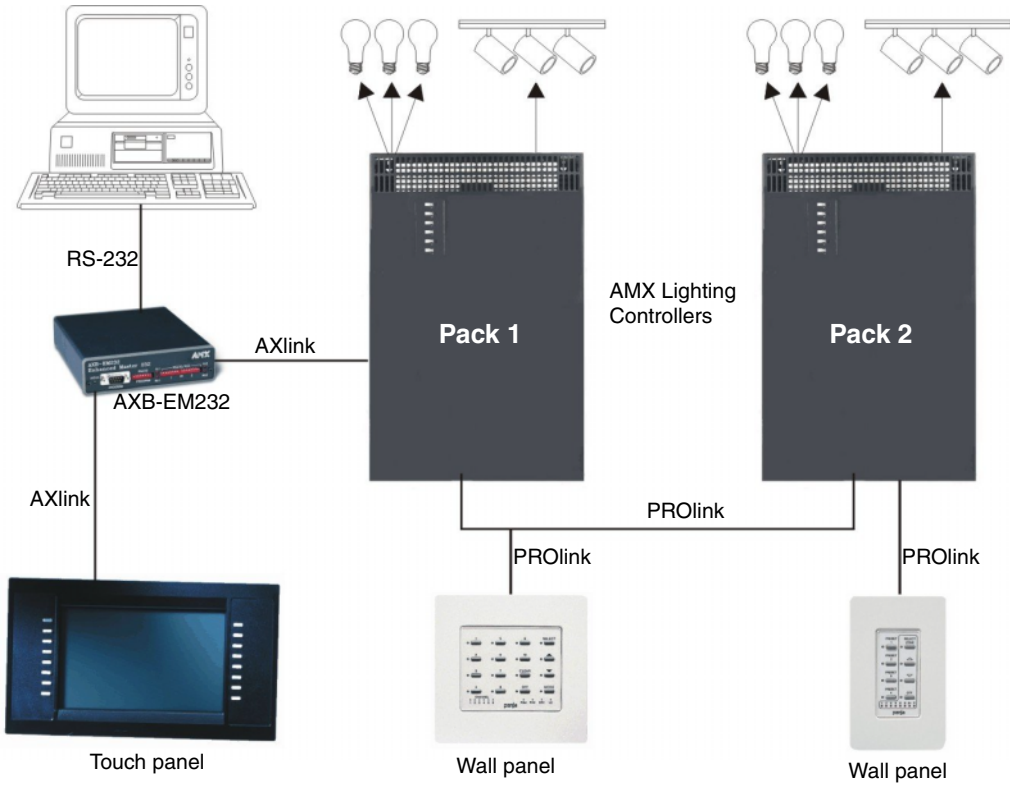

FIG. 1 Sample AMX Lighting Control System

PROlink wall panels

PROlink wall panels are available for direct connection to the AMX Lighting system. PROlink panels do not rely on an AXlink connection. PROlink panels have an internal fixed program that is powered from the PROlink connector on the AMX Lighting controller. These panels get power from the power supply available to the controller where the panel is connected. These panels reflect changes made to the AMX Lighting system by the Axcess system when the AMX Lighting Controllers are also connected on AXlink.

Lighting Systems

AMX Lighting systems are based on a modular construction. There are three basic components to the modular structure: Controller, Enclosure, and Dimmer/Switch Modules. All AMX Lighting controllers have six channels of control. Seven channels of control will always require the use of two controllers.

In order to have the controllers address different dimmers ranges, they have a DIP switch installed to address each pack/group of six channels to a specific range. Changing the PROlink DIP switch address (value) is a means of differentiating the various dimmers. All AXlink devices also have an address DIP switch to set a unique ID from 1 to 255. FIG. 2 shows a sample AMX Lighting controller and its internal components.

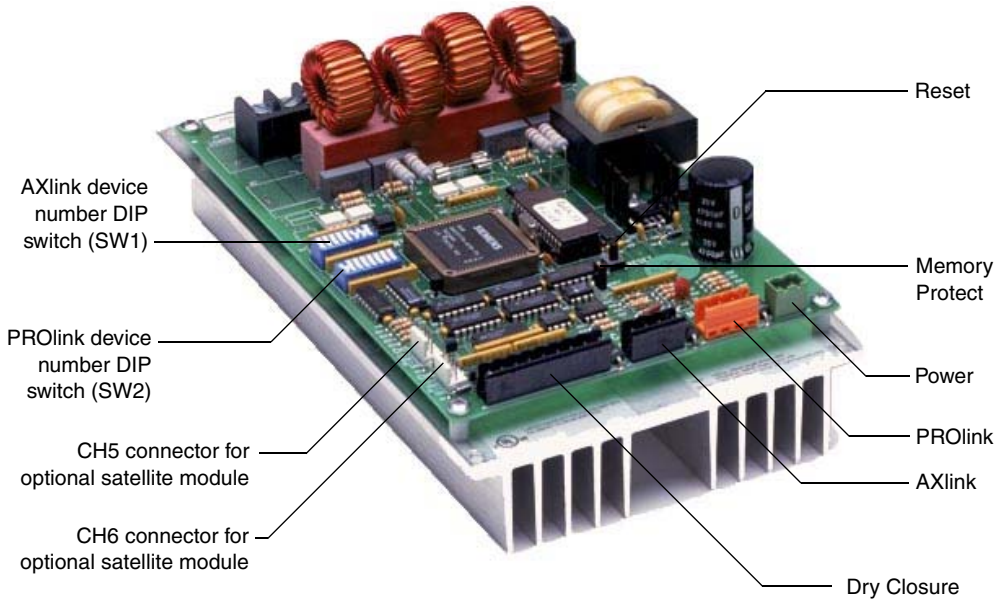

FIG. 2 RDD-DM low-voltage connections and DIP switches

The first of a ten pack PROlink system can have one of the 255 AXlink addresses. That means that a single AXlink address can control 60 channels of dimming or an entire PROlink system. Refer to the DIP switch configuration subsection for more detailed information about both the PROlink and AXlink pack numbers.

Axcess Statements

Axcess Send_Command statements are received in the AXlink buffer, processed and sent to the PROlink buffer where they are translated to the dimming engine. The same is true in reverse, such that the dimming engine updates the PROlink buffer that sends data to the AXlink buffer and then to the AXlink Central Controller.

FIG. 3 shows the pathway of the Axcess commands to the dimming engine.

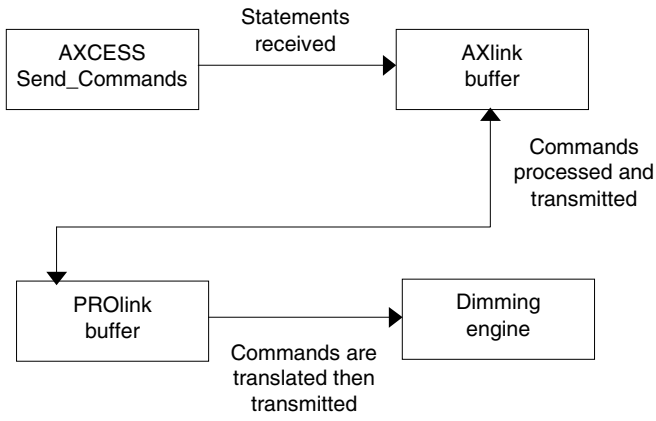

FIG. 3 Flowchart for Axcess Send_Commands to dimming engine

All this communication takes milliseconds of time. The AXlink buffer sends data to the PROlink buffer, receives commands from the PROlink buffer, receives data from the Axcess Central Controller, and connects AXlink levels to an Axcess Central Controller. Each Central Controller can control over 250 devices on the AXlink control bus. There is a DIP switch on each AXlink device to set the address from 1 to 255. Each AXlink Central Controller can receive 8 levels from a device. AMX Lighting pack #1 can send all six of its levels directly to the AXlink bus. Only Pack #1 can send AXlink levels; Pack 2-10 cannot return direct levels to the Axcess Central Controller.

Programming Commands

There are four main types of programming commands used in the AMX Lighting system: Setup, Recording, Status, and Operation commands. The following descriptions apply to both the PROlink and AXlink Command Structure.

Setup commands

These types of commands are global commands sent to Pack #1 that affect the entire PROlink network. These commands are used to set the default values and parameters that are typically entered at the startup of the system and not changed. If certain commands are issued with a time value associated then the AMX Lighting system will use an available default value determined at setup. The commands for recording and recalling presets use these defaults, as do ramping operations. Curve settings are setup commands done on a individual channel basis and are not global. Curves are set in the beginning and do not need to be changed unless the loads also change.

Recording commands

These commands send preset data to the AMX Lighting memory chip. All recording and setup commands are stored in non-volatile memory. These commands are also used to store presets, assign presets for dry closure recall, and erase stored presets.

Status commands

Status commands allow a user or a program to get data from the lighting system and act on that information. This feature gives a computer the ability to perform interactive processes with the AMX Lighting system. AXlink status data and Axcess Levels have unique differences from PROlink status data. The combination of AXlink and PROlink status commands provides the greatest flexibility.

Operation commands

This is the largest category of commands. The operational commands are used for real-time lighting control and setup of scenes prior to programming presets. Operational commands recall, ramp, and set levels for dimmers. They can also be used for remote operation of the dry closure contact.

Control Curves

There is a great influx of new lamps and ballast on the market. Each one has properties and dimming characteristics that present a new challenge for the dimmer manufacturer to provide an appropriate dimmer. What was designed as a standard incandescent dimmer must now be able to control electronic ballast, incandescent lamps, low voltage track lighting, and a host of new transformers.

One way to solve many of these problems is to apply different control curves to each dimmer and to provide a variable low-end cutoff point.

A dimming curve is a graphical or electronic representation of the amount of control that must be applied to a dimmer in relation to the dimmer output. It is like a directional map that the controller follows. The amount of control is typically measured in percent; from an Off-state of level 0 to an On-state at level 100. Dimmer output is measured in volts. A graphical representation of a dimming curve is usually the percentage of dimming in relation to the output voltage (RMS) of the dimmer connected to a standard load. FIG. 4 shows a sample dimming curve.

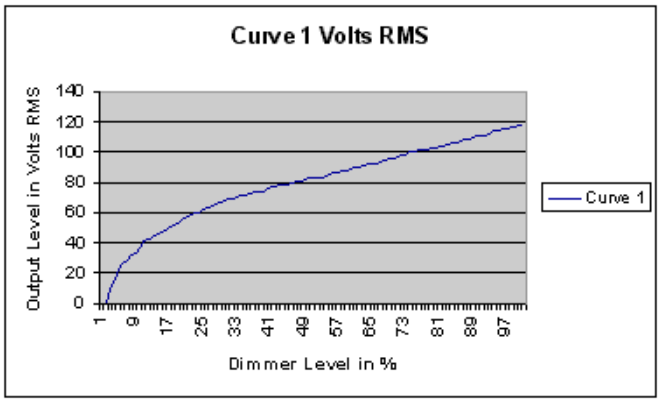

FIG. 4 Sample dimming curve

Sometimes a fixture or lamp has a problem dimming down to a low range. When this happens the lights can flicker and cause unwanted dimming performance. To correct for anomalies in the dimming performance of various devices, the AMX Lighting controller has provisions to individually set a low-end trim for each of the six dimming channels. The AMX Lighting dimming system employs a low-end cutoff that allows the dimmer to turn on to a specified level or to dim down to a specific level. The level at which the dimmer turns on is called the Low End Setting. Low End commands prevent the dimmer from going below a set threshold. They also force the dimmers on to the preset threshold. That is useful for some transformer loads and track lights.

NOTE

Refer to Appendix C: AMX Lighting Curves for more information.

Pre-Installation Settings

Dry Closures

Each AMX Lighting controller has a 9-pin captive screw connector for use as a dry closure input. One connection is for a common ground and the rest are for the eight dry closure inputs.

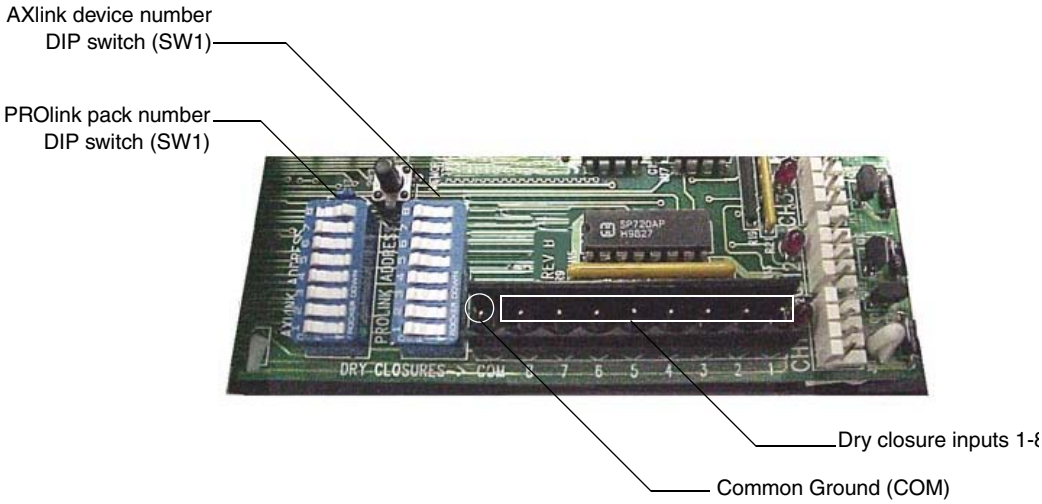

FIG. 5 Sample dry closure connector

The inputs are an open collector pulled up to 5 VDC. The status is normally open, channel Off, closure released. When an input is pulled low to ground and falls below 3 VDC, the AMX Lighting system sees the action as an input closure and the AXlink channel is turned On and a push sent to the Axcess Central Controller.

Configuring and connecting AXlink

The DIP switch SW1 sets the AXlink device number. The device number is determined by the value of all the switch position settings. The following table shows the SW1 DIP switch positions and their values. The device number assignment range is 1 through 255.

Position	1	2	3	4	5	6	7	8
Value	1	2	4	8	16	32	64	128

CAUTION

Power Off the unit before setting the DIP switch

To set DIP switch SW1 and connect AXlink:

1. Power Off the unit at the circuit breaker.
2. Locate the SW1 DIP switch (marked AXLINK ADDRESS) and set the device number using the values shown above.

3. Connect the four-pin AXlink male connector onto the four-pin female AXlink connector in the AMX Lighting Controller. FIG. 6 shows how to wire the AXlink connector to a Central Controller.

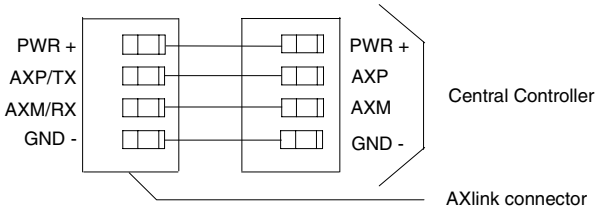

FIG. 6 AXlink wiring diagram

4. Power up the AMX Lighting Controller at the circuit breaker panel or push the Reset Button.

Configuring and connecting PROlink

DIP switch SW2 sets the PROlink pack number. The pack number is determined by the value of all the switch position settings. The following table shows the SW2 DIP switch positions and their values. The pack number assignment range is 1 through 10. The lighting system will not work if you assign pack numbers outside of the range. DIP switch #8 is a test switch. It will turn all the lights to full in the On position. It must be in the Off position for normal operation.

Position	1	2	3	4	5	6	7	8
Value	1	2	4	8	N/A	N/A	N/A	Test

To set DIP switch SW2 and connect PROlink:

CAUTION

Power Off the unit before setting the DIP switch

1. Power Off the unit at the circuit breaker.
2. Locate the SW2 DIP switch and set the pack number using the values shown above. The pack number must be 1 to 10.

NOTE

Assign pack #1 for all communications, diagnostics, and response (feedback).

3. Connect the four-pin PROlink male connector into the four-pin female PROlink connector in the AMX Lighting Controller. FIG. 7 shows how to wire the PROlink connector to a PROlink wall panel.

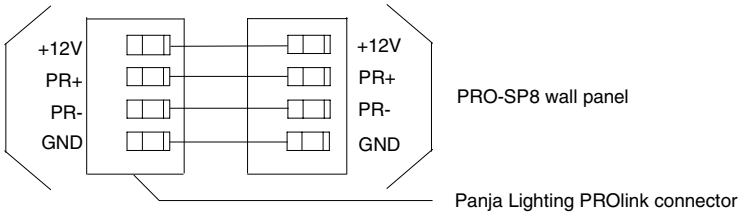

FIG. 7 PROlink wiring diagram

Connecting dry closures

Eight connections are available for dry contact closures and one common reference point. FIG. 8 shows the standard wiring configuration for the 9-pin dry closure connector.

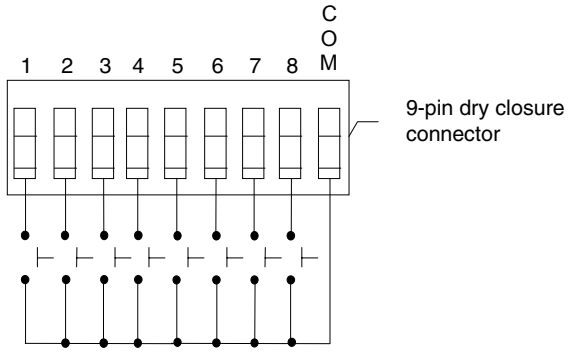

FIG. 8 9-pin dry closure connector (standard configuration)

Each contact closure connection (1 through 8) is pre-programmed with a default preset. The following table shows the default presets for each contact closure.

Default Dry-Closure Presets	
Contact closure	**Default presets & functions**
1	Preset 1, Channel 1 at 100% in 1 second*
2	Preset 2, Channel 2 at 100% in 1 second*
3	Preset 3, Channel 3 at 100% in 1 second*
4	Preset 4, Channel 4 at 100% in 1 second*
5	Preset 5, Channel 5 at 100% in 1 second*
6	Preset 6, Channel 6 at 100% in 1 second*
7	Preset 7, Channel 1 - 6 at 100% in 1 second*
8	Preset 8, Channel 1 - 6 at 0% in 1 second*

Dry closure method to reset Default Settings

The default settings can be restored using the Dry Closure Input connection. By wiring all nine pins (input pins 1-8, and the COM pin) together and plugging it into the Dry Closure port on a control card for one minute will reset all default settings and parameters to the factory default settings as listed previously.

To reset a AMX Lighting controller to default mode:

1. Power Off the AMX Lighting controller at the circuit breaker panel.

2. Disconnect all AXlink and PROlink cables from the controller module.
3. Connect a jumper to the dry contact closures 1 through 8 and to ground as shown in FIG. 9.

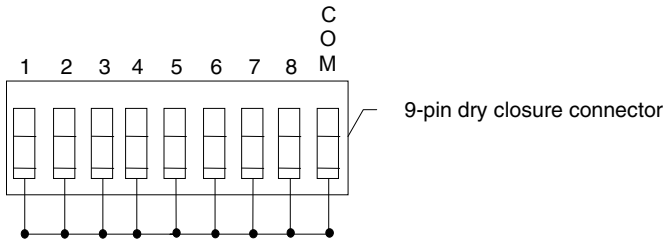

FIG. 9 9-pin dry closure connector set to default mode

4. Power up the controller and wait for the controller's green status LED to go off after about one minute.
5. At the breaker panel, remove power from the controller again.
6. Remove the 9-pin connector from the Dry Closure connector.
7. Reconnect AXlink and PROlink.
8. Reapply power to the AMX Lighting controller.

Default Settings and Parameters

There are several default settings involved with the AMX Lighting controller. There are default values for recalling a preset, going to a specified level, ramping up or down a dimmer or preset, which presets are stored for dry closure recall, and enabling PROlink response and feedback strings. Once a default parameter is set it does not have to be changed for the life of the system. These settings are stored in non-volatile memory in a separate memory chip. The first 8 presets are defined in the default startup, and these presets are also attached to the default dry closures. The eight dry closures will recall the first 8 presets. All default values and the clearance of all other presets can be accomplished using a special function of the dry closure connector. All channels are cleared of any low-end trim during a factory reset of the processor. The pack will report, ♀P01:000,000,000,000,000,000 designating all channels be cleared of low-end settings. By connecting a jumper to dry contacts 1-8 and to the common ground, the factory default mode erases all existing presets stored in memory.

NOTE

The symbol ♀ is obtained by pressing ALT+ 012, entering the Hexadecimal value $0C, or by entering the decimal number 12.

The following tables shows the default low-end settings, default preset time values, default dry-closure presets and factory presets for AMX Lighting:

Default Low-End Settings

Function	Low-end setting
Channel 1	LE=0
Channel 2	LE=0
Channel 3	LE=0
Channel 4	LE=0
Channel 5	LE=0
Channel 6	LE=0

Default preset time values

Firmware version	Function	Time Value
2.0 or greater	Default ramp time	6
	Default level time	1
	Default preset time	3

Default dry-closure presets

Contact closure	Default presets & functions
1	Preset 1, Channel 1 at 100% in 1 second*
2	Preset 2, Channel 2 at 100% in 1 second*
3	Preset 3, Channel 3 at 100% in 1 second*
4	Preset 4, Channel 4 at 100% in 1 second*
5	Preset 5, Channel 5 at 100% in 1 second*
6	Preset 6, Channel 6 at 100% in 1 second*
7	Preset 7, Channel 1 - 6 at 100% in 1 second*
8	Preset 8, Channel 1 - 6 at 0% in 1 second*

Factory presets

Preset number	Description
1	Channel 1, Channel 1 at 100% in 1 second*
2	Channel 2, Channel 2 at 100% in 1 second*
3	Channel 3, Channel 3 at 100% in 1 second*
4	Channel 4, Channel 4 at 100% in 1 second*
5	Channel 5, Channel 5 at 100% in 1 second*
6	Channel 6, Channel 6 at 100% in 1 second*
7	Channel 1 - 6 at 100% in 1 second*
8	Channel 1 - 6 at 0% in 1 second*

Wiring Considerations

The following information relates to wiring considerations for a AMX Lighting system.

CAUTION

Do not connect power to the device until the wiring is complete.

Preparing/connecting captive wires

1. Strip 0.25 inch of wire insulation off all wires.
2. Insert each wire into the appropriate opening on the connector according to the wiring diagrams and connector types described in this section.
   - Do not tighten the screws excessively; doing so may strip the threads and damage the connector.

Axcess Control - PC to Axcess Controller

The following table lists the pinout information for the DB-9 connector.

DB-9 Connector Pinouts

Pin	Signal	Pin	Signal
1	N/A	6	N/A
2	RXD	7	RTS
3	TXD	8	CTS
4	N/A	9	N/A
5	GND		

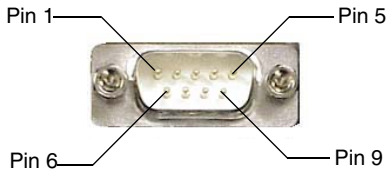

FIG. 10 shows a DB9 pinout relation from the computer to the Axcess Central Controller.

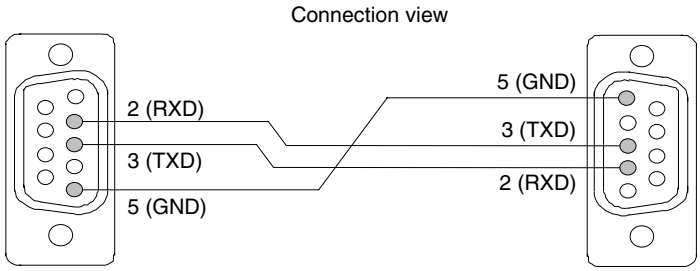

FIG. 10 Computer to Axcess connection

Use cable FG #10-727 to connect computer the COM port to Axcess or AXCENT Program Port.

AXlink wiring between multiple devices

FIG. 11 shows AXlink wiring between AXlink devices.

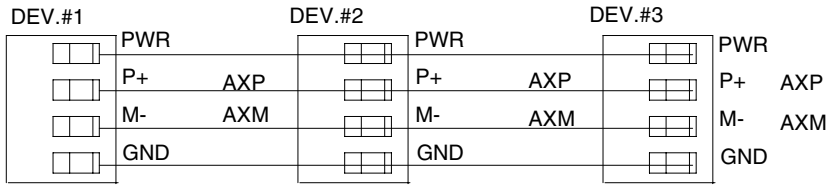

FIG. 11 Multiple AXlink wiring connections

CAUTION

Disconnect the main power to the AMX Lighting controller if rewiring the AXlink cables.

PROlink wiring between multiple devices

FIG. 12 shows PROlink wiring between PROlink panels and controllers.

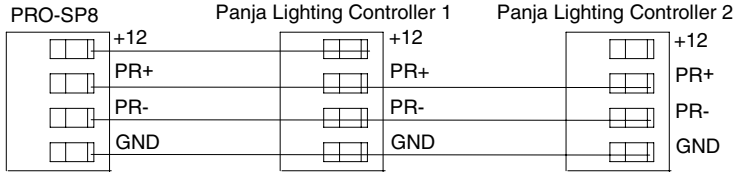

FIG. 12 Multiple PROlink wiring connections

CAUTION

Disconnect the main power to the AMX Lighting controller if rewiring the PROlink cables.

Power considerations

The following information relates to wiring considerations for a AMX Lighting system.

Power connections

Power to a controller must be maintained to avoid losing communication with AXlink. Pack #1 will survive a brownout or temporary loss of power and recover online to AXlink. Reset Pack #1 to bring Packs #2 and above online. If Pack #1 loses power and power is then restored, all other packs (2 - 10) will remain offline until Pack #1 is reset.

AXlink connections

In order to establish an AXlink connection for programming, the controller must be connected to a power source and be powered on. The AMX Lighting system will allow programming after power has been applied. Once power has been applied and the AMX Lighting controller has established an AXlink connection, the 12VDC supply to the processor will allow program changes if the 120VAC supply is cut off.

Programming Strings

Strings

A string is a set of values grouped together with single and/or double quotes. Character arrays (strings) are enclosed between double quotes while ASCII strings are enclosed within single quotes. All ASCII strings are character arrays. If an ASCII string needs to be sent with non-ASCII characters, it must first be enclosed in double quotes and then the non-ASCII characters must be delineated with commas. Axcess looks at:

- ASCII characters — These characters are surrounded with single quotes.
- Hexadecimal characters — These characters begin with a $. An example is $0D that acts as a carriage return and enters the information.
- Decimal characters — These characters are numerical and are not enclosed with any quotation but are separated from other types of characters by a comma.

PROlink Programming Strings

PROlink accepts ASCII commands from the AXlink connection. These commands take the form of a Send_String command to the AXlink device. Most commands are terminated with a carriage return. A carriage return is represented by the decimal value 13 or the hexadecimal form $0D. Response (feedback) values for presets, time values, and dimmer levels are usually three characters. The AMX Lighting controller is both an AXlink and PROlink device. You can send PROlink commands through the AXlink COM port, but you cannot send AXlink commands to the PROlink port.

A sample command structure is shown below:

• Example:	`SEND_STRING <device>,"'<command string>', <CR>"`
• Example 2:	`Send_String LTS, "'RT5', 13"`
• PROlink response example:	♀`RAMPTIME SET AT 005`

The 'RT5' are ASCII characters and the '13' are decimal characters. Everything within the double quotes gets sent out when followed with a carriage return, <CR> like $0D.

The ASCII character ♀ or $0C precedes all responses from the AMX Lighting controller. The PROlink response will have a carriage return $0D and a line feed $0A at the end of each response. For example purposes the <device> is always named 'LTS' and the <CR> will be substituted with the Decimal numerals 13. Levels are expressed in percent from level 0 (zero) to 99 with full On or 100% expressed as two characters, FF.

In the command format, such as the one shown below, the <n> parameter refers to the individual dimmer number or group of dimmers. The value <n> can be in the range from 1 to 60. It can be expressed as a compound number using the - (dash) and & (ampersand). The letter A for ALL ('include all 60 dimmers') is also valid as a value for <n>. The string '**1&3-6&9L99**' is an example of a compound group consisting of dimmers 1, 3, 4, 5, 6, and 9. The example string '**AL0T0**' would send all 60 dimmers to level 0 instantly. The following is a generalized PROlink command structure example:

PROlink Command Structure	
Sample format:	`Send_String <device>, "'<n>L<m>T<t>', 13"`
Variables:	• <n>: This is the dimmer number from 1-60 (Any combination of dimmers • <m>: This is the dimmer level percentage 0-100 • <t>: This is the time value, 0-255 in seconds
Example:	`Send_String LTS, "'1L57T3', 13"`
PROlink response example:	♀001 LEVEL 57 IN 003

PROlink commands should not be sent while the PROlink buffer is responding to the previous command or a data collision could occur. In Axcess programs there should be at minimum a 3/10-sec. wait (WAIT 3) between commands sent to the controller. Repetitive commands should have a ½ second wait (WAIT 5) between commands for greater accuracy. The dimmers all have the ability to turn On or Off in 1/10 of a second.

A <CR> or '13' is sent before a command string will also clear the PROlink buffer allowing more reliable data transfer.

A dimmer or group of dimmers can be excluded from a preset using the 'Undefined' command. Undefined is a level command that allows a dimmer to be ignored during the recording of a preset; it has no defined level. A preset can be created where dimmers 1 and 2 can be set to 50% while dimmers 3 and 4 are set to undefined levels.

The following example shows a command line where any undefined dimmers wouldn't be included in a preset:

• Example:	`Send_String LTS, "'3-4LU'"`
• PROlink response example:	♀GROUP LEVEL UN IN 000

If all lights were on full before this preset was recalled, then only dimmers 1 and 2 would go to 50% while dimmers 3 and 4 would stay at full. This is useful where one AMX Lighting enclosure must service several rooms or when a preset is needed for only one light in the entire room. The 'All Levels Undefined' command is often used before recording a preset to clear the scene to a 'neutral' level. A preset stored with all levels undefined will have no affect on the dimmers when recalled.

AXlink cannot 'Undefine' a single channel.

The following example shows a command line where any undefined dimmers wouldn't be included in a preset.

• Example:	`Send_String LTS, "'ALU', 13"`
• PROlink response example:	♀ALL LEVEL UN IN 000

Use this type of preset to initiate unique actions that do not change the lighting. All unique action presets can be assigned to AXlink, PROlink, or dry closure panels. This allows any AMX Lighting panel to do non-lighting functions. A non-lighting preset could be used to turn on music or set an alarm. A preset using all levels undefined will still be counted as one of the available 128 presets and there can be many presets that do nothing to the lights.

There are three special presets in AMX Lighting controllers that have a fixed, non-programmable function. Special preset #255 ramps a preset down; preset #254 ramps a preset up; and preset #253 allows dry closures to record presets. All special presets can be stored and recalled just like the other 128 standard presets. The addition of preset ramping as a preset was most useful for dry closures, giving them the ability to raise or lower lighting levels using simple switches.

Preset ramping can raise or lower all the levels in a preset in a proportional manner. Preset ramping gives you the ability to raise all the levels to 100% or lower all the levels to 0. The preset will retain its proportional levels after it has been raised or lowered to an extreme level (0 or 100). If a preset is raised to all levels equal 100%, then it can be lowered back to its original state with all levels in proportion to the others. If a preset has channel 1 at 75% and channel 2 at 90%, then ramping the preset up 10% will put channel 1 at 85% and channel 2 at 100%; then ramping down 20% will put channel 1 at 65% and channel 2 at 80%. All presets can be recovered after ramping the preset to an extreme level. This is useful for incremental changes to an entire scene.

All presets and startup features are stored in a separate non-volatile memory chip. The memory protect jumper on each control card will physically prevent the memory chip from being updated, or accidentally erased. If the Memory Protection jumper is installed the AMX Lighting controller will still react like it has changed or stored the new preset without actually doing so. This can be a potential source of confusion. There is no digital command to determine if the jumper is in place or not.

AXlink Programming Strings

Earlier lighting products communicated via RS232 that required them to use Send_Strings. More recent lighting products began to use AXlink cable to communicate on an AXlink bus. Send_Commands, channel and level information was also added to the programming language. PROlink uses Send_Strings such as "**13, $0D, 'S**'" where decimal, hexadecimal, and ASCII characters are used respectively. AXlink uses Send_Commands such as SEND_COMMAND LTS. The relation between the two is that the current Axcess language used in AMX Lighting integrates the two. For example:

```
SEND_COMMAND <device>, '<Send_String>'
```

As Axcess processes a string expression, it evaluates each member of the expression from left to right, and the result is a complete string.

Levels

The best way to get levels from the AMX Lighting controller is to use the AXlink level feature built in to each AMX Lighting controller. Use the DEFINE_CONNECT_LEVEL feature for touch panel and wall panel bargraphs. The CREATE_LEVEL command feature can be used to display the 8-bit AMX Lighting level or to use the level on other AXlink 8-bit level devices like the AXB-VOL3 box, a text window, or the AXB-DMX512 controller.

Active bargraphs on touch panels tend to raise or lower lights in uneven steps. The size of the active bargraph does not lend itself to smooth dimming, especially at the top or bottom of the slider. The preferred way would be to use Up and Down arrows or commands, and to put bargraphs in display mode only.

Polling the AMX Lighting controller for levels is the least effective way to get and display levels; this is not recommended.

To determine if a AMX Lighting level is in the 'UNDEFINED' state you must use the PROlink string command for single dimmer status as described in PROlink - Status section under the heading 'Dimmer status'. The AXlink layer could report a level as FF (all on), but at the same time the PROlink layer has assigned that channel as 'UNDEFINED'; this will make a difference when recording presets. Presets are stored using the PROlink layer, not the AXlink layer.

Levels are returned in AXlink as an 8-bit figure with 256 steps from 0 to 255. Use the formula x = (x*100/255) [where x is the dimmer level] to express an 8-bit level in percent. This will give an approximate percentage level, with a 1% accuracy.

Buffers

The recommended way to determine a AMX Lighting response to a buffer is to use this format:

```
LTS_RESPONSE = REMOVE_STRING (LTS_BUFFER,"13,10", 1) '
```

There are a few constants that may help in PROlink string manipulation. Presets use the 'GOTO' command, levels are preceded by the word 'LEVEL', and time values are preceded by the word 'IN'.

Refer to the Create_Buffer subsection on more information on creating a buffer.

Responses

The responses from the AMX Lighting controller can be turned Off in order to quickly send commands. Commands can be sent faster if there is no waiting for a response after each command is sent. The default mode at startup is RXON, which will allow responses to be sent from the AMX Lighting controller. It is recommended to send a command and wait for the response, then send another command. Use the RXOFF mode to avoid data collisions. This will disable most of the return responses from PROlink and speed up the data transfer rate. It will also stop all feedback.

Dry Closures

Dry closures are read in sequential order and are assigned to AXlink channels 147 - 154. If two buttons are pressed simultaneously, only one channel will be active. Buttons on closures must be pushed sequentially to have more than one channel active. Pushing dry closure #1, then #2, then #3 will activate all three channels (AXlink channels 147, 148, 149). All eight closures can be used at once.

PROlink Command Structure

Setup Commands

These commands are used to set the default values and parameters that are typically entered at the startup of the system and not changed.

- For example purposes the <device> is always named 'LTS' and the <CR> will be substituted with the ASCII numerals 13.

Setting a Default Level Time

LT	Level Time is the time it takes for a level to change from its present state to a new level when using a Level command. If a level command is sent without the time value specified (T), the dimmer will go to the specified level using the Default Level Time.
	The factory default for this value is 1 second
	`Send_String LTS, "'LT<t>', 13"`
	Variables:
	• <t>: Fade time, 0-255 in seconds
	Example:
	`Send_String LTS, "'LT1', 13"`
	PROlink response:
	`♀LEVEL TIME SET AT 001`

Setting a Default Ramp Time

RT	Ramp Time is the time it takes to raise or lower the channel or preset from its preset levels to either extreme of level zero or 100%. All ramp commands will use the Default Ramp Time. Individual dimmers cannot have individual ramp rates
	`Send_String LTS, "'RT<t>', 13"`
	Variables:
	• <t>: Fade time, 1-255 in seconds, zero is not valid
	Example:
	`Send_String LTS, "'RT5', 13"`
	PROlink response:
	`♀RAMPTIME SET AT 005`

Setting a Default Preset Time

PT	Preset Time is the time it takes for a preset to be recalled. If a preset is stored or recalled without the time value specified (T), it will be recalled or stored using the Default Preset Time.
	The factory default for this value is 3 seconds
	`Send_String LTS, "'PT<t>', 13"`
	Variables:
	• <t>: Fade time, 0-255 in seconds
	Example:
	`Send_String LTS, "'PT3', 13"`
	PROlink response:
	`♀PRESET TIME SET AT 003`

Enabling a PROlink response

RN	Response On: PROlink acknowledges each command with a response. This command will enable responses to the AXlink master, and it is the default start-up condition.
	`Send_String LTS, "'RN', 13"`
	Example:
	`Send_String LTS, "'RN', 13"`
	PROlink response:
	`♀RXON MODE`

Disabling a PROlink response

RF	Response Off: PROlink acknowledges each command with a response. This command will disable responses to the AXlink master and speed up communication. `Send_String LTS, "'RF', 13"` Example: `Send_String LTS, "'RF', 13"`

Phase/zero-crossing detection and correction

P	Phase/zero-crossing detection and correction features at startup and reset.
	In the presence of a phase/zero-crossing error:
	• The green AXlink LED on the Radia will blink very fast.
	• The Radia will add a "P<pack#> PHASE ERROR" to any command response.
	The current state of the phase/zero-cross detection system can be queried on a pack by pack basis.
	Syntax:
	`<pack#>Y`
	Return:
	`P<pack#>PH: (OK or FAIL)`
	`1(Y or N), 2A(Y or N), 2B(Y or N), 3(Y or N)`
	A correctly working system will dislplay OK,Y,Y,Y,Y. A failure would read: PH: FAIL and an N following the <phase #> in question

PROlink remote reboot

QQQ	The command triggers execution equivalent to start-up or activation of reset button. Syntax: <pack#>QQQ

Setting a Curve

A curve is used to match the channel level setting with the dimmer output. A curve can be used to govern the amount of dimming control relative to the level setting allowing for uniform dimming between different loads.

Format:	Send_String LTS, "'<n>/<c>', 13"
Variables:	• <n>: Dimmer number from 1-60, and All • <c>: Curve selection from 1-9, A-F, N, O
Example 1:	Send_String LTS, "'1/1', 13"
PROlink response:	♀01 CURVE 1
Example 2:	Send_String LTS, "'1&2/6', 13"
PROlink response:	♀GROUP CURVE 6

Setting a Low End voltage

The Low End setting allows a programmer to set the initial turn On voltage. The dimmer will ramp up to the Low End threshold at Level 1 and stay there until the LE command releases the threshold and allows normal dimming. This is also used to prevent certain loads from dimming below the product's ability. They only ramp down to a set level and stay there until it reaches level 0.

Format:	Send_String LTS, "'<n>LE<m>', 13"
Variables:	• <n>: Dimmer number from 1-60, and All • <m>: Dimmer level percentage (0-100)
Example 1:	Send_String LTS, "'1LE7', 13"
PROlink response:	♀MINIMUM LEVEL IS: 007
Example 2:	Send_String LTS, "'1-6LE3', 13"
PROlink response:	♀MINIMUM LEVEL IS: 003

Recording Commands

These commands send preset data to the AMX Lighting controller memory chip. All recording and setup commands are stored in non-volatile memory. These commands are also used to store presets, assign presets for dry closure recall, and erase stored presets.

Recording Presets

If the value for <t> is not entered, the AMX Lighting controller will use the value specified by the Default Preset Time. The <t> parameter is optional.

Format:	Send_String LTS, "'<s>R<t>', 13"
Variables:	• <s>: This is the preset number • <t>: This is the ramp rate, 0-255 in seconds
Example 1:	Send_String LTS, "'4R2', 13"
PROlink response:	♀RECORD 004 IN 002
Example 2:	Send_String LTS, "'4R', 13"
PROlink response:	♀RECORD 004 IN 003 (default time=3)

Recording Dry Closure Presets

Special presets #253, #254, and #255 are allowed for the <s> value. These presets allow preset ramping and enable the record mode.

Format:	Send_String LTS, "'<p>E<cl>P<s>', 13"
Variables:	• <p>: This is the pack number 1-10 or A (all) • <cl>: This is the dry closure number 1-8 • <s>: This is the preset number 1-128, 253, 254, 255
Special presets:	All special presets can be stored and recalled just like the other 128 standard presets. • #253 allows dry closures to record presets • #254 ramps a preset up • #255 ramps a preset down
Example:	Send_String LTS, "'1E2P99', 13"
PROlink response:	♀PRST 099 ON PK 01 SW 2

Status Commands

Status commands allow a user or a program to get data from the lighting system and to act on that information.

Obtaining a Dimmer status

This is the fastest way to get dimmers status. It is also the fastest way to see if a computer is connected to the AMX Lighting controller using the terminal emulator mode in Axcess. Use this command to determine any undefined channels.

Format:	Send_String LTS, "'<n>', 13"
Variables:	• <n>: This is the dimmer number from 1-60 (Only one dimmer at a time)
Example:	Send_String LTS, "'1', 13"
PROlink response:	♀CHAN:01 CURV: 1 LEV: 25

Obtaining a Pack Curve status

This is the fastest way to see the curves in a pack. The PROlink answer gives the pack number followed by the dimmer curve status starting with dimmer one.

Format:	Send_String LTS, "'<p>C', 13"
Variables:	• <p>: This is the pack number 1-10 (Only one pack at a time)
Example:	Send_String LTS, "'1C', 13"
PROlink response:	♀P01: 1, 1, 1, 6, N, N

Obtaining All the Pack Curve status

This is the fastest way to see the curves in a PROlink system. The PROlink answer gives the pack curve status starting with pack one, a carriage return, and a line feed, and then the next pack. It does not report packs that are not on line.

Format:	Send_String LTS, "'AC', 13"
Example:	Send_String LTS, "'AC', 13"
PROlink responses:	♀P01: 1, 1, 1, 6, N, N ♀P02: 1, 1, 1, 6, N, N …

Obtaining a Pack Level status

This is the fastest way to see the levels in a pack. The PROlink answer gives the pack level status starting with pack one. This command does not identify any undefined channels.

Format:	Send_String LTS, "'<p>Z', 13"
Variables:	• <p>: This is the pack number 1-10 (Only one pack at a time)
Example:	Send_String LTS, "'1Z', 13"
PROlink response:	♀P01: 25, 37, 00, 00, FF, 88

Obtaining All Pack Level status

This is the fastest way to see the levels in a PROlink system. The PROlink answer gives the pack levels starting with pack one, a carriage return, and a line feed, and then the next pack. It does not report packs that are not on line. This command does not identify any undefined channels.

Format:	Send_String LTS, "'AZ', 13"
Example:	Send_String LTS, "'AZ', 13"
PROlink responses:	♀P01: 25, 37, 00, 00, FF, 88 ♀P02: 00, 22, 99, FF, FF, FF …

Obtaining a Pack Low End Setting status

This is the fastest way to see the Low End Settings in a pack. The PROlink answer gives the pack Low End trim status from the selected pack starting with the pack number, followed by the six dimmer channels beginning with dimmer one.

Format:	Send_String LTS, "'<p>LE?', 13"
Variables:	• <p>: This is the pack number 1-10 or A (all) (Only one pack at a time)
Example:	Send_String LTS, "'1LE?', 13"
PROlink response:	♀P01: 000, 005, 000, 000, 005, 000

Obtaining firmware version in PROlink

The PROlink version is useful if a specific Radia is to be queried for its Firmware version.

Format:	SEND_STRING RADIA," <pack#> `VER', 13"
Example:	String From [96:1:1]-[$0C<pack#> VERSION #3.01$0D$0A?] - 11:53:29

Operation Commands

Operation commands are used for real-time lighting control and setup of scenes prior to programming presets.

Recalling Presets

If the value for <t> is not entered, the AMX Lighting controller will use the value stored at the time the preset was recorded. The <t> parameter is optional. This is the fastest way to have many lights change levels.

Format:	Send_String LTS, "'<s>B<t>', 13"
Variables:	• <s>: This is the preset number 1-128, 253, 254, 255 • <t>: This is the ramp rate, 0-255 in seconds (optional)
Example 1:	Send_String LTS, "'3B5', 13"
PROlink response:	♀GOTO 003 in 005
Example 2:	Send_String LTS, "'3B', 13"
PROlink response:	♀GOTO 003 in 003 (default time = 3)

Ramping Dimmers Up

The dimmer will continue ramping until the carriage return is sent or until the dimmer reaches level zero or 100. Ramping is best done on the push, while stopping is done on the release of a button.

Format:	Send_String LTS, "'<n>U'" no<enter>
Variables:	• <n>: This is the dimmer number from 1-60 or All (Any combination of dimmers)
Example:	Send_String LTS, "'1U'"
PROlink response:	♀01 UP

Ramping Dimmers Down

The dimmer will continue ramping until the carriage return is sent or until the dimmer reaches level zero or 100. Ramping is best done on the push, while stopping is done on the release of a button.

Format:	Send_String LTS, "'<n>D'" no<enter>
Variables:	• <n>: This is the dimmer number from 1-60 or All (Any combination of dimmers)
Example:	Send_String LTS, "'1D'"
PROlink response:	♀01 DOWN

Stop Ramping Dimmers - Method 1

The dimmer will continue ramping until the carriage return or <enter> is sent or until the dimmer reaches level zero or 100. Ramping is best done on the push, while stopping is done on the release of a button.

Format:	Send_String LTS, "13"
Example:	Send_String LTS, "13"
PROlink response:	♀01 STOP

Stop Ramping Dimmers - Method 2

This command will stop any amount of dimmers. It is useful in stopping individual dimmers during a long fade.

Format:	Send_String LTS, "'<n>S', 13"
Variables:	• <n>: This is the dimmer number from 1-60 (Any combination of dimmers)
Example:	Send_String LTS, "'1-3&5S', 13"
PROlink response:	♀GROUP STOP

Stop Ramping for All Dimmers

This command will stop all dimmers. It is the most reliable way to stop the ramping of dimmers. This command will also stop preset ramping.

Format:	Send_String LTS, "'AS', 13"
Example:	Send_String LTS, "'AS', 13"
PROlink response:	♀ALL STOP

Ramping a Preset Up

The preset will continue ramping until the carriage return is sent or until the new preset is reached. Ramping is best done on the push, while stopping is done on the release of a button. This is the same as AXlink channel command 145 and preset 254.

Format:	Send_String LTS, "'PU'"
Example:	Send_String LTS, "'PU'"
PROlink response:	♀PRESET 001 RAMPING UP

Ramping a Preset Down

The preset will continue ramping until the carriage return is sent or until the new preset is reached. Ramping is best done on the push, while stopping is done on the release of a button. This is the same as AXlink channel command 146 and preset 255.

Format:	`Send_String LTS, "'PD'"`
Example:	`Send_String LTS, "'PD'"`
PROlink response:	♀`PRESET 001 RAMPING DOWN`

Stop Ramping Presets - Method 1

The dimmer will continue ramping until the carriage return or <enter> is sent or until the dimmer reaches level zero or 100. Ramping is best done on the push, while stopping is done on the release of a button.

Format:	`Send_String LTS, "13"`
Example:	`Send_String LTS, "13"`
PROlink response:	♀`PRESET 001 RAMP STOPPED`

Stop Ramping Presets - Method 2

The dimmer will continue ramping until this command is received.

Format:	`Send_String LTS, "'PS'"`
Example:	`Send_String LTS, "'PS'"`
PROlink response:	♀`PRESET 001 RAMP STOPPED`

Setting Dimmer Levels

If the value for <t> is not entered, the AMX Lighting controller will use the value specified by the Default Preset Time. The <t> parameter is optional. This is the fastest and most reliable way to send multiple dimmers to the same level.

Format:	`Send_String LTS, "'<n>L<m>T<t>', 13"`
Optional Format:	`Send_String LTS, "'<n>L<m>', 13"`
Variables:	• <n>: This is the dimmer number from 1-60 (Any combination of dimmers • <m>: This is the dimmer level percentage 0-100 • <t>: This is the ramp rate, 0-255 in seconds (optional)
Example:	`Send_String LTS, "'1L57T3', 13"`
PROlink response:	♀`001 LEVEL 57 IN 003`

Setting Group Dimmer Levels

If the value for <t> is not entered, the AMX Lighting controller will use the value specified by the Default Preset Time. The <t> parameter is optional. This is the fastest and most reliable way to send multiple dimmers to the same level.

Format:	Send_String LTS, "'<n>L<m>T<t>', 13"
Optional Format:	Send_String LTS, "'<n>L<m>', 13"
Variables:	• <n>: This is the dimmer number from 1-60 (Any combination of dimmers • <m>: This is the dimmer level percentage 0-100 • <t>: This is the ramp rate, 0-255 in seconds (optional)
Example:	Send_String LTS, "'1-3&6-8&12L63T5', 13"
PROlink response:	♀GROUP LEVEL 63 in 005

Setting Dimmer Levels as Undefined

Any undefined dimmers will not be included in a preset. A dimmer will stay in the undefined mode until it is reassigned to a level from 0 to 100.

Format:	Send_String LTS, "'<n>LU', 13"
Variables:	• <n>: This is the dimmer number from 1-60
Example:	Send_String LTS, "'1LU', 13"
PROlink response:	♀001 LEVEL UN IN 000

Setting All Dimmer Levels as Undefined

Any undefined dimmers will not be included in a preset. A dimmer will stay in the undefined mode until it is reassigned to a level from 0 to 100. This command duplicates the AXlink channel command 155. This command is often used before recording a preset to clear the scene to a 'neutral' level. A preset stored with all levels undefined will have no affect on the dimmers when recalled. Use this type of preset to initiate unique actions that do not change the lighting.

Format:	Send_String LTS, "'ALU', 13"
Example:	Send_String LTS, "ALU', 13'"
PROlink response:	♀ALL LEVEL UN IN 000

Closing or Pushing a Dry Closure

The closure will remain closed until a release is sent. Closed closures respond on AXlink with channels 147 to 154 going on. PROlink will display preset number recalled.

Format:	Send_String LTS, "'<p>XN<cl>', 13"
Variables:	• <p>: This is the pack number 1-10 or A (all) • <cl>: This is the dry closure number 1-8
Example:	Send_String LTS, "'1XN2', 13"
PROlink response:	♀GOTO 001 IN 000

Opening or Releasing a Dry Closure

The closure will remain closed until a release is sent. Released closures respond on AXlink with channels 147 to 154 going off.

Format:	`Send_String LTS, "'<p>XO<cl>', 13"`
Variables:	• <p>: This is the pack number 1-10 or A (all) • <cl>: This is the dry closure number 1-8
Example:	`Send_String LTS, "'1XO2', 13"`
PROlink response:	`NO RESPONSE`

AXlink Command Structure

AMX Lighting Channel Commands

Channel commands are available for AMX Lighting firmware version 2.0 and greater. The following table shows the AMX Lighting AXlink programming commands.

AMX Lighting Channel Commands			
Channel number	**Function**	**Channel number**	**Function**
1-128	Status of presets, indicates active preset	142	Ramp all 60 channels down
129	Ramp channel 1 up	143	Turn all 60 channel on
130	Ramp channel 2 up	144	Turn all 60 channels off
131	Ramp channel 3 up	145	Ramp active preset up
132	Ramp channel 4 up	146	Ramp active preset down
133	Ramp channel 5 up	147	Status of dry closure 1
134	Ramp channel 6 up	148	Status of dry closure 2
135	Ramp channel 1 down	149	Status of dry closure 3
136	Ramp channel 2 down	150	Status of dry closure 4
137	Ramp channel 3 down	151	Status of dry closure 5
138	Ramp channel 4 down	152	Status of dry closure 6
139	Ramp channel 5 down	153	Status of dry closure 7
140	Ramp channel 6 down	154	Status of dry closure 8
141	Ramp all 60 channels up	155	All levels 'Undefined'

Setup Commands

These commands are used to set the default values and parameters that are typically entered at the startup of the system and not changed.

Setting a Default Level Time

Level Time is the time it takes for a level to change from its present state to a new level when using a Level command. If a Level command is sent without the time value specified (T), the dimmer goes to the specified level using the Default Level Time. The factory default for this value is 1 second.

Format:	`SEND_COMMAND LTS, 'LT<t>'`
Variables:	• <t>: This is the ramp rate, 0-255 in seconds
Example:	`SEND_COMMAND LTS, 'LT1'`
PROlink response:	♀`LEVEL TIME SET AT 001`

Setting a Default Ramp Time

Ramp Time is the time it takes to raise or lower the channel or preset from its preset levels to either extreme of level zero or 100%. All ramp commands will use the Default Ramp Time. Individual dimmers cannot have individual ramp rates. The factory default for this value is 6 seconds.

Format:	SEND_COMMAND LTS, 'RT<t>'
Variables:	• <t>: This is the ramp rate, 1-255 in seconds; zero is not valid
Example:	SEND_COMMAND LTS, 'RT5'
PROlink response:	♀RAMP TIME SET AT 005

Setting a Default Preset Time

Preset Time is the time it takes for a preset to be recalled. If a preset is stored or recalled without the time value specified (T), it will be recalled or stored using the Default Preset Time. The factory default for this value is 3 seconds.

Format:	SEND_COMMAND LTS, 'PT<t>'
Variables:	• <t>: This is the ramp rate, 0-255 in seconds
Example:	SEND_COMMAND LTS, 'PT3'
PROlink response:	♀PRESET TIME SET AT 003

Enabling AXlink Levels/Responses

PROlink acknowledges each command with a response. This command will enable responses to the AXlink master, and it is the default start-up condition.

Format:	SEND_COMMAND LTS, 'RXON'
Example:	SEND_COMMAND LTS, 'RXON'
PROlink response:	♀RXON MODE

Disabling AXlink Levels/Responses

PROlink acknowledges each command with a response. This command will disable responses to the AXlink master, and it is the default start-up condition.

Format:	SEND_COMMAND LTS, 'RXOFF'
Example:	SEND_COMMAND LTS, 'RXOFF'
PROlink response:	NO RESPONSE

Recording Commands

These commands send preset data to the AMX Lighting controller memory chip. All recording and setup commands are stored in non-volatile memory. These commands are also used to store presets, assign presets for dry closure recall, and erase stored presets.

Recording Presets

If the value for <t> is not entered, the AMX Lighting controller will use the value specified by the Default Preset Time. The <t> parameter is optional.

Format:	SEND_COMMAND LTS, 'SP<s>T<t>'
Variables:	• <s>: This is the preset number • <t>: This is the ramp rate, 0-255 in seconds
Example:	SEND_COMMAND LTS, 'SP1T3'
PROlink response:	NO RESPONSE

Status Commands

Status commands allow a user or a program to get data from the lighting system and to act on that information.

Retrieving the Current Preset status (feedback)

AXlink channels 1 through 128 are linked to the active status of the 128 presets. Presets are mutually exclusive. If preset #1 is active, AXlink channel #1 is active.

Format:	AXlink channel 1..channel 128
Example:	[PANEL, 100] = [LTS, 1]
PROlink response:	♀GOTO 001 IN 003

Retrieving a Dry Closure PUSH/RELEASE status

AXlink channels 147 through 154 are linked to the active status of the 8 dry closure inputs. Each closure has an independent status. This input section of the AMX Lighting controller can act in a similar manner to an Input8 card.

Format:	AXlink channel 147..channel 154
Feedback:	[PANEL, 128] = [LTS, 147]
PUSH example:	PUSH [LTS, 147]
PROlink response:	♀GOTO 001 IN 003
RELEASE example:	RELEASE [LTS, 147]
PROlink response:	NO RESPONSE
Example 2:	[LTS, 147] = (MOTION_DETECTED) This action associates a channel state with a variable action. In this case, if motion is detected then it turns channel 147 On.
AXlink response	PUSH [LTS, 147]
PROlink response:	♀GOTO 001 IN 003

Operation Commands

Operation commands are used for real-time lighting control and setup of scenes prior to programming presets.

Recalling Presets

If the value for <t> is not entered, the AMX Lighting controller will use the value specified by the Default Preset Time. The <t> parameter is optional.

Format:	SEND_COMMAND LTS, 'RP<s>T<t>'
Variables:	• <s>: This is the preset number • <t>: This is the ramp rate, 0-255 in seconds (optional)
Example:	SEND_COMMAND LTS, 'RP1T6'
PROlink response:	NO RESPONSE

Ramping Dimmers Up

The dimmer will continue ramping up as long as the channel is on or until the dimmer reaches level 100. A 'TO' statement is preferred for this application.

Format:	AXlink channel 129 (dimmer one) …channel 134 (dimmer six)
Example:	PUSH [TP, 100] TO [LTS, 129] (Ramp dimmer 1 up)
PROlink PUSH response:	♀01 UP
PROlink RELEASE response:	♀01 STOP

Ramping Dimmers Down

The dimmer will continue ramping up as long as the channel is on or until the dimmer reaches level 100. A 'TO' statement is preferred for this application.

Format:	AXlink channel 135 (dimmer one) …channel 140 (dimmer six)
Example:	PUSH [TP, 107] TO [LTS, 135] (Ramp dimmer 1 down)
PROlink PUSH response:	♀01 DOWN
PROlink RELEASE response:	♀01 STOP

Ramping All Dimmers Up

The dimmers will continue ramping up as long as the channel is on or until the dimmers reach level 100. A 'TO' statement is preferred for this application.

Format:	AXlink channel 141
Example:	PUSH [TP, 113] TO [LTS, 141] (Ramp all dimmers up)
PROlink PUSH response:	♀ALL UP
PROlink RELEASE response:	♀ALL STOP

Ramping All Dimmers Down

The dimmers will continue ramping down as long as the channel is on or until the dimmers reach level zero. A 'TO' statement is preferred for this application.

Format:	AXlink channel 142
Example:	PUSH [TP, 114] TO [LTS, 142] (Ramp all dimmers down)
PROlink PUSH response:	♀ALL DOWN
PROlink RELEASE response:	♀ALL STOP

Turning All Channels On

The dimmers in pack #1 will go to 100 percent. A 'TO' statement is preferred for this application but the 'PULSE' statement can also be used.

Format:	AXlink channel 143
Example:	PUSH [TP, 115] TO [LTS, 143] (Turn all dimmers On)
PROlink PUSH response:	♀ALL LEVEL FF IN 001
PROlink RELEASE response:	NO RESPONSE

Turning All Channels Off

The dimmers in pack #1 will go to level zero. A 'TO' statement is preferred for this application but the 'PULSE' statement can also be used.

Format:	AXlink channel 144
Example:	PUSH [TP, 116] TO [LTS, 144] (Turn all dimmers Off)
PROlink PUSH response:	♀ALL LEVEL 00 IN 001
PROlink RELEASE response:	NO RESPONSE

Ramping Presets Up

The preset will continue ramping up as long as the channel is on or until the preset reaches level 100 with all dimmers on PROlink. A 'TO' statement is preferred for this application.

Format:	AXlink channel 145
Example:	PUSH [TP, 117] TO [LTS, 145] (Ramp preset up)
PROlink PUSH response:	♀PRESET 001 RAMPING UP
PROlink RELEASE response:	♀PRESET 001 RAMP STOPPED

Ramping Presets Down

The preset will continue ramping down as long as the channel is on or until the preset reaches level zero with all dimmers on PROlink. A 'TO' statement is preferred for this application.

Format:	AXlink channel 146
Example:	PUSH [TP, 118] TO [LTS, 146] (Ramp preset down)
PROlink PUSH response:	♀PRESET 001 RAMP STOPPED
PROlink RELEASE response:	♀PRESET 001 RAMPING DOWN

Setting Dimmer Levels

This command must be sent for each dimmer and can only access pack #1. If the value for <t> is not entered, the AMX Lighting controller will use the value specified by the Default Preset Time. The <t> parameter is optional.

Format:	SEND_COMMAND LTS, 'P<n>L<m>T<t>'
Variables:	• <n>: This is the dimmer number, 1-6 (Any combination of dimmers) • <m>: This is the dimmer level percentage, 0-100 • <t>: This is the ramp rate, 0-255 in seconds
Example:	SEND_COMMAND LTS, 'P1L88T3'
PROlink response:	NO RESPONSE

Setting a Dimmer Level as Undefined

AXlink cannot 'Undefine' a single channel.

Setting all Dimmer Levels to Undefined

A dimmer will stay in the undefined mode until it is reassigned to a level from 0 to 100. This command is often used before recording a preset to clear the scene to a 'neutral' level. A preset stored with all levels undefined will have no affect on the dimmers when recalled.

Format:	AXlink channel 155
PUSH example:	PUSH [TP, 119] TO [LTS, 155] (All levels undefined)
AXlink response	ON [LTS, 155]
PROlink response:	♀ALL LEVEL UN IN 000

AXlink Buffer Commands

All commands that go between the AMX Lighting system and Axcess go into the buffer.

AXlink Buffer Commands	

CREATE_BUFFER
CREATE _BUFFER buffers incoming characters from the specified device in the specified string array.
	Use this within the DEFINE_VARIABLE section of the Axcess program. An example of the Array would be: LTS_BUFFER [#], where the # is the length of characters in the buffer.
	Syntax:
	`CREATE_BUFFER device, array`
	Array must have been defined in DEFINE_VARIABLE as a string array.
	Example:
	`DEFINE _VARIABLE`
	`LTS_BUFFER[100]`
	`DEFINE_START`
	`CREATE_BUFFER LTS, LTS_BUFFER`

AXlink Level Commands

Level programming applies to Axcess programs. These are not commands sent to the AMX Lighting controller. AXlink levels are returned as 8-bit levels in 255 steps. Use a conversion to percent when displaying levels to variable text buttons because it is more familiar to people. Terminal Emulator will display AMX Lighting buffer responses if you send the buffer to device 0. An example would be:

```
IF (LENGTH_STRING (LTS_BUFFER))
{
      SEND_STRING 0, "LTS_BUFFER"
      CLEAR_BUFFER LTS_BUFFER
}
```

AXlink Level Commands	

CREATE_LEVEL
CREATE_LEVEL buffers incoming level changes in the specified variable for the specified device.
	Create AMX Lighting levels Dim1..Dim6 for use with AXlink touch panels and other 8-bit level displays.
	Syntax:
	`CREATE_LEVEL <device>, <level number>, <variable>`
	Example:
	`DEFINE _VARIABLE`
	`DIM1`
	`DEFINE_START`
	`CREATE_LEVEL LTS, 1, DIM1`

SEND_LEVEL
SEND_LEVEL sends a AMX Lighting dimmer level to a touch panel bar graph or a Softwire panel. Follow procedures for CREATE_LEVEL first.
	AMX Lighting levels can be sent to touch panels or other AXlink devices like the AXB-DMX512 or the volume box AXB-VOL3.
	Syntax:
	`SEND_LEVEL <device>, <level_number>, <variable>`
	Example:
	`SEND_LEVEL PANEL, 1, DIM1`

AXlink Level Commands (Cont.)	

DEFINE_CONNECT LEVEL
This command links AMX Lighting dimmers to touch panel bargraphs and other displays.
	You don't need to CREATE_LEVEL unless you plan to watch or use DIM1.
	Syntax:
	`DEFINE_CONNECT_LEVEL`
	`<device1>, <level_1>, <device2>, <level_2>, <device3>, <level_3>`
	Example 1:
	`DEFINE_CONNECT_LEVEL`
	`(LTS, 1, TP, 1)`
	`(LTS, 2, TP, 2)`
	`CREATE_LEVEL LTS, 1, DIM1`
	• AXlink response: Touch panel levels 1 and 2 display output of AMX Lighting dimmers 1 and 2.
	• PROlink response: Not active, no response
	Example 2:
	`DEFINE_CONNECT_LEVEL`
	`(LTS, 1, TP, 1, MSP8,1)`
	• AXlink response: Touch panel level 1 and wall panel MSP8 bargraph display output of AMX Lighting dimmer 1.
	• PROlink response: Not active, no response

Appendix A: PROlink vs. AXlink Commands

The following table lists a comparison of the PROlink and AXlink commands present in areas such as: setup, recording, status, and operations.

Comparison of PROlink and AXlink Commands	
PROlink Programming Commands	**AXlink Programming Commands**
Setup	**Setup**
Default Level Time	Default Level Time
Default Ramp Time	Default Ramp Time
Default Preset Time	Default Preset Time
Enable AXlink Levels (Default)	Enable AXlink Levels (Default)
Disable AXlink Levels	Disable AXlink Levels
Curve Settings Per Dimmer	
Low End Setting Per Dimmer	
Recording	**Recording**
Presets	Presets
Dry Closure Presets	
Status	Status
Individual Dimmers, All 60	Current Preset
Pack Curves	AXlink levels, 1 - 6
Pack Levels	Dry closure PUSH
Pack Low End Trim	Dry closure RELEASE
PROlink Curves	
PROlink Levels	
Operations	**Operations**
Preset Recall	Preset Recall
Ramp Dimmer Up, All 60	Ramp pack channels up, 6
Ramp Dimmer Down, All 60	Ramp pack channels down, 6
Stop Ramping, All 60	Ramp all 60 channels up
Ramp Preset Up	Ramp all 60 channels down
Ramp Preset Down	Ramp Preset Down
Stop Preset Ramping	Set Channel Level
Set Channel Level	Set All Levels to 100
Set Channel Level As 'Undefined'	Set All Levels to 0
Set Group Level	Set All Levels to 'undefined'
Dry Closure Push	
Dry Closure Release	

Appendix B: AMX Lighting Curves

There are thousands of different lighting fixtures with unique shapes and styles all designed to do something visibly different with light. Any one of those fixtures in a hundred different locations could produce a different lighting effect. Two identical lights in different locations could produce different reflections and shadows.

There might be a situation where low-voltage track lights are mixed with compact fluorescent down lights to illuminate a hallway with pictures. Under normal dimming conditions the two different light sources would dim differently and possibly require individually set dimmers to accomplish uniform lighting at different levels. An Up or Down button on a wall control panel would dim both sources at a common rate, but the lamps and fixtures would dim at different rates due to the lamp and ballast characteristics. The track light may stay bright for a long time and then rapidly dim to nothing while the fluorescent lamp dims smoothly to a point and then abruptly shuts off. The combined effect produces an uncoordinated scene change.

An unwanted feature of dimmable fluorescent ballasts and low-voltage electronic transformers is their ability to cause the lamps to flicker when dimmed to low levels. The normal way to avoid this is to use presets that are not dimmed below the fixture's threshold or to use any low end trim feature provided by the ballast or transformer manufacturer. Problems arise when the performance of the dimmer does not match the performance of the dimmable ballast. The AMX Lighting system now gives the user the ability to change the performance of the dimmer to avoid problems.

Many types of track lights and dimmable ballast only have a limited dimming range for the dimmer to work with. In a dimming range of 0 to 120 volts AC, there are many lamps that do not start to display dimming until less than 100 volts is applied. Lamps often do most of their dimming between 40 and 100 volts. Dimmers designed to increment voltages from 0 to 120 volts can be wasted on lamps that do not even respond to 50% of the dimmer's output. Some lamps are more sensitive to voltage changes at the low end and can accommodate many degrees of dimming, but standard dimmers tend to rush past the lamp's sensitive range and occasionally linger in an unusable range.

Slowly turning a lamp on can be a very different effect than slowly dimming that same lamp off. Some light sources require a minimum level to turn on. Once these lamps are on they can be dimmed down to lower light levels. At the same time, most common dimmers are built to dim at a uniform rate with no respect for the individual characteristics of each lamp or the number of lamps.

There is a great influx of new lamps and ballasts on the market. The properties and dimming characteristics of each one present a new challenge to the dimmer manufacturer to provide an appropriate dimmer. What was designed as a standard incandescent dimmer must now be able to control electronic ballasts, incandescent lamps, transformered low-voltage track lighting, and a host of electronic transformers.

One way to solve many of these problems is to tailor the style of dimming for each individual dimmer in a system. The way to do this is to apply different dimming curves to each dimmer and to provide a variable low-end cut-off point.

A dimming curve is a graphical or electronic representation of the amount of control to a dimmer in relation to the dimmer output. It is like a directional map that the dimmer follows. The amount of control is typically measured in percent; from an

off-state at level 0 to an on-state at level 100. Dimmer output is measured in volts. A graphical representation of a dimming curve is usually the percentage of dimming in relation to the output voltage (RMS) of the dimmer connected to a standard load.

AMX Lighting curve changes are implemented by a Send_String command to the AMX Lighting device. The command structure is: "<dimmer>/<curve><enter>" ; SEND_STRING LTS, "'1/6',13". This example would set dimmer channel #1 to curve 6. The available curves that can be sent to the AMX Lighting controller are: 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, N, O, and F.

The AMX Lighting dimming system employs a low-end cutoff that allows the dimmer to turn on to a specified level or to dim down to a specific level. The level at which the dimmer turns on is called the Low End Setting. This is also used to turn a light off at the low end point when dimming down from a bright level. A low end setting of 25 applied to the standard dimming curve would prevent the fixture from being dimmed below Level 25. From an off condition the same fixture would dim up to Level 25 and hold that level until the dimming curve directed the level higher.

The Low End Setting uses a Send_String command to the AMX Lighting controller. The command structure is: <dimmer>LE<level><enter>; SEND_STRING LTS, "'1LE20',13". This example would set the Low End Setting for dimmer channel #1 to 20%. This would prevent dimmer #1 from dimming below dimmer level 20.

If a fixture flickers just before it goes out then the Low-End Setting can be used to avoid the unusable dimming range. Set the Low-End Setting to just above the level where flickering problem starts. This will prevent the dimmer from allowing the flicker to be seen.

Dimmer manufacturers follow or adopt a level to output ratio called the Square Law curve. It is an exponential relationship between percentage of light perceived and the percentage of light measured. The Square Law Curve is a presumed relationship between perceived illuminance and measured illuminance. The AMX Lighting controller's Curve 1 is a basic Square Law Curve. From this basic curve, AMX has developed a set of curves other than standard to accommodate the many different properties of the various loads connected to a AMX dimmer. Multiple curves provide a user with multiple ways to control lighting. This will provide lighting designers with a more powerful lighting tool.

To demonstrate how a AMX dimmer actually performed under real conditions, we have adopted a set of uniform tests to display the output characteristics of a dimmer.

The AMX test fixture for incandescent tests was set up using a constant Voltage feed of 120 VAC to the dimmer. The output of the dimmer was connected to (6) 100W GE lamps with a total load of 5 Amps. All fluorescent tests were done using the RAD-VDR module connected to a (2) lamp Advance Mark VII ballast using T-8 rapid start lamps. These curve plots are to be used as a relative guide to determining optimum performance. Actual field performance and measurements will be similar but not equal. FIG. 13shows a basic dimming curve.

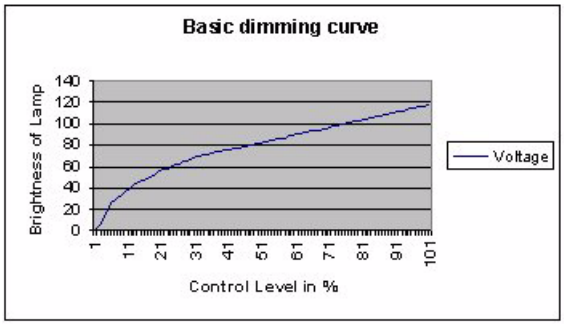

FIG. 13 Basic dimming curve

Each curve allows a dimmer to change its output characteristics in relation to the amount of dimming. For example, the standard dimming curve at 50% could make a light brighter than another curve also at 50%.

Each AMX Lighting control channel has three dimmer characteristics; AC dimming, DC dimming, and switching. These are the three primary control methods for most lighting systems worldwide. The first characteristic is the output level in volts RMS. This is represented by the following Curve charts showing the Y-axis in (Dimmer) Output Level in Volts RMS (0-120VAC). The second characteristic is displayed on the second curve chart with the (Dimmer) Output Level in Volts DC (0-12VDC). The third characteristic is the turn on level for the switched (relay) aspect and is noted in text as the Relay Turn On Level.

These three characteristics are applied to different AMX Lighting dimmers to change the way the dimmers perform. The first characteristic is most often used for incandescent dimming. All that is needed is a variable high-voltage output to one Hot wire connected to the incandescent lamp. The curve determines the amount of high-voltage applied to the dimmer's output in relation to the control level. The second dimmer characteristic applied to low-voltage output of the AMX RAD-VDR module is commonly used for fluorescent ballasts that require a low-voltage control signal to vary the output of the ballast. The third dimmer characteristic merely turns a relay on or off at a specified level. Except for special cases, this third characteristic is usually set at a level of 1. The combinations of these characteristics allow AMX to tailor the outputs of different AMX Lighting dimmers.

The RAD-INC and RAD-INC6 modules only require the first characteristic that controls the high voltage output of a dimmer. All the internal dimmers in the AMX Lighting MC packs also use the first characteristic to determine dimmer output. All curve diagrams that use this characteristic are labeled in Volts RMS.

The RAD-SWM module uses the third dimmer characteristic of switching a relay on or off. The relay turn on level indicates the level at which the RAD-SWM turns on. This is usually set to 1, except for Curve N, which is set at Level 9.

The RAD-FDB module uses a combination of the first and third characteristics to send a variable high-voltage output along with a single switched output. The RAD-FDB module is a combination of two devices in a single package. One device is an incandescent dimmer like the RAD-INC, and one device is a relay like the RAD-SWM. These devices combine to switch power on and off to a ballast, and at the same time deliver a high-voltage reference signal to the dimming ballast. The RAD-FDB module also works with several lighting interfaces made by others.

The RAD-VDR module uses a combination of the second and third dimmer characteristic to send a variable low-voltage control signal along with a single switched output. This module is commonly used for control of dimmable fluorescent ballasts.

Curves can be used for energy saving applications where the high end needs to be trimmed to reduce voltage to the lamps and thereby increase lamp life. They can also be used to reduce the dimming range of some fluorescent ballasts, which can prevent premature failure of the ballasts and lamps.

The AMX Lighting system now offers over 12 ways to alter the performance of the lighting fixture by digitally changing the way the dimmer responds. Using the RAD-VDR module, for instance, to control an 0-10 volt ballast applied to a single compact fluorescent light fixture might 'look' better when dimmed using one curve instead of another. After the furniture is installed the designer may decide that a different curve applied to certain fixtures has a better 'feel.' It is now possible to apply many new curves to all the AMX Lighting dimmers using simple commands. Designers and specifiers have much more control over the look and feel of their designs using the AMX Lighting system. Installers will have greater ability to temper the output of a dimmer to avoid problems. FIG. 14 shows a standard dimming curve.

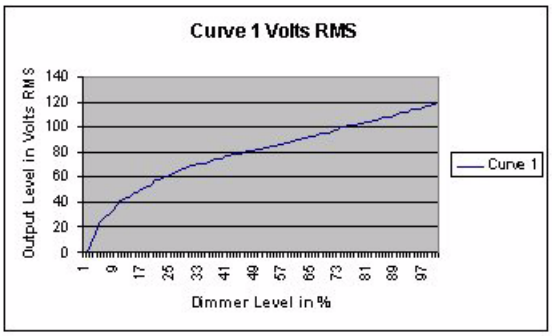

FIG. 14 Standard dimming curve

As the dimming level increases the output voltage increases. The dimmer goes smoothly from 0 to 120 volts output. This is the most common curve used in dimming applications.

- Relay turn on level = 1%
- Dimming Range = 0 - 120 VAC.

FIG. 15 shows the curve 1 voltage output in volts DC.

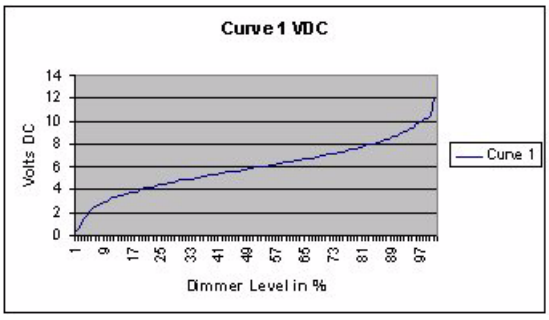

FIG. 15 Curve 1 Voltage output in Volts DC

FIG. 16 shows the dimmer turning on to level 20 from an off condition. It maintains the level until the dimmer reaches a level above 20%, at which point the dimmer output starts to climb again. Conversely, it will dim down to 20% and maintain that level until it turns off.

- Relay turn on level = 1%
- Dimming Range = 56 - 120 VAC.

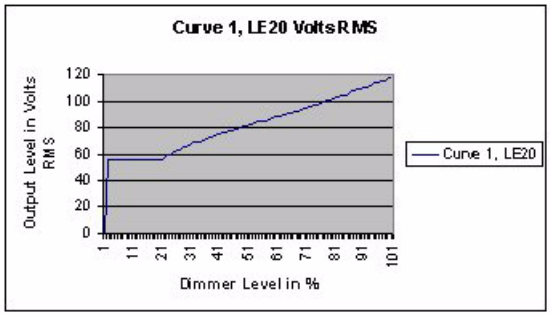

FIG. 16 Curve 1 with Low End Setting @ 20% Volts RMS

FIG. 17 shows the low-voltage output of the RAD-VDR module. The voltage range is 4 to 12 VDC when attached to test ballast.

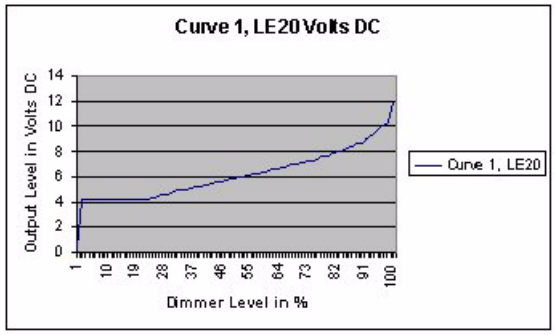

FIG. 17 Curve 1 voltage output with Low End Setting @ 20 % Volts DC

FIG. 18 shows three different Low End Settings of 5%, 10%, and 20%. Each curve holds its assigned value until the dimmer level reaches 0. Ramping up from level 0 will turn on the lamps at three different levels respectively. Low End settings can be used to correct for problems in dimming various lighting products at low levels. Dimming ranges can be controlled using the low end setting. Curve 1 dimming range is normally 0 -120 VAC, but with a Low End Setting of 5 the range is reduced to 26 - 120, or a 20% reduction in total dimming range. A Low End Setting of 10% reduces the range from 40 to 120 VAC or 35% reductions while a Low End Setting of 20 on Curve 1 is about a 50% reduction in dimming range. Small adjustments in a curve can cause significant changes in a dimmer's response.

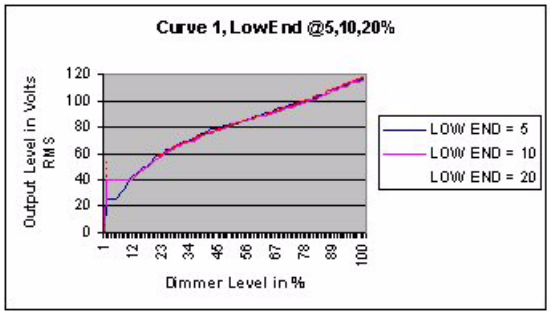

FIG. 18 Curve 1 with Low End Setting @ 5%, 10%, and 20% Volts RMS

Similar to Curve 1, Curve 2 rolls off at 90% of the top end or about 105 volts maximum. FIG. 19 shows a curve that reduces the maximum output to 90% of maximum to conserve energy. It is also called the 'energy saving curve'.

- Relay turn on level = 1%
- Dimming Range = 0 - 114 VAC.

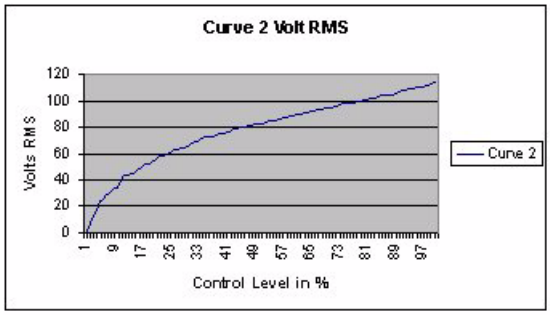

FIG. 19 Curve 2 voltage output in volts RMS

FIG. 20 shows the low-voltage output of the RAD-VDR module. The voltage range is from 0 to 9 VDC when attached to test ballast. This curve can be used with 0-10 VDC dimming ballasts.

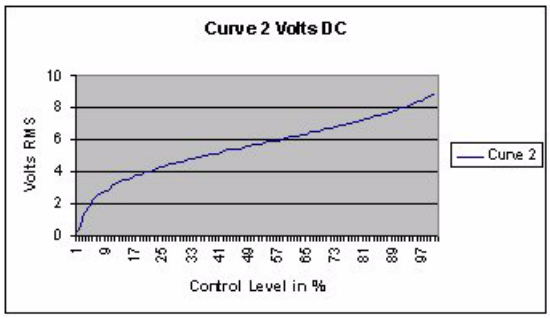

FIG. 20 Curve 2 voltage output in volts DC

FIG. 21 shows the output voltage of a RAD-MC120 dimmer. It has a smooth taper and a cut off point of 25 volts. This curve will shrink incandescent dimming range 25%.

- Relay turn on level = 1%
- Dimming Range = 30 - 115 VAC.

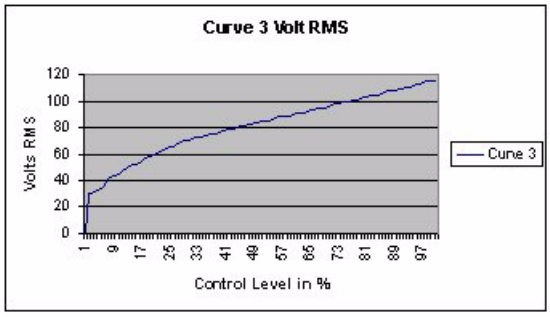

FIG. 21 Curve 3 voltage output in volts RMS

FIG. 22 shows the output voltage of the RAD-VDR module. The voltage range is from 2.6 to 9.3 VDC when attached to test ballast. This curve is primarily used with Advance Mark VII ballast using the RAD-VDR module.

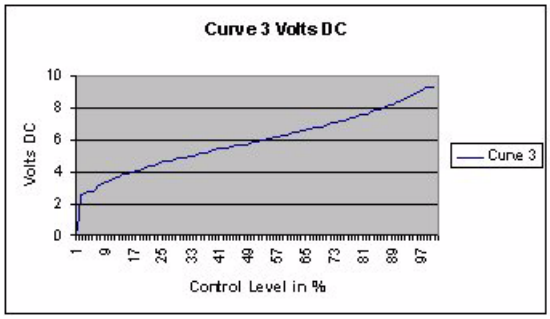

FIG. 22 Curve 3 output in volts DC

FIG. 23 shows the output voltage of a RAD-MC120 dimmer. There is a noticeable gap at the low end. Curve 4 is a smooth fade until 15%, then it rolls off sharply.

- Relay turn on level = 1%
- Dimming Range = 0 - 120 VAC.

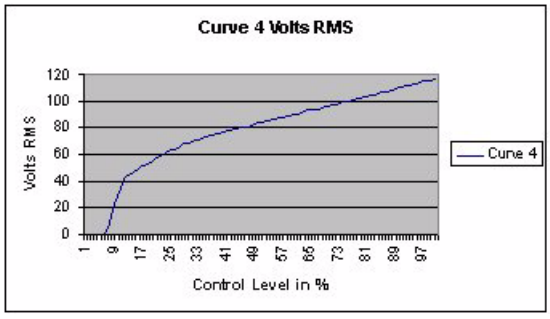

FIG. 23 Curve 4 Voltage output in Volts RMS

FIG. 24 shows the output voltage of the RAD-VDR module. Curve 4 is primarily used for control of Prescolite Intelect Ballast, using the RAD-VDR module. Its range is from 1 to 12 VDC.

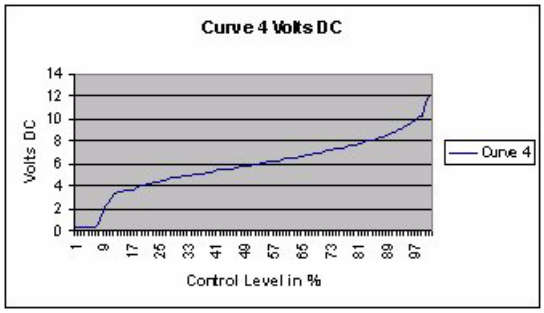

FIG. 24 Curve 4 Voltage output in volts DC

FIG. 25 shows the output voltage of a RAD-MC120 dimmer. It quickly dims the high end and extends the mid-range dimming control with a cut-off at 18 volts. This curve can be useful with two wire dimmable fluorescent ballasts.

- Relay turn on level = 1%
- Dimming Range = 16 - 120 VAC.

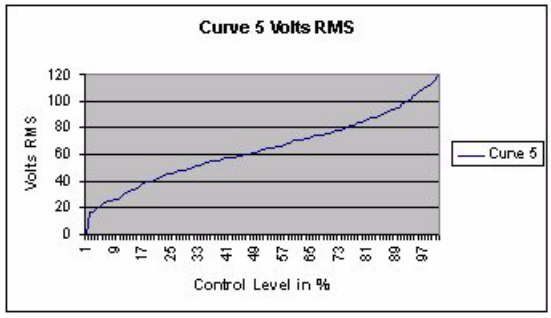

FIG. 25 Curve 5 Voltage output in Volts RMS

FIG. 26 shows the output voltage of Curve 5 applied to the RAD-VDR module. It turns on to about 2 volts and rises to 12 VDC. There is a large increase in output above 98%.

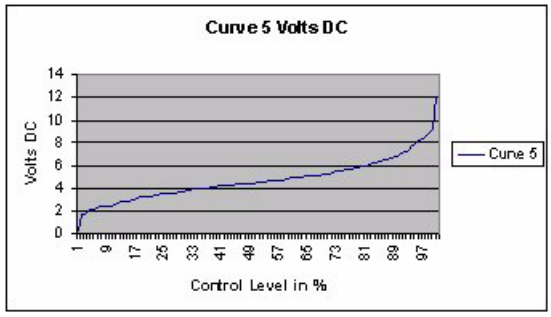

FIG. 26 Curve 5 Voltage output in volts DC

FIG. 27 shows the voltage output of Curve 6 applied to a RAD-MC120 dimmer. Curve 6 will smoothly dim the high end and extend the low-end range of dimming. This curve can be useful for dimming applications using transformers and requiring a more precise low end dimming range.

- Relay turn on level = 1%
- Dimming Range = 21 - 120 VAC.

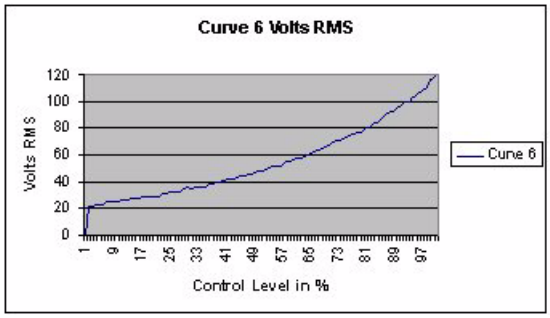

FIG. 27 Curve 6 Voltage output in Volts RMS

FIG. 28 is a plot shows the output voltage of Curve 6 applied to the RAD-VDR module. The turn on voltage is 2 VDC and rises to 12 VDC. There is a rapid increase in output above 95%.

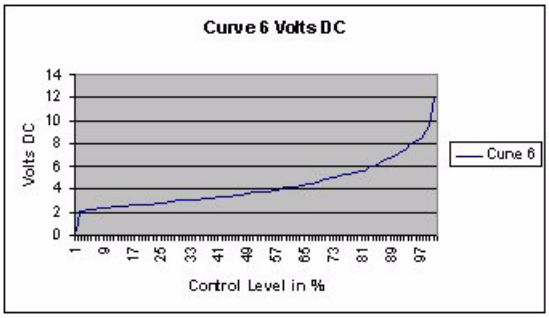

FIG. 28 Curve 6 Voltage output in volts DC

FIG. 29 shows the output voltage of a RAD-MC120 dimmer. This curve follows the Standard dimming curve (Curve 1) for the first half of its control. After Level 50 the curve rolls off to 40 volts before cut off. This provides a 30% reduction in dimming.

- Relay turn on level = 1%
- Dimming Range = 39 - 1 20 VAC.

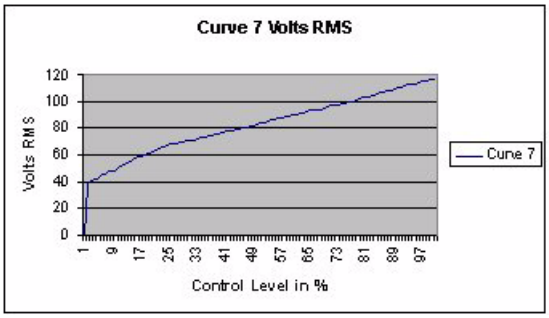

FIG. 29 Curve 7 Voltage output in Volts RMS

FIG. 30 shows the DC output voltage of Curve 7 applied to the RAD-VDR module. It starts at 3 VDC and rises to 12 VDC.

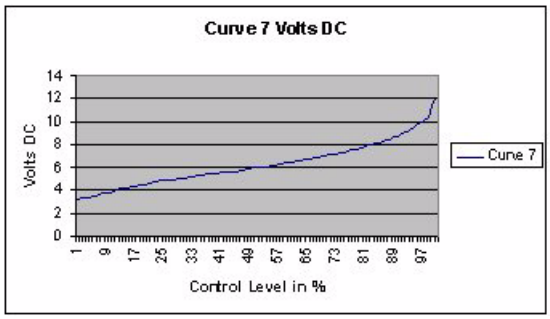

FIG. 30 Curve 7 Voltage output in volts DC

FIG. 31 shows the output voltage of a RAD-MC120 dimmer. This curve follows the Standard dimming curve (Curve 1) for the first 50% and then levels off to a 50 volts cut-off. This can be used on Advance Mark X ballasts.

- Relay turn on level = 1%
- Dimming Range = 52 - 120 VAC.

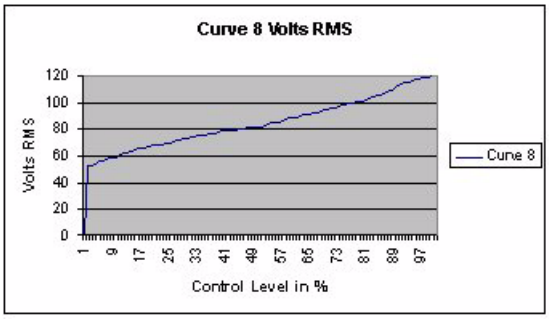

FIG. 31 Curve 8 Voltage output in Volts RMS

FIG. 32 shows the output voltage of the RAD-VDR module. The low end starts at 4 volts and slowly rises to 12 VDC. This curve provides precise mid-range dimming.

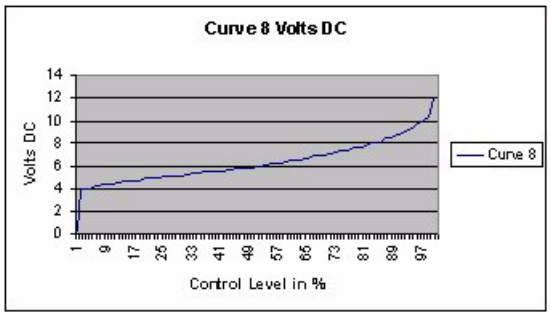

FIG. 32 Curve 8 Voltage output in volts DC

FIG. 33 shows the output voltage of a RAD-MC120 dimmer. Curve 9 starts at 70 volts and rises to 120 volts for a dimming range of 40%. This curve can be used to dim some fan motors. Use this curve when very little voltage range can be tolerated.

- Relay turn on level = 1%
- Dimming Range = 72 - 120 VAC.

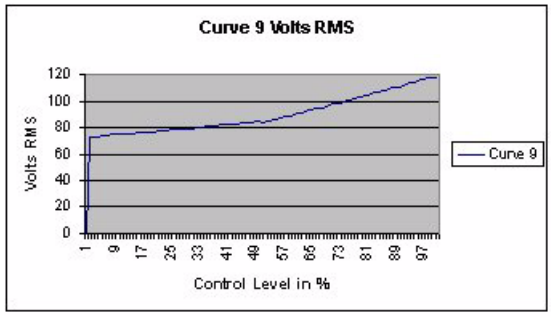

FIG. 33 Curve 9 Voltage output in Volts RMS

FIG. 34 shows the output voltage of the RAD-VDR module. Curve 9 starts at 5 volts and rises to 12 VDC. This provides a dimming range of 7 VDC.

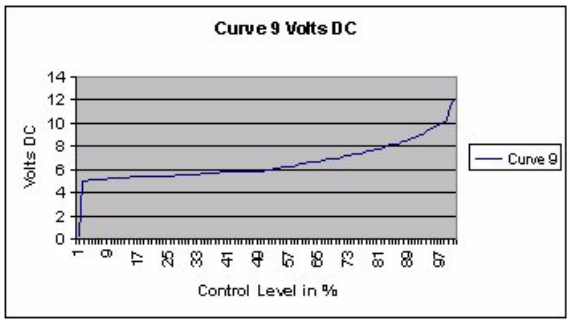

FIG. 34 Curve 9 Voltage output in volts DC

FIG. 35 shows the output voltage of a RAD-MC120 dimmer. Curve A is an alternate version of the Standard dimming curve (Curve 1). It rolls off the high end quickly and extends the dimming range in the middle with a sharper roll off starting at 20% dimming level.

- Relay turn on level = 1%
- Dimming Range = 0 - 120 VAC.

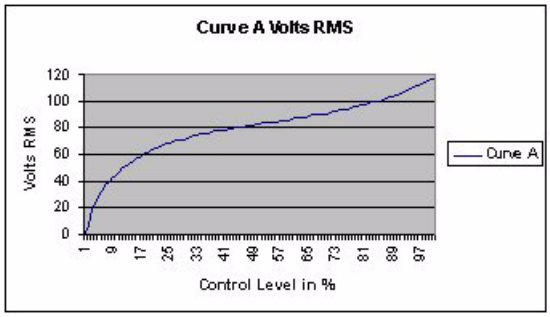

FIG. 35 Curve A Voltage output in Volts RMS

FIG. 36 shows the output voltage of the RAD-VDR module. Curve A starts at 2 volts and slowly rises. It increases 3 volts in the last 10% of its travel. This curve can be used with 0-12 VDC dimming ballasts like Prescolite Intelect ballasts.

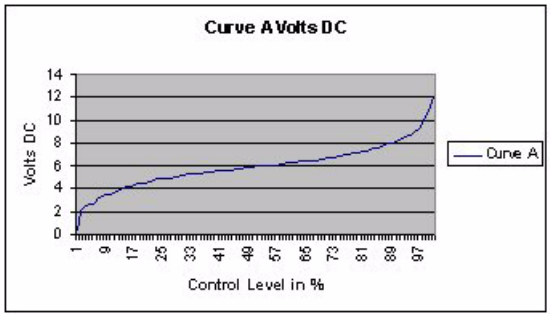

FIG. 36 Curve A Voltage output in volts DC

FIG. 37 shows the output voltage of a RAD-MC120 dimmer. It rolls off the high end slower and becomes somewhat linear until a roll-off at 18 VAC.

- Relay turn on level = 1%
- Dimming Range = 18 - 115 VAC.

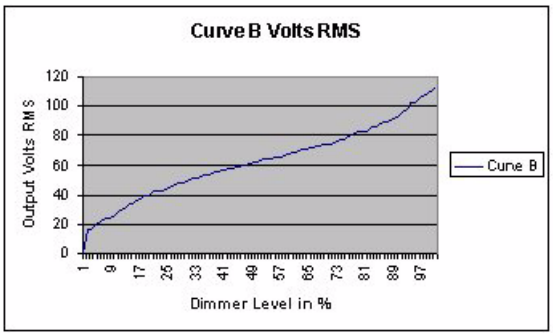

FIG. 37 Curve B Voltage output in Volts RMS

FIG. 38 shows the output voltage of Curve B applied to the RAD-VDR module. The turn on voltage is 2VDC and rises to 10VDC. This curve can be used with 0-10 VDC dimming ballasts.

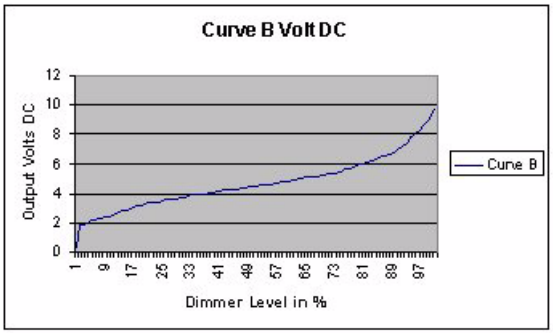

FIG. 38 Curve B Voltage output in Volts DC

FIG. 39 shows the output voltage of a RAD-MC120 dimmer. This curve starts at the low end at about 20 volts and gently rises to only 113 volts. This curve reduces dimming range by about 20%.

- Relay turn on level = 1%
- Dimming Range = 20 - 115 VAC.

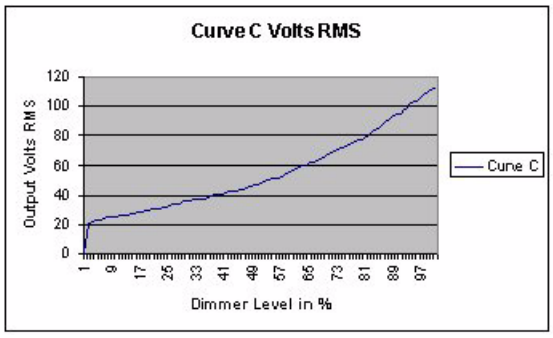

FIG. 39 Curve C Voltage output in Volts RMS

FIG. 40 shows the DC output voltage of Curve C applied to the RAD-VDR module. It starts at 2VDC and rises to 10VDC. This curve can be used with 0-10 VDC dimming ballasts.

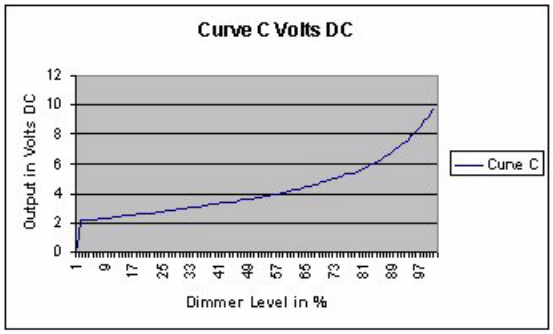

FIG. 40 Curve C Voltage output in Volts DC

FIG. 41 shows the output voltage of a RAD-MC120 dimmer. Curve D is an alternate version of Curve A. It rolls off the high end slower and extends the dimming range in the middle with a sharp roll off starting at 25% dimming level.

- Relay turn on level = 1%
- Dimming Range = 0 - 115 VAC

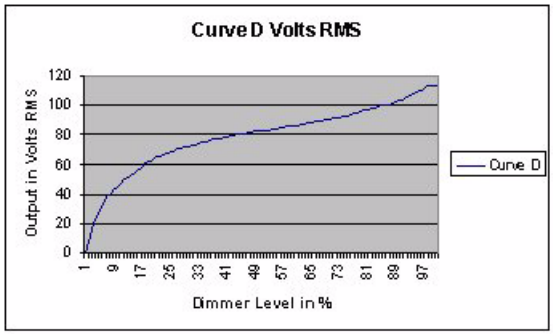

FIG. 41 Curve D Voltage output in Volts RMS

FIG. 42 shows the output voltage of the RAD-VDR module. Curve D is a variation of Curve A but at a 10% reduction. This curve can be used with 0-10 VDC dimming ballasts using the proper low-end cutoff.

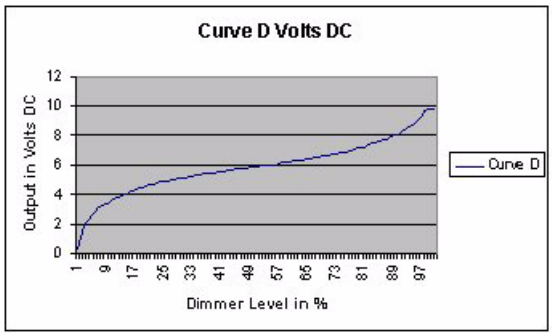

FIG. 42 Curve D Voltage output in volts DC

FIG. 43 shows the output voltage of the RAD-VDR module. This is an incandescent dimmer always on, starting at Level 9. Relay turn on level = 09. The RAD-VDR module will output 12 VDC above Level 09.

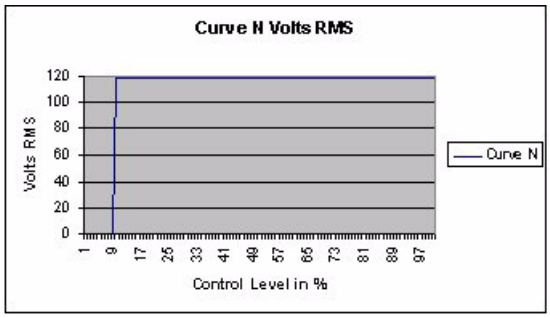

FIG. 43 Curve N Voltage output in Volts RMS

FIG. 44 is an incandescent dimmer, always off. No Level command will turn this dimmer on. Relay turn on level = none. The RAD-VDR module will output no voltage.

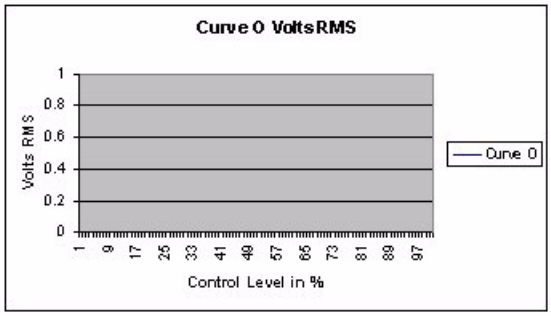

FIG. 44 Curve O Voltage output in Volts RMS

FIG. 45 is an incandescent dimmer, always on. No command will turn this dimmer off. Relay turn on level = always on. The RAD-VDR module will output a constant 12 VDC.

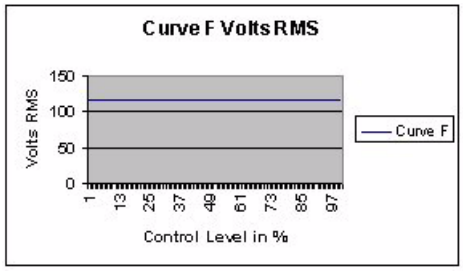

FIG. 45 Curve F Voltage output in Volts RMS

FIG. 46 is the voltage plot of the original Radia MC Series in FDB mode. This is provided for informational purposes only as the current RDD-DM4 does not support FDB mode due to large variety of FDB ballasts. AMX recommends using the RDM-FDB, RDM-FDB2, RDC-HFDB, or RDC-MDM module for 3-wire dimming control of FDB ballasts.

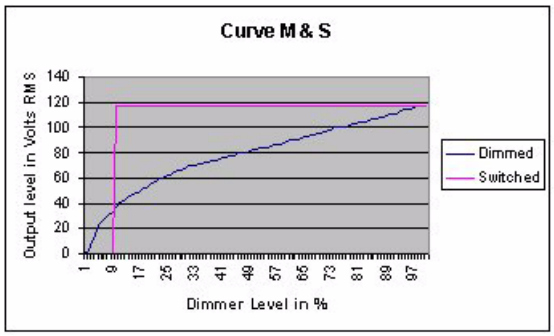

FIG. 46 Curve M & S Voltage output in Volts RMS

Appendix C: Troubleshooting

Software Issues

The following items address software related technical support issues.

The following steps describe the steps necessary to use it in Terminal Emulator mode.

Using PASS mode

Use with a computer running Axcess software connected to an AXlink master controller, and the AMX Lighting controller connected as an AXlink device.

Establishing communication with the Axcess controller can be verified when the display window in the lower left corner of Axcess shows the PUSH channels and channel numbers.

1. Go to the Terminal Emulator screen (Ctrl+T or F4) after communication is verified.
2. Type "VER" to get status of AXlink devices online to the controller. This is where you determine the AXlink device number of the AMX Lighting controller.
3. Enter Pass mode by typing PASS followed by the device number. If the device number of the AMX Lighting controller were 96, you would type "PASS 96".
4. Press Enter.
5. The AMX Lighting controller returns the string ERXON in acknowledgment. If you do not get the pack, you have not communicated or something else is wrong.
6. Once this point has been reached, the Pass mode will last for 15 seconds. After that time it is required that you re-enter pass mode.

Testing AMX Lighting features

The following table lists the different procedures for testing AMX Lighting.

Testing procedures for AMX Lighting features

To test this	Type this, then press Enter	Result
Communications	`1`	Status of AMX Lighting channel 1
Curves	`AC`	Status of All Curves
	`AZ`	Status of All Levels
	`AL100`	All levels = 100%
	`AL0`	All levels = 0
Channels	`1L50T9`	AMX Lighting channel 1 = 50%
	`2L50T9`	AMX Lighting channel 2 = 50%
	`3L50T9`	AMX Lighting channel 3 = 50%
	`4L50T9`	AMX Lighting channel 4 = 50%
	`5L50T9`	AMX Lighting channel 5 = 50%
	`6L50T9`	AMX Lighting channel 6 = 50%
Low End Setting	`<Pack number>LE?`	Pack Status of Low End Trim
Ramping Up	`AL100T20`	Ramp all up in 20 sec.
Ramping Down	`AL0T20`	Ramp all down in 20 sec.

Hardware Issues

The following items address hardware related technical support issues.

You should make sure that AXlink is a unique number. Duplicate AXlink device numbers will cause problems. The same holds true for PROlink pack numbers, they should not be duplicated.

Troubleshooting hardware

The following table shows the different areas that should be checked if a hardware problem arises.

Hardware Checklist	
To check this	Type this, then press Enter.
Memory Protect Jumper	Verify position, ON or OFF.
Verify Status of PROlink DIP switch	Default is #1 ON, 2-8 OFF.
Verify Status of Low Voltage Cables	• Wiggle check • Correct position? • Good strong connection? • Verify with wiring diagram or manual.
Verify Status of Loads	• Have loads been checked for shorts? • Have loads been verified to work (Bypass module)? • Check for transformers. • Electronic or magnetic? • Transformer rating (overload)?
Verify Status of Wires	• Correct voltage? • Correct phase? • One Neutral per controlled Zone? • Check for common neutrals. • Wires connected to correct terminal? • Are all multi-phase line terminals connected?

AMX reserves the right to alter specifications without notice at any time.

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