Phason
electronic control systems

PLC user manual

Limited warranty

This warranty applies only to the Phason Programmable Lighting Control (PLC). If you need warranty service, return the product and original proof of purchase to your dealer.

Phason Inc. (Phason) warrants the PLC subject to the following terms and conditions.

This warranty is valid only to the original purchaser of the PLC, for two years from the manufacturing date. The manufacturing date is stated in the first eight digits of the serial number in the form year-month-day.

Phason hereby warrants that should the PLC fail because of improper workmanship, Phason will repair the unit, effecting all necessary parts replacements without charge for either parts or labor.

Conditions

- Installation must be done according to our enclosed installation instructions.
- The PLC must not have been previously altered, modified, or repaired by anyone other than Phason.
- The PLC must not have been involved in an accident, misused, abused, or operated or installed contrary to the instructions in our user and/or installation manuals. Phason's opinion about these items is final.
- The person requesting warranty service must be the original purchaser of the PLC, and provide proof of purchase upon request.
- All transportation charges for products submitted for warranty must be paid by the purchaser.

Except to the extent prohibited by applicable law, no other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose, shall apply to the PLC. Any implied warranties are excluded.

Phason is not liable for consequential damages caused by the PLC.

Phason does not assume or authorize any representatives, or other people, to assume any obligations or liabilities, other than those specifically stated in this warranty.

Phason reserves the right to improve or alter the PLC without notice.

Service and technical support

Phason will be happy to answer all technical questions that will help you use your PLC. Before contacting Phason, check the following:

- Read this manual for information about the feature with which you are having trouble.
- If you are having a problem using your PLC, see if the problem is described in **Appendix B: Troubleshooting** on page 46 and then follow the directions for correcting the problem.
- If you still have a problem with your PLC, collect the following information:
  - The serial number
  - A description of the problem
  - A description of what you were doing before the problem occurred

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Table of contents

Chapter 1: Introducing the PLC 1

Introducing the PLC 1
PLC features 1
Electrical ratings 2
Optional PLC accessories and slave units 3
Becoming familiar with the PLC 4
Understanding light intensity and light levels 4
Reading the display 5
Using the buttons 6
Using the menu system 7

Chapter 2: Installing the PLC 8

What you need to know before installing your PLC 8
Understanding power surges and surge suppression 9
Electrical ratings 9
Precautions, guidelines, and warnings 10
PLC-1 layout 12
PLC-2 layout 13
Mounting the PLC 14
Connecting equipment to your PLC 14
Connecting incandescent lights to the variable AC outputs 14
Connecting dimmable fluorescent ballasts to the variable DC outputs 16
Connecting loads to the relay outputs 16
Connecting the alarm relay to the alarm circuit 17
Connecting the power source 18
Finishing the installation 18
Verifying your connections 18
Closing the cover 19

Chapter 3: Configuring and programming the PLC 20

What you need to know before configuring your PLC 20
Understanding the initial setup process 20
Configuring the main control functions 21
Selecting the input frequency 22
Assigning outputs to program groups 22
Setting relay trip levels 23
Selecting the last day settings 24
Setting the current time 25
Creating lighting programs 26
Adding segments 27
Setting up triggers 28

Chapter 4: Using the PLC 31
Working with the lighting programs 31
Starting and stopping the lighting programs 31
Adjusting the current day 32
Using manual override mode 33
Servicing and maintaining your PLC 34
Cleaning the control 34
Preventing moisture 34
Saving and restoring settings 35
Displaying the firmware version 36
Restoring factory defaults 37

Appendices 38
Appendix A: Worksheets 38
Program group worksheet 39
Segment worksheets 40
Trigger worksheets 41
Appendix B: Troubleshooting 46
Appendix C: Hints, tips, and frequently asked questions 47
Hints and tips 47
Common questions 47
Appendix D: Glossary 48
Index 49

Chapter 1: Introducing the PLC

Chapter 1 introduces you to your PLC and the layout of this manual. Read this chapter before reading the rest of the manual. Topics in chapter 1 include:

- **Introducing the PLC** below
- **Becoming familiar with the PLC** on page 4

Introducing the PLC

Light intensity (brightness) and duration are important factors in poultry production. Light intensity affects bird aggression, feed consumption, and water consumption. Light duration affects reproductive cycles, egg production cycles, total feed consumption, and growth rates. Studies have shown that a well-designed lighting program can improve the productivity of your poultry operation.

The PLC allows you to control light duration and intensity and automatically adjust them during the birds' life cycle. Designed primarily for poultry barns, the PLC (Programmable Lighting Control) is loaded with powerful and useful features. With multiple outputs and programs, the PLC allows you to easily design a control program that works for your operation.

PLC controls have variable AC outputs for dimming incandescent lights, general-purpose relays for turning lights on and off or operating devices such as feed augers, and variable 0 to 10 VDC outputs for operating DC-controlled fluorescent lights.

The LCD display shows status and setting information and the four-button keypad allows you to easily scroll through the information and program the control. The PLC's real-time clock and power-failure memory retention means you will never loose your settings and program status because of a power failure.

PLC features

- Programmable lighting operation
  - Multiple lighting programs (multiple output staging)
  - Up to 365 days per program
  - Up to 20 segments (groups of days) per program
  - Up to 32 triggers (light/relay state changes) per day

- Variable AC outputs: two on the PLC-1; one on the PLC-2
- Two variable DC-signal outputs
- General-purpose relay outputs: two on the PLC-1; one on the PLC-2
- Alarm relay
- Expandable capacity using optional slave units
- Sixteen character, two-line backlit LCD display
- Four-button keypad
- Real-time clock
- Power-fail memory protection
- Rugged enclosure (corrosion resistant, water resistant, and fire retardant)
- CSA approval
- Two-year limited warranty

Electrical ratings

PLC-1

Input:	120/230 VAC, 50/60 Hz
Input fuse:	250 V, 1 A fast-acting glass
Variable AC outputs (2):	1200 W at 120 VAC, 2300 W at 230 VAC 10 A at 120/230 VAC, general-purpose (resistive)
Variable AC fuses (2):	15 A, 250 VAC ABC-type ceramic
Relay outputs (2):	1/3 HP at 120 VAC, 1/2 HP at 230 VAC 360 W tungsten at 120 VAC 10 A at 120/230 VAC, general-purpose (resistive) 250 VA at 120 VAC for pilot-duty use
Relay fuses (2):	12 A, 250 VAC ABC-type ceramic
DC-signal outputs (2):	0 to 10 V, 30 mA
Alarm relay:	0.4 A at 125 VAC; 2 A at 30 VDC, resistive load 0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

PLC-2

- Input: 120/230 VAC, 50/60 Hz
- Input fuse: 250 V, 1 A fast-acting glass
- Variable AC output:: 2300 W at 120 VAC
  20 A at 120 VAC, general-purpose (resistive)
- Relay output: 20 A at 120 V tungsten, 230 V ballast
  1 HP at 120 VAC, 2 HP at 230 VAC
- DC-signal outputs (2): 0 to 10 V, 30 mA
- Alarm relay: 0.4 A at 125 VAC; 2 A at 30 VDC, resistive load
  0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

Optional PLC accessories and slave units

Phason's Programmable Lighting Controls have optional accessories designed to increase your lighting control options and make it even easier to set up multiple controls. For more information about optional PLC accessories or slave units, contact your dealer.

Slave units

The PLC has the capacity to control 20 ampere of lighting load: the PLC-1 has two 10-ampere circuits and the PLC-2 has one 20-ampere circuit. Slave units allow you to increase the lighting capacity of a PLC-1 or PLC-2. Installation is simple and there is no additional configuration required; all slave units follow the programs and settings of the master control.

There are two types of slave units:

- The PSU-20 Single-Phase Slave has a variable 20-ampere circuit and must be used on the same phase as the master control.
- The PLC-2SDC Three-Phase Slave unit has a variable 20-ampere circuit and a 20-ampere relay. The PLC-2SDC has additional circuitry to control lamps that are on phases other than that used by the master control.

PLC Saver

The PLC Saver allows you to keep a backup of your configuration and lighting programs. The PLC Saver stores a complete copy of a PLC's configuration and settings in only seconds. You can also use the PLC Saver to transfer the information to other PLCs. This means you can set up a PLC in seconds!

Becoming familiar with the PLC

This section explains the set up process and layout of the control. Read this section before configuring and programming the PLC.

Understanding light intensity and light levels

Light intensity (brightness) and duration are important factors in poultry production. Light intensity affects bird aggression, feed consumption, and water consumption. Light duration affects reproductive cycles, egg production cycles, total feed consumption, and growth rates.

Light intensity, sometimes referred to as luminance, is measured in foot-candles or lux (1 foot-candle equals 10.76 lux, 1 lux equals 0.0929 foot-candles). You can measure ambient light using an ambient light meter.

The table below shows typical light levels for some common places.

Location	Light intensity	
	lux	foot-candles
Typical broiler room	20	1.858
Typical office desk	500	46.45
Bright, sunny day	100,000	9290
Overcast day	30,000 to 40,000	2787 to 3716
Clear night with full moon	0.01	0.000929

There are many sources of information about lighting in poultry housing. For more information, search the Internet or contact your state, provincial, or federal agricultural agencies.

In the PLC, the light intensity is expressed as a number between 0 and 100, not as a percentage. Zero is off, 100 is fully on. The PLC's light level scale makes every change in light level equal.

For example, if you change the light intensity from 1% to 2%, you have doubled the intensity. Likewise, if you change the intensity from 50% to 100%, you have doubled the intensity. If you were to use percentage as a scale, there would only be one level between 1 and 2 percent, but 50 levels between 50 and 100 percent.

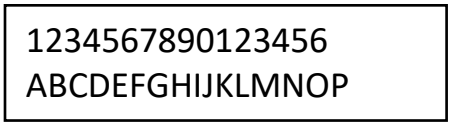
With the PLC's light level scale, every doubling (or halving) of the light intensity has ten equal levels. This makes the changes in light intensity almost undetectable.

The best way to convert light intensity to light levels is to manually adjust the lights using the control and then read the light intensity using an ambient light meter. When the light meter reads the desired light intensity, check the PLC display and write down the light level.

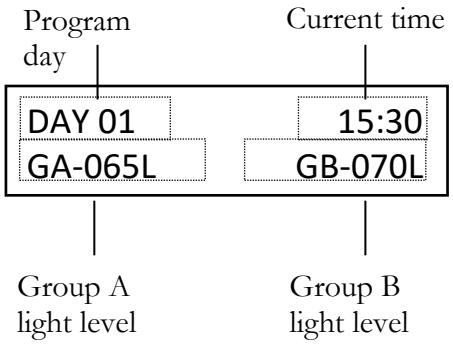
Ambient light meters are available from many different sources. Searching the internet for *"ambient light meter"* or checking your local camera shop is a good place to start looking. A meter with a digital display that reads low light levels works best.

Reading the display

The PLC has a two-line LCD (liquid crystal display) that can display up to 16 characters on each line.

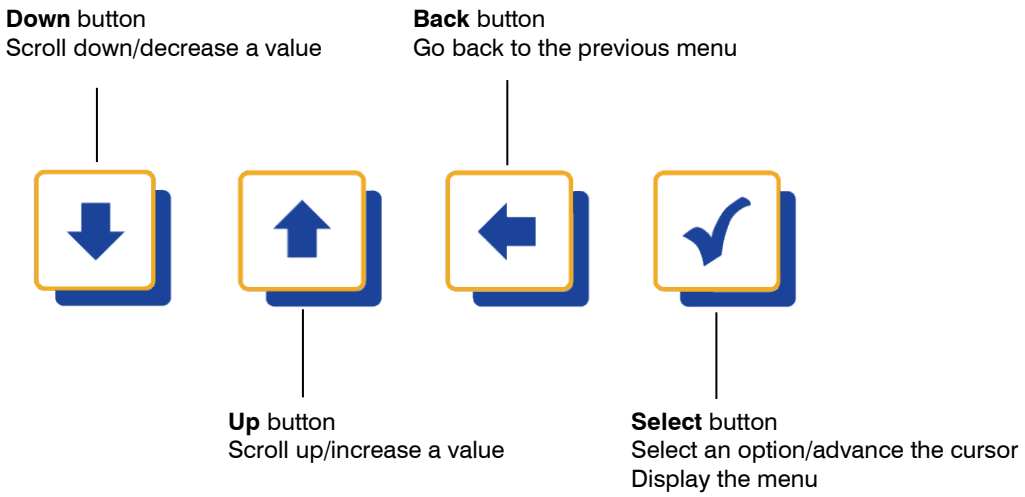


While the PLC is operating, the LCD displays the program day, current time, and light level for each program group.



Using the buttons

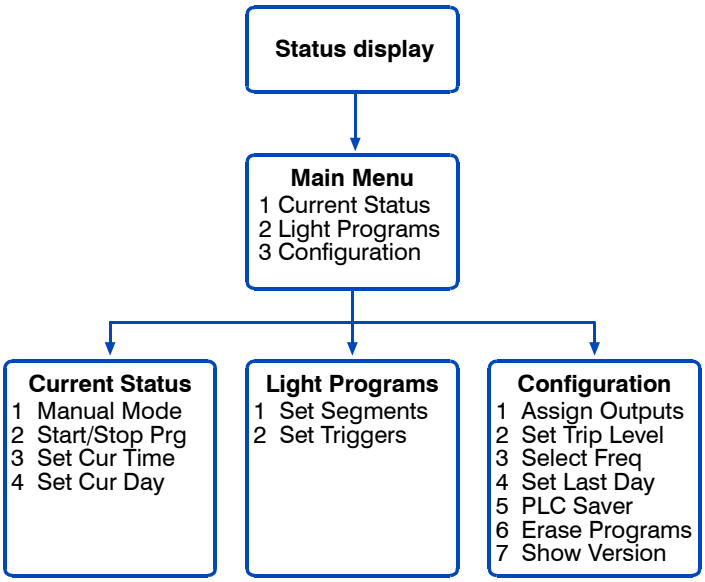
There are four buttons on the PLC that allow you to scroll through the settings and program the control. Each time you press a button the PLC makes a 'beep' sound.



The button functions are also on the reference card. Keep the reference card close to the control so you can refer to it.

Using the menu system

The PLC has a menu system that allows you to easily view the control's status, create or modify lighting programs, and configure the control. The diagram below shows the menu order.



To display the menu, press the Select button from the status display.

The menu structure is also on the reference card. Keep the reference card close to the control so you can refer to it.

Current Status

The Current Status menu has options that allow you to set the time and the current program day, start or stop the lighting programs, or temporarily switch to manual override mode.

Light Programs

The Light Programs menu has options that allow you to create or modify the lighting programs.

Configuration

The Configuration menu has options that allow you to set up how the control functions.

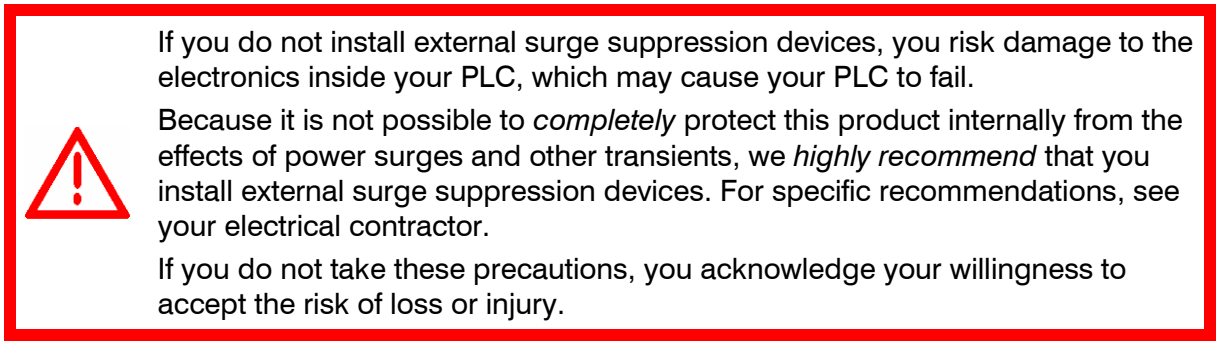
Chapter 2: Installing the PLC

Chapter 2 explains how to mount, install, and connect equipment to your PLC. Topics in chapter 2 include:

- **What you need to know before installing your PLC** below
- **Connecting equipment to your PLC** on page 14
- **Finishing the installation** on page 18

What you need to know before installing your PLC

1. Read **Understanding power surges and surge suppression** on page 9.



2. There are four main steps to installing the PLC. Read all the steps before installing the PLC. Follow all the steps in the order they are listed.

1	2	3	4
Read all the installation instructions and collect any necessary items.	Select a suitable location and then mount the PLC.	Wire the incoming power and equipment to the PLC.	Fasten the cover to the PLC.

In addition to the parts included with the PLC, you need to provide the following items.

- An external disconnect switch or power contactor for the variable AC lamp circuit
- Enough power cable to go from the incoming power supply to the PLC
- Enough conduit to go from the incoming power supply to the PLC
- Watertight strain reliefs or conduit connectors at all cable entry points

Understanding power surges and surge suppression

Power surges can be caused by external influences (outside the barn—for example, lightning or utility distribution problems) or they can be caused internally (inside the barn—for example, starting and stopping inductive loads).

One of the most common causes of power surges is lightning. When lightning strikes the ground, it produces an enormously powerful electromagnetic field. This field affects nearby power lines, which transmit a surge to any device connected to it, such as lights, computers, or environmental controls like your PLC. Lightning does not have to actually strike a power line to transmit a surge.

Surge suppression devices offer some protection from power surges. Because it is not possible to internally protect this product completely from the effects of power surges and other transients, Phason *highly recommend* that you install external surge suppression devices. For specific recommendations, see your electrical contractor. If you do not take these precautions, you acknowledge your willingness to accept the risk of loss or injury.

Electrical ratings

PLC-1

◆ Input:	120/230 VAC, 50/60 Hz
◆ Input fuse:	250 V, 1 A fast-acting glass
◆ Variable AC outputs (2):	1200 W at 120 VAC, 2300 W at 230 VAC 10 A at 120/230 VAC, general-purpose (resistive)
◆ Variable AC fuses (2):	15 A, 250 VAC ABC-type ceramic
◆ Relay outputs (2):	1/3 HP at 120 VAC, 1/2 HP at 230 VAC 360 W tungsten at 120 VAC 10 A at 120/230 VAC, general-purpose (resistive) 250 VA at 120 VAC for pilot-duty use
◆ Relay fuses (2):	12 A, 250 VAC ABC-type ceramic
◆ DC-signal outputs (2):	0 to 10 V, 30 mA
◆ Alarm relay:	0.4 A at 125 VAC; 2 A at 30 VDC, resistive load 0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

PLC-2

- Input: 120/230 VAC, 50/60 Hz
- Input fuse: 250 V, 1 A fast-acting glass
- Variable AC output:: 2300 W at 120 VAC
  20 A at 120 VAC, general-purpose (resistive)
- Relay output: 20 A at 120 V tungsten, 230 V ballast
  1 HP at 120 VAC, 2 HP at 230 VAC
- DC-signal outputs (2): 0 to 10 V, 30 mA
- Alarm relay: 0.4 A at 125 VAC; 2 A at 30 VDC, resistive load
  0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

NOTE

The relay in the PLC-2 can be used as the disconnect switch for the variable AC lamp circuit.

Precautions, guidelines, and warnings

See also **Servicing and maintaining your PLC** on page 34.

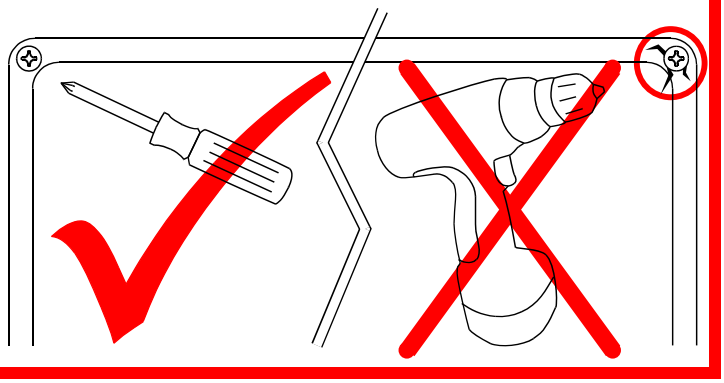
The PLC must be installed by a qualified electrician.

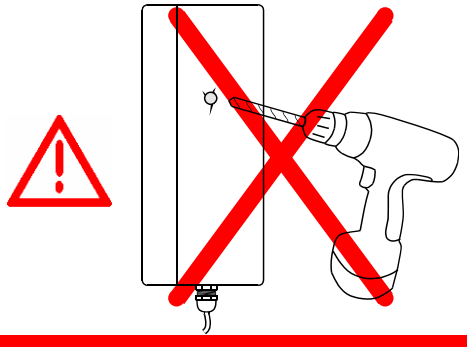
Before installing or servicing the PLC, switch OFF the power at the source.

Install the PLC and all equipment connected to it according to local electrical codes.

Mount the control on a sheltered, vertical surface, with the electrical knockouts facing down.

Use a screwdriver to tighten the screws in the enclosure. Do not use a drill or over tighten the screws; this can crack the enclosure and ruin the watertight seal.





Use the electrical knockouts for bringing wires or cables into or out of the enclosure. Use watertight strain reliefs or conduit connectors at all cable-entry points.

Do not make additional holes in the enclosure; this can damage the watertight seal or control components and void the warranty.

Routing data wires

Routing data wires in the same conduit as, or beside AC power cables, can cause electrical interference, erratic readings, and/or improper control. Data wires include **all** of the following:

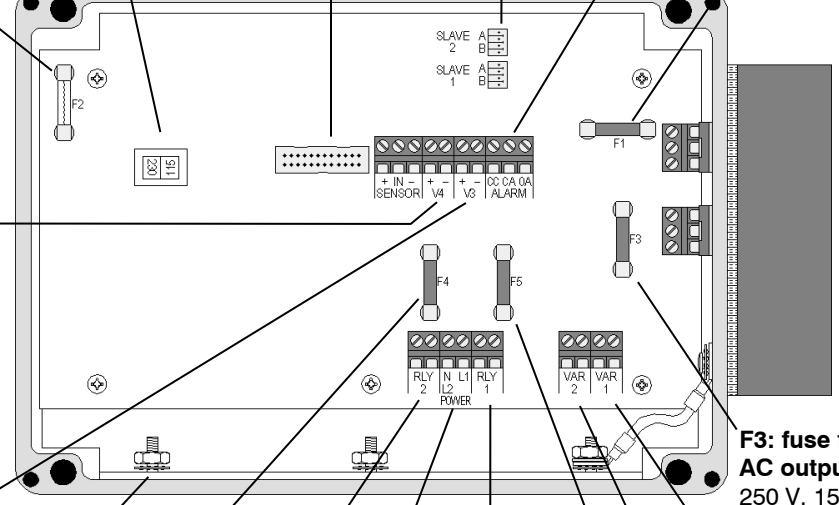
- Temperature probe and humidity sensor cables
- Actuator feedback (potentiometer) wires
- Data communication wires, including RS-232/RS-485
- Any cable or wire that does not provide AC power

Guidelines for routing data wires

- Do not run the wires in the same conduit as AC power cables.
- Do not run the wires beside AC power cables or near electrical equipment.
- When crossing other cables or power lines, cross them at a 90-degree angle.

If in doubt, **do not run any wire or cable that is not an AC-power wire** inside the same conduit or beside other AC-power wires.

PLC-1 layout



Voltage selector switch

Slave unit connections

Alarm relay connection

F2: fuse for incoming power
250 V, 1 A, fast-acting glass fuse

Socket for display cable

F1: fuse for variable AC output (VAR2)
250 V, 15 A, slow-blow ceramic fuse

Variable 4 (DC)
Variable 4
DC-controlled ballast connection

Variable 3 (DC)
Variable 3
DC-controlled ballast connection

F3: fuse for variable AC output (VAR1)
250 V, 15 A, slow-blow ceramic fuse

Ground studs
Connect the ground wire to one of the ground studs.

Variable 1 (AC)
Variable 1 lamp control circuit

F4: Fuse for relay 2 (RLY2)
250 V, 12 A, slow-blow ceramic fuse

Incoming power connection

Variable 2 (AC)
Variable 2 lamp control circuit

Relay 2
General-purpose relay connection 2

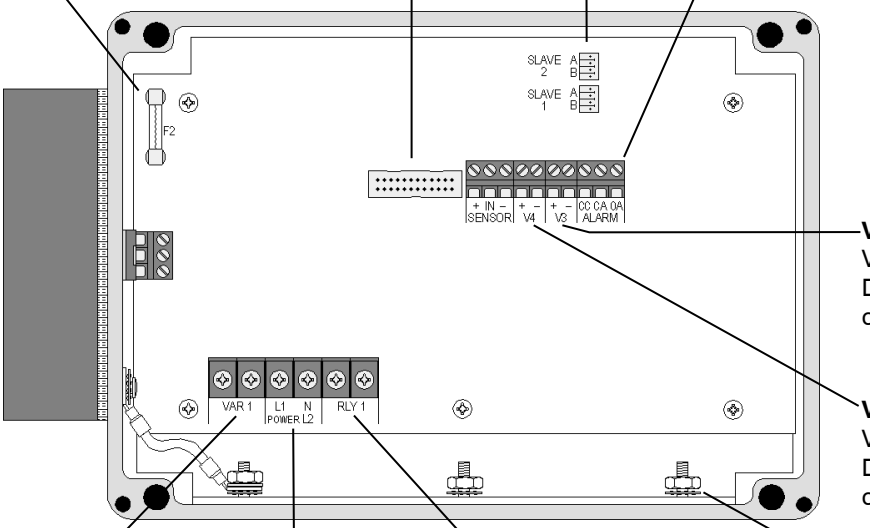
Relay 1
General-purpose relay connection 1

F5: Fuse for relay 1 (RLY1)
250 V, 12 A, slow-blow ceramic fuse

NOTE

Refer to the installation instructions on pages 10 to 18 when installing the PLC-1.

PLC-2 layout



Slave unit connections

F2: fuse for incoming power
250 V, 1 A, fast-acting glass fuse

Socket for display cable

Alarm relay connection

Variable 3 (DC)
Variable 3 DC-controlled ballast connection

Variable 4 (DC)
Variable 4 DC-controlled ballast connection

Variable 1 (AC)
Variable 1 lamp control circuit

Incoming power connection

Relay 1
General-purpose relay connection 1

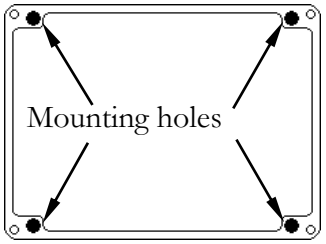
Ground studs
Connect the ground wire to one of the ground studs.

NOTE

Refer to the installation instructions on pages 10 to 18 when installing the PLC-2.

Mounting the PLC

1. Remove the cover from the enclosure.
2. Mount the PLC using the fours screws provided.



NOTE

Mount the PLC away from sources of heat and on a vertical surface with the electrical knockouts facing down. Failure to do this can allow moisture into the control and will void the warranty.

Connecting equipment to your PLC

Follow these instructions when installing your PLC and connecting equipment to it.

Use the electrical knockouts for bringing wires or cables into or out of your PLC enclosure. Do not make additional holes in the enclosure; this can damage the watertight seal or control components and void the warranty.

Your PLC's test modes are useful for testing your equipment after installing and configuring it. For more information, see **Using manual override mode** on page 33.

Connecting incandescent lights to the variable AC outputs

The variable AC outputs are for controlling incandescent lights. The variable AC outputs are VAR1 and VAR2 on a PLC-1 and VAR1 on the PLC-2.

A disconnect switch must be installed in series with the variable AC circuits.

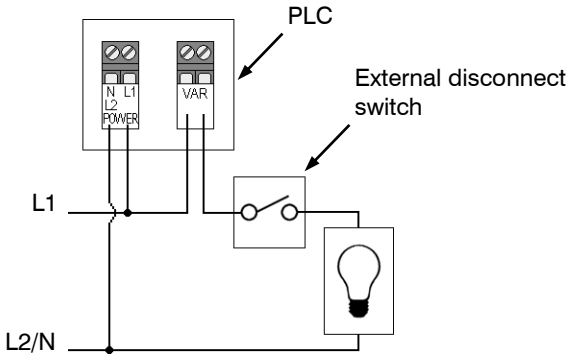
There are three methods you can use when installing the disconnect switch:

- Using an external manual disconnect switch
- Using an onboard relay to control a power contactor that acts as the disconnect switch
- Using the 20 ampere onboard relay as the disconnect switch (PLC-2 only)

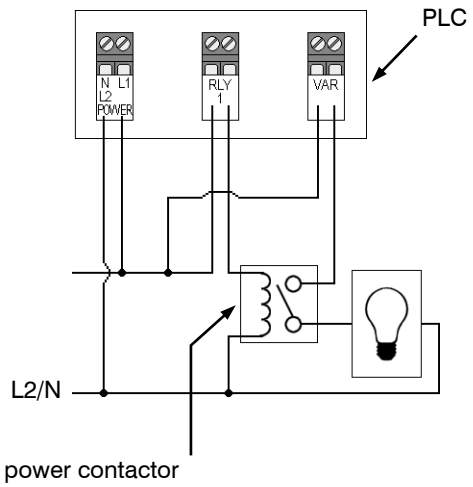
If you choose one of the two methods that use the onboard relay, you must set up the relay to be dependant on the variable output. The relay must turn on at light level 1 and off at level 0. For more information about configuring the relay to be dependant on the variable output, see **Assigning outputs to program groups** on page 22 and **Setting relay trip levels** on page 23.

Connect the lights and disconnect switch to the PLC as shown in one of the following three methods.

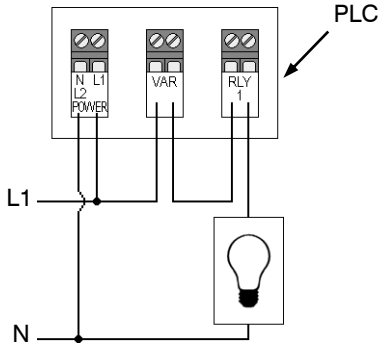
Using an external disconnect switch



Using an onboard relay and power contactor as the disconnect switch



Using the 20 ampere onboard relay as the disconnect switch (PLC-2 only)



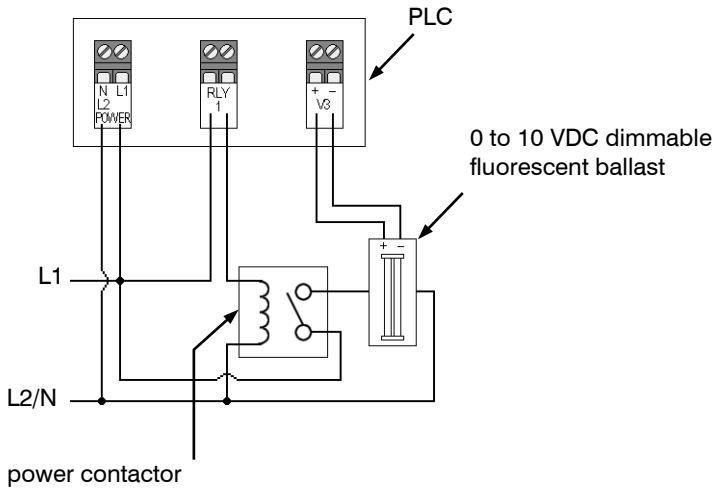
Connecting dimmable fluorescent ballasts to the variable DC outputs

The variable DC outputs are for controlling AC-powered, dimmable fluorescent lights requiring a 0 to 10 VDC signal. The variable DC outputs are V3 and V4 on both the PLC-1 and PLC-2.

Dimmable fluorescent lights dim down to one to five percent of full brightness. They require a switch to disconnect the AC voltage for a 'lights-out' condition. You can use the PLC relay to control a power contactor that switches the lights off.

Configure the relay to be dependent on the variable DC output. The relay must turn on at a light below the minimum brightness capability of the ballasts. For more information about configuring the relay to be dependant on the variable output, see **Assigning outputs to program groups** on page 22 and **Setting relay trip levels** on page 23.

Connect the dimmable fluorescent ballasts to the PLC as shown below.



Connecting loads to the relay outputs

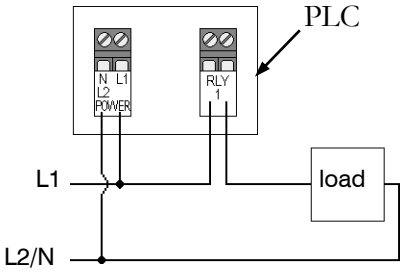
The relays outputs are general-purpose relays for controlling devices such as feed augers or for switching lights on and off. The relay outputs are RLY1 and RLY2 on the PLC-1 and RLY1 on the PLC-2.

NOTE

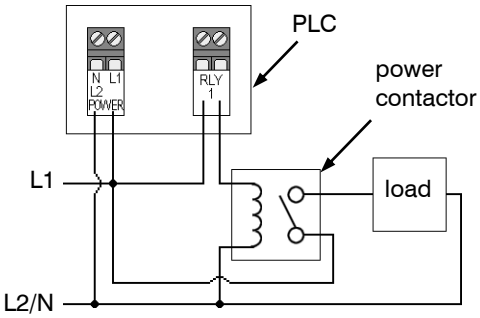
If the load connected to the relay output exceeds the ratings of the PLC, you must use a power contactor to switch the load.

Connect the load to the relay output as shown below.

Normal loads



Loads exceeding the ratings of the PLC

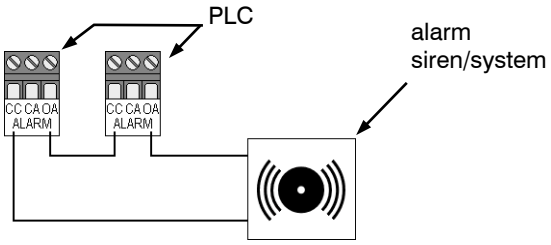


Connecting the alarm relay to the alarm circuit

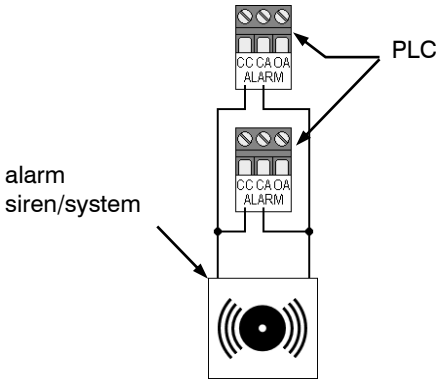
The PLC alarm relay warns of power failures at the control.

Connect the alarm relay to your alarm siren (or alarm system) as shown below. For information about the type of alarm system you have, open on alarm or closed on alarm, see your system's user manual.

Normally closed system (open on alarm)



Normally open system (closed on alarm)

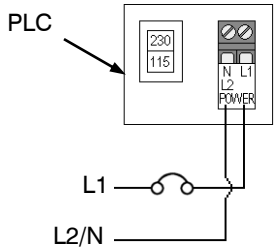


Connecting the power source

The PLC-1 can use either 120 or 230 VAC, 50/60 Hz power. The PLC-2 uses 120 VAC, 50/60 Hz power.

1. Connect the incoming power to the PLC as shown below.
2. On the PLC-1, before applying power, make sure the voltage selector switch is set to the correct line voltage.

> NOTE
>
> If you have three-phase power and will be using slave units, make sure you wire the slave units to the correct phase. The PSU-20S Single-Phase Slave must be on the same phase as the master. The PLC-2SDC Three-Phase Slave unit can be on any phase.
>
> For information about installing slave units, see your unit's installation guide.



Finishing the installation

After installing and connecting equipment to your PLC, you are ready to finish the installation. Before you start configuring your PLC, you need to verify the connections and fasten the cover to the PLC.

Verifying your connections

It is very important that you verify the connections to the terminals because the next step after closing the cover is to tell your PLC which equipment is connected to each terminal. It is important so you can be sure you are controlling the equipment you think you are controlling.

Closing the cover

After you have finished connecting all equipment, wiring, and cables to your PLC, it's time to verify the wires are connected properly and the close the cover.

1. Make sure all the wires are properly connected to the correct terminals.
2. Make sure the voltage selection switch is in the correct setting.
3. Make sure the display cable is properly connected. For more information, see **PLC-1 layout** on page 12 or **PLC-2 layout** on page 13.
4. Place the cover on the control.
5. Switch on the power to your PLC.
6. Insert the four screws into the cover and then tighten them.

Do not over tighten the screws. Avoid using power screwdrivers or drills.

Chapter 3: Configuring and programming the PLC

Chapter 3 explains how to configure your PLC. Topics in chapter 3 include:

- **What you need to know before configuring your PLC** below
- **Configuring the main control functions** on page 21
- **Creating lighting programs** on page 26

What you need to know before configuring your PLC

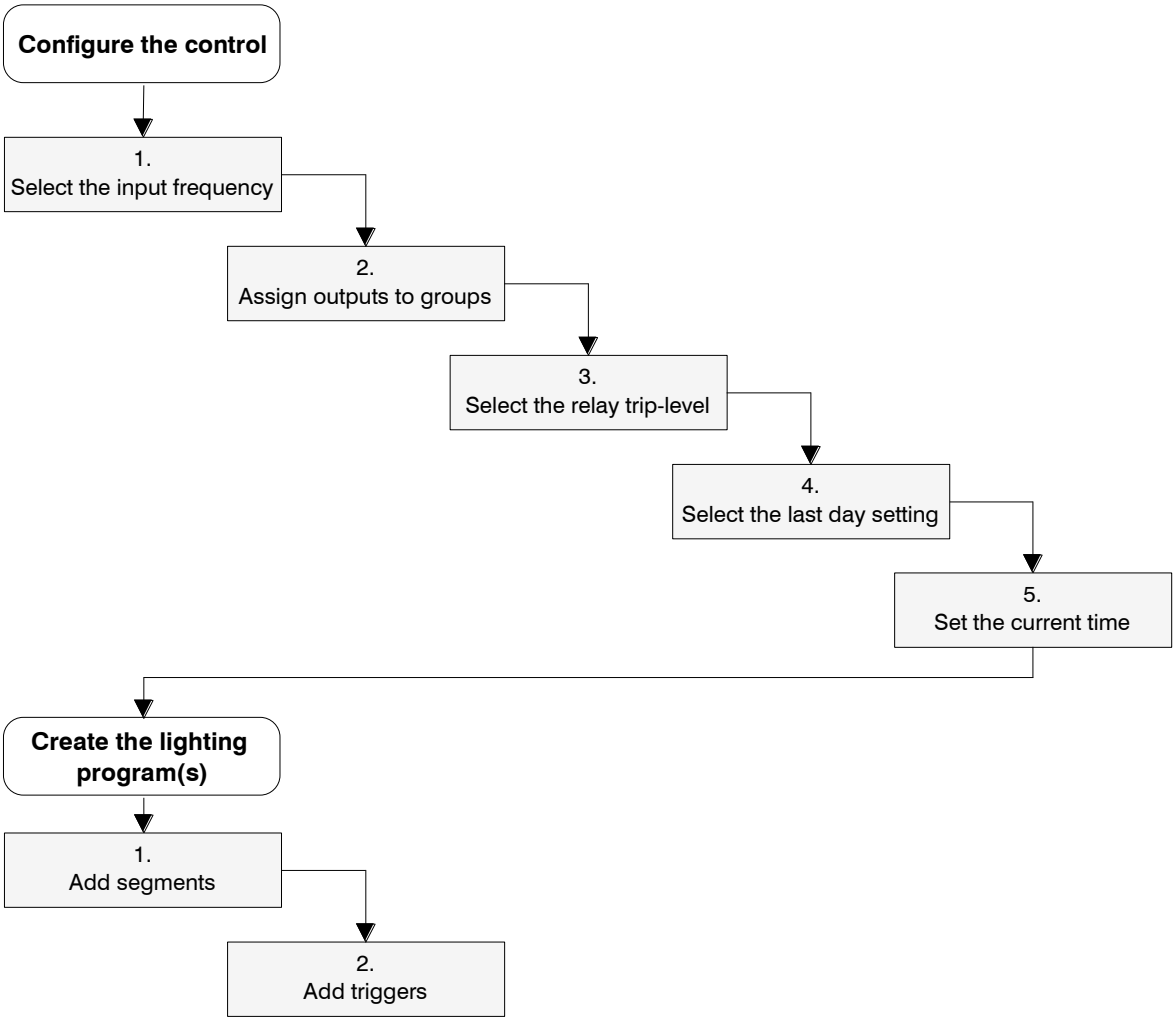
Configuring your PLC means telling it what equipment it will be controlling and how it will be controlling that equipment.

Before you begin configuring your PLC, make sure:

- It has power
- All equipment has been properly connected to the correct terminals.
- You know which equipment is connected to which relays and variable stages

Understanding the initial setup process

After installing the PLC and becoming familiar with the buttons and display, you need to set up and program the control. There are two stages to the initial setup process: **configuring the control**, and **creating the lighting program(s)**. The following diagram shows the steps that must be completed for each stage.



Configuring the main control functions

Before configuring the variable and relay stages, you need to configure the main control functions. Main control functions include items such as temperature units that the PLC needs to know before you configure the variable and relay stages. Main control functions include:

- Input frequency (on page 22)
- Program groups (on page 22)
- Relay trip levels (on page 23)
- Last day settings (on page 24)
- Current time (on page 25)

Selecting the input frequency

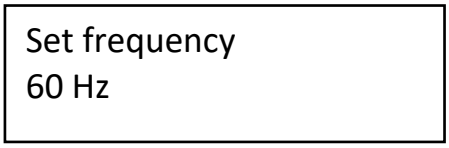
The PLC can operate with either 50 or 60 Hz input power. The default is 60 Hz. If you are using 50 Hz power, you need to change the input frequency setting.

Consult your electrician if you are unsure which input frequency you are using.

If you select the wrong frequency, the internal clock on the PLC will not function properly.

To select the input frequency

1. Scroll to the Configuration menu and then press **Select**.
2. Scroll to Select Freq and then press **Select**.
3. Press **Up** or **Down** to change the frequency.
4. Press **Back** to return to the Main menu.



Assigning outputs to program groups

The PLC-1 has six outputs: two variable AC outputs (Variable1 and Variable2), two variable DC outputs (Variable3 and Variable4), and two relay outputs (Relay1 and Relay2).

The PLC-2 has four outputs: one variable AC output (Variable1), two variable DC outputs (Variable3 and Variable4), and one relay output (Relay1).

The PLC controls the outputs according to lighting programs. A lighting program is the settings (segments, triggers, light levels, and so on) the PLC uses to control the outputs. The PLC has four lighting programs: Group A, Group B, Relay1, and Relay2. You need to tell the PLC which outputs belong to which programs.

The menu for the PLC-2 lists *Variable2* and *Relay2* as available outputs. These outputs are not normally available on the PLC-2.

You can make *Variable2* available by connecting a PSU-20 Single-Phase Slave to the SLAVE 2 connector. For more information, see **PLC-2 layout** on page 13.

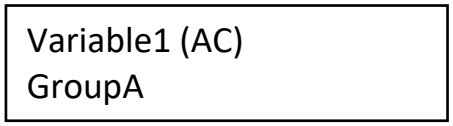
Variable outputs can only be assigned to Group A or Group B. Relays can be assigned Group A, Group B, or used independently.

If a relay is assigned to a group, you can set it to turn on at a certain light level and off at another light level. If a relay is independent, you can set it to turn on at certain times and off at other times.

Use the **Program group worksheet** on page 39 to help configure your program groups.

To assign outputs to a group

1. Scroll to the Configuration menu and then press **Select**.
2. Scroll to Assign Outputs and then press **Select**.
3. Scroll to the output you want to assign and then press **Select**.
4. Press **Up** or **Down** to change the program group and then press **Select**.
5. Repeat steps 3 and 4 for each output you want to assign and then press **Back** twice to return to the Main menu.



Setting relay trip levels

If a relay is assigned to program Group A or Group B, you can set it to turn on at a certain light level and off at another light level. The level can be between 0 and 100.

For example, if relay 1 is assigned to Group A, you can have it turn on when the light level rises to 65 and off when the light level drops to 55.

If you set both the ON and OFF settings to the same light level, the relay will not change state when the light level reaches the setting.

If you did not assign the relay to a group, you do not need to set a trip level.

Use the **Program group worksheet** on page 39 to help configure your program groups.

To set the relay trip levels

1. Scroll to the Configuration menu and then press **Select**.
2. Scroll to Set Trip Level and then press **Select**.
3. Scroll to the relay you want to set up and then press **Select**.
4. Press **Up** or **Down** to adjust the relay ON level and then press **Select**.
5. Press **Up** or **Down** to adjust the relay OFF level and then press **Select**.
6. Repeat steps 2 to 4 for each relay you want to set the trip level for and then press **Back** twice to return to the Main menu.

Relay2 GroupB
ON-L065 OFF-L057

Selecting the last day settings

Selecting the last day settings means selecting the day on which the programs will end and selecting whether the programs will restart or stop.

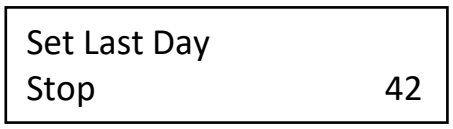
If you select restart, the programs automatically restart at day 1 after the last day. This is useful for laying hens where the program is consistent from day to day.

If you select stop, the programs maintain their current light levels and relay positions and wait for the program to be manually restarted.

All lighting programs have the same number of days and follow the same last day settings.

To select the last day setting

1. Scroll to the Configuration menu and then press **Select**.
2. Scroll to Set Last Day and then press **Select**.
3. Press **Up** or **Down** to select the Restart or Stop and then press **Select**.
4. Press **Up** or **Down** to set the number of days in the programs and then press **Select**.
5. Press **Back** twice to return to the Main menu.



Setting the current time

The PLC uses an internal real-time clock to keep track of time and days. The clock counts time (hours, minutes, and seconds) and elapsed days. It does not keep track of calendar days.

A 'day' starts at 0 hours, 0 minutes (midnight). The PLC counts the time and when 24 hours has elapsed, it moves to the next day.

The PLC uses 24-hour time. The table below shows some common standard times and their 24-hour equivalents.

Standard time	24-hour time	Standard time	24-hour time
12:00 AM	00:00	12:00 PM	12:00
01:00 AM	01:00	01:00 PM	13:00
02:00 AM	02:00	02:00 PM	14:00
03:00 AM	03:00	03:00 PM	15:00
04:00 AM	04:00	04:00 PM	16:00
05:00 AM	05:00	05:00 PM	17:00
06:00 AM	06:00	06:00 PM	18:00
07:00 AM	07:00	07:00 PM	19:00
08:00 AM	08:00	08:00 PM	20:00
09:00 AM	09:00	09:00 PM	21:00
10:00 AM	10:00	10:00 PM	22:00
11:00 AM	11:00	11:00 PM	23:00

The PLC starts counting time as soon as it is connected to an incoming power supply. If the power fails and the unit has been powered up for at least 24 consecutive hours, the clock will keep the time for one month

To set the current time

1. Scroll to the Current Status menu and then press **Select**.
2. Scroll to Set Cur Time and then press **Select**.
3. Press **Up** or **Down** to adjust the hour and then press **Select**.
   The cursor moves to the minute position.
4. Press **Up** or **Down** to adjust the minute and then press **Select**.
5. Press **Back** twice to return to the Main menu.

Creating lighting programs

Creating the lighting program is the second stage of the setup process. A lighting program is the settings the PLC uses to control the outputs to during the period. The period is the duration, up to 365 days, of the lighting program. The settings consist of segments and triggers.

Segments are parts of the lighting program where all the days follow the same triggers. There can be up to 20 segments per lighting program. The only setting for a segment is the start day.

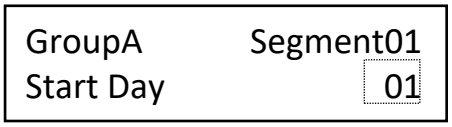
Triggers are events in the lighting program that cause the light level to increase or decrease, or a relay to change position (ON/OFF). There can be up to 32 triggers per segment. The settings for a trigger are start time, ramp time, and light level.

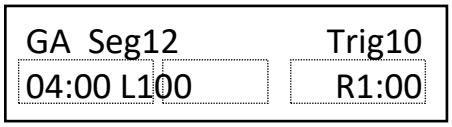
A PLC-1 can have up to four lighting programs: Group A, Group B, and two independent relay programs (Relay1, and Relay2). A PLC-2 can have up to three lighting programs:

The menu for the PLC-2 lists *Relay2* as an available option, but this program is not available on that model.

There are two steps in creating lighting programs: adding segments and adding triggers.

For Group A and Group B lighting programs, you enter the segment start days and the trigger start times, light levels, and ramp times.





For Relay1 and Relay2 programs, you enter the segment start days and the trigger times and relay positions.

Relay1	Segment12
Start Day	30

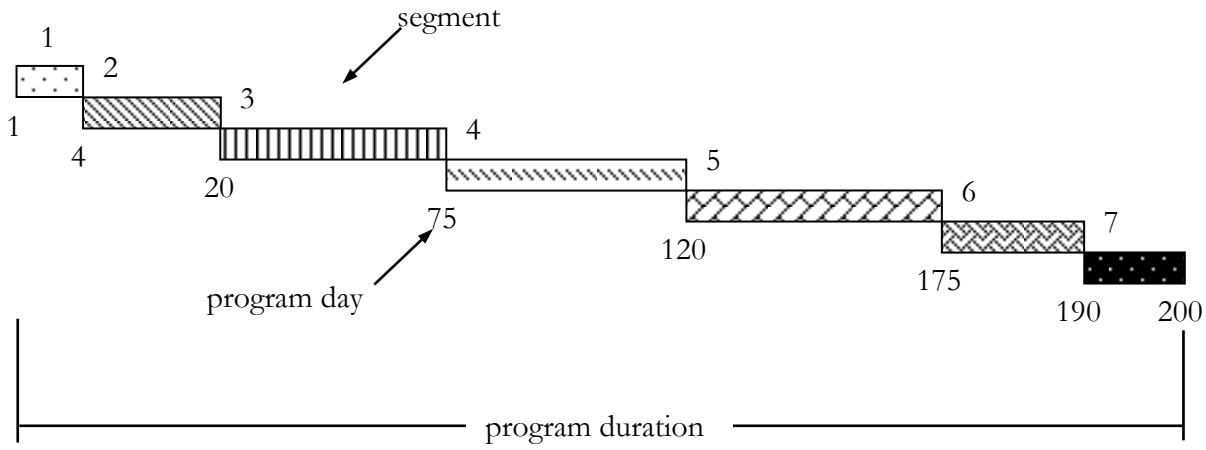
R2 Seg12	Trig10
06:30 Active	ON

Use the worksheets in **Appendix A** on page 38 to help create your lighting programs.

Adding segments

Segments are parts of the lighting program where all the days have the same triggers. A segment starts on the start day and lasts until the start day of the next segment. When the last segment ends, the lighting program is over. You can have up to 20 segments per lighting program.

In the following example, the program is 200 days in duration and there are 7 segments. Segment 1 (days 1, 2, and 3) starts on day 1, segment 2 starts on day 4, segment 3 starts on day 20, etc. Segment 7 (and the program) ends on day 200.



On day 1, the lighting program starts. For days 1, 2, and 3 (segment 1) the PLC will control the lights the same each day (according to the triggers for segment 1.)

On day 4, segment 2 starts. For days 4 to 19, the PLC will control the lights the same each day. This process is the same for each segment until day 200 when the lighting program ends.

Use the **Segment worksheets** on page 40 to help create your program segments.

To set up segments

1. Scroll to the Light Programs menu and then press **Select** twice.
2. Scroll to the group you want to set up and then press **Select**.
3. Scroll to the segment you want to set up and then press **Select**.
4. Press **Up** or **Down** adjust the start day and then press **Select**.
5. Repeat steps 2 to 4 for each segment you want to set up and then press **Back** twice to return to the Main menu.

GroupA	Segment01
Start Day	01

Relay1	Segment12
Start Day	155

Setting the start day to zero disables the segment. A disabled segment will retain its settings, but will not occur as scheduled.

For example, segment 3 starts on day 5, segment 4 starts on day 7, and segment 5 starts on day 10. If you change the start day of segment 4 to 0, segment 3 will continue until day 10 when segment 4 starts.

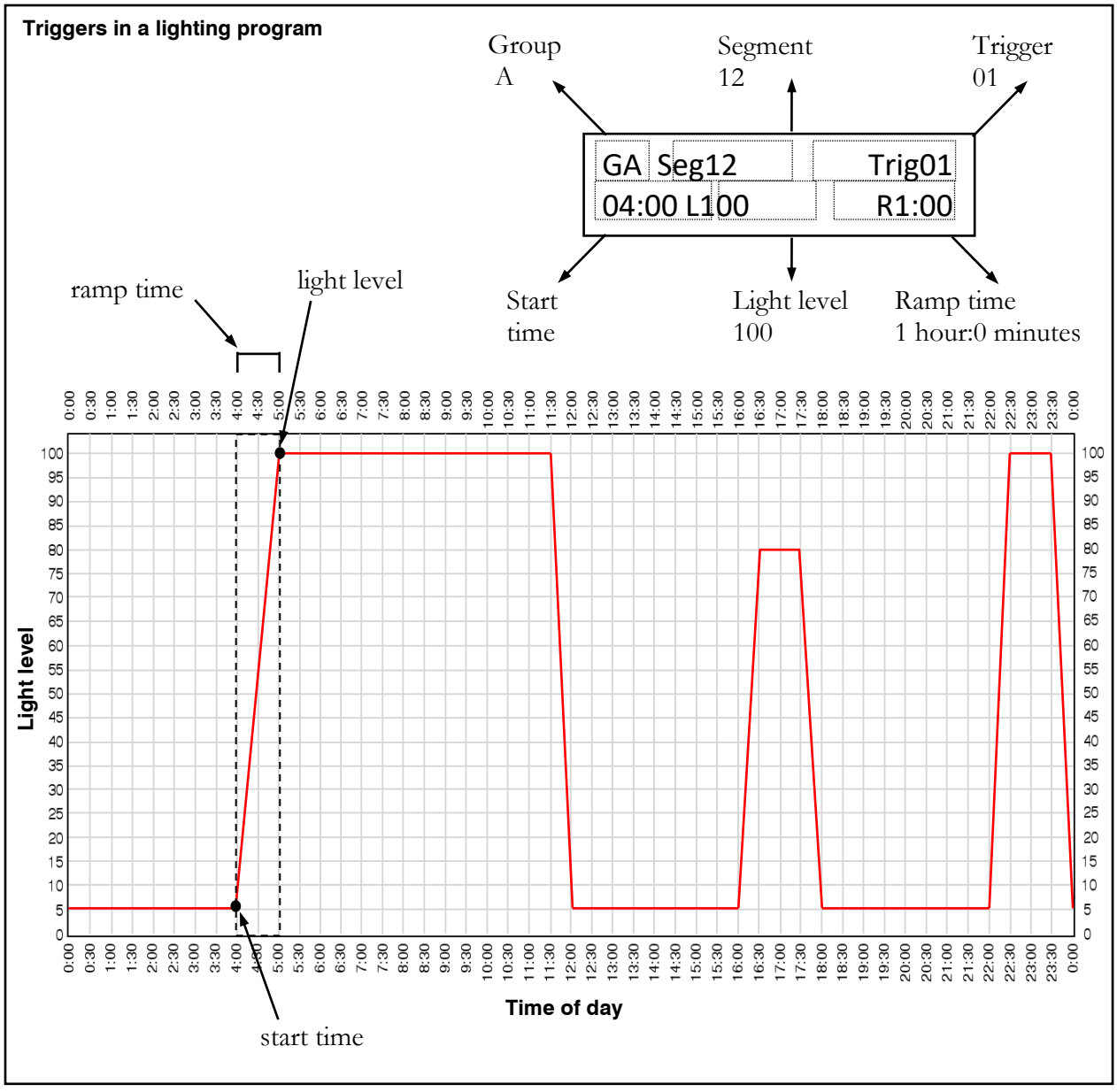
Setting up triggers

Triggers are events in the lighting program that cause the light level to change, or a relay to change position (ON/OFF). Each segment has its own triggers. There can be up to 32 triggers per day.

The settings for a Group A or Group B trigger include start time, ramp, and light level. The settings for an independent relay trigger include time and relay position.

- Start time is the time at which the PLC starts to change the light level.
- Light level is the intensity to which the PLC needs to adjust the lights.
- Ramp time is the amount of time the PLC takes to adjust from one light level to the next.
- Relay position is ON or OFF.

In the following example, the light level is at 5 at 0:00 (midnight.) At 4:00 (4:00 AM), the light level starts to increase to 100. At 5:00, the light level reaches 100. This process is the same for each trigger during the day. Each day during the segment will have the same triggers.

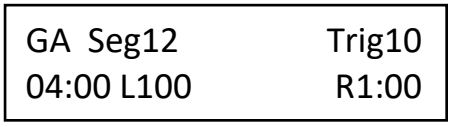


Use the **Trigger worksheets** on page 41 to help create your segment triggers.

NOTE

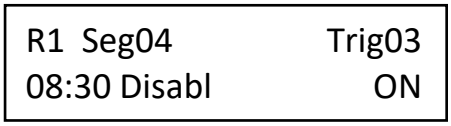
The maximum ramp time is 240 minutes, or 4:00 on the display. Setting the ramp time to 0:00 disables the trigger. Disabled triggers retain their settings, but do not occur as scheduled.

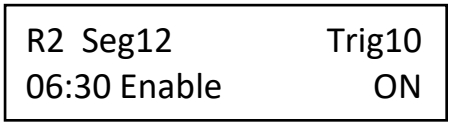
To set up Group A or Group B triggers



1. Scroll to the Light Programs menu and then press **Select**.
2. Scroll to Set Triggers and then press **Select**.
3. Scroll to the group you want to set up and then press **Select**.
4. Scroll to the segment you want to set up and then press **Select**.
5. Scroll to the trigger you want to set up and then press **Select**.
6. Press **Up** or **Down** to adjust the start hour (in 24-hour time) and then press **Select**.
7. Press **Up** or **Down** to adjust the start minute and then press **Select**.
8. Press **Up** or **Down** to adjust the light level and then press **Select**.
9. Press **Up** or **Down** to adjust the ramp time (duration) and then press **Select**.
10. Repeat steps 3 to 9 for each trigger you want to set up and then press **Back** twice to return to the Main menu.

To set up independent relay triggers





1. Scroll to the Light Programs menu and then press **Select**.
2. Scroll to Set Triggers and then press **Select**.
3. Scroll to the relay you want to set up and then press **Select**.
4. Scroll to the segment you want to set up and then press **Select**.
5. Scroll to the trigger you want to set up and then press **Select**.
6. Press **Up** or **Down** to adjust the hour (24-hour time) and then press **Select**.
7. Press **Up** or **Down** to adjust the minute and then press **Select**.
8. Press **Up** or **Down** to select the trigger status and then press **Select**.
9. Press **Up** or **Down** to adjust the relay state (ON or OFF) and then press **Select**.
10. Repeat steps 3 to 9 for each trigger you want to set up and then press **Back** twice to return to the Main menu.

Chapter 4: Using the PLC

After you configure the PLC and create the lighting programs, there are several other things you can do. Topics in chapter 4 include:

- **Working with the lighting programs** below
- **Using manual override mode** on page 33
- **Servicing and maintaining your PLC** on page 34

Working with the lighting programs

After creating your lighting programs, there are a couple functions you will need to perform occasionally as you move birds in and out of your facility.

- Starting and stopping the lighting programs
- Adjusting the current day

Starting and stopping the lighting programs

You can start or stop the lighting programs. If you are receiving birds on a certain day, you will want to start the programs on that day.

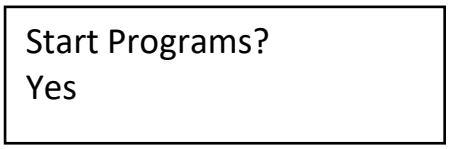
When you start the programs, they start at the current day on the clock. You can change the current day so that the programs start on day 1. For more information, see **Adjusting the current day** on page 32.

When you stop the programs, **all programs** stop and **all outputs** remain at their current light level or state.

The clock counts days while the programs are stopped.

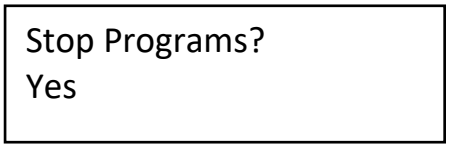
To start the lighting programs

1. Scroll to the Current Status menu and then press **Select**.
2. Scroll to Start/Stop Prg and then press **Select**.
3. Press **Up** or **Down** to select Yes and then press **Select**.
4. Press **Back** to return to the Main menu.



To stop the lighting programs

1. Scroll to the Current Status menu and then press **Select**.
2. Scroll to Start/Stop Prg and then press **Select**.
3. Press **Up** or **Down** to select Yes and then press **Select**.
4. Press **Back** to return to the Main menu.



Adjusting the current day

The PLC's real-time clock counts time (seconds, minutes, hours, days). The clock counts up to 365 days and then starts at day 1 again.

Adjusting the current day allows you to advance or set back the program schedule. This is useful if your animals are ahead of or behind schedule, or if you want to start the programs and the current day is not at day 1.

For example, you are receiving a new batch of animals today and want to start your lighting programs, but your current day is not at day 1. You can adjust the current day to 'day 1' and then start the programs.

To adjust the current day

1. Scroll to the Current Status menu and then press **Select**.
2. Scroll to Set Cur Day and then press **Select**.
3. Press **Up** or **Down** to adjust the current day and then press **Select**.
4. Press **Back** twice to return to the Main menu.

Using manual override mode

Manual override mode allows you to temporarily override the lighting programs. This is useful for when you need clean a room or perform any maintenance. Manual mode allows you to set any program or independent relay to a light level or state (ON/OFF). The output stays in that state until you exit manual mode.

When you enter manual mode, you select a program to override and a light level (or a state for an independent relay) to go to. The PLC adjusts the light level or state as you press **Up** or **Down**.

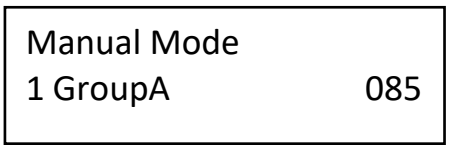
When the PLC is in manual mode, all programs suspend until you exit manual mode.

If you override a Group A or B program that has a relay assigned to it, the relay will still switch on or off at the relay trip levels.

If power to the control is disrupted while in manual mode, the manual settings are cleared when the power returns.

When you exit manual mode, the outputs go back to the level or state they should be at in the lighting program. For example, if the light level is at 80 in manual mode and should be at 20 in the lighting program, when you exit manual mode, the PLC will return to 20 using the ramp time for that trigger.

To enter manual override mode



1. Scroll to the Current Status menu and then press **Select** twice.
2. Scroll the group you want to override and then press **Select**.
3. Press **Up** or **Down** to adjust the light level for the group and then press **Select**.
4. Repeat steps 2 and 3 for each group you want to override.

To exit manual mode

Press **Back** until you return to the status display.

Servicing and maintaining your PLC

Servicing and maintaining your PLC extends the life of the control and your equipment.

Before installing or servicing your PLC, switch OFF the power at the source.

Cleaning the control

- To clean the surface of the control, wipe it with a damp cloth.
- Use caution when washing the room with a high-pressure washer.

DO NOT direct a high-pressure washer at the control.

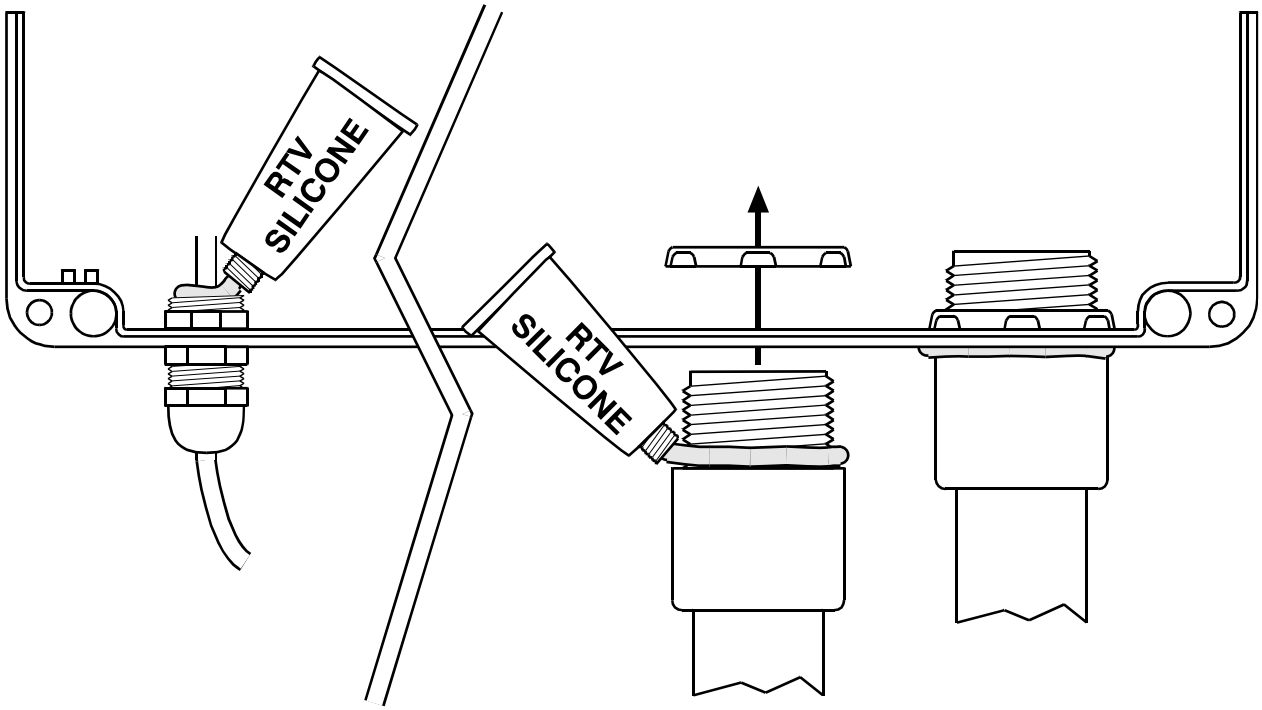
Do not use harsh or abrasive cleaners or rub the surface of the control with your bare hands.

Preventing moisture

Moisture should not cause problems with the control if you take proper care during installation.

1. After the first two weeks of operation, remove the cover from the unit and check inside for moisture. Be sure to turn off the power to the control before opening the cover.
2. If there is moisture present, wipe it out with a dry cloth and check the cable entry points and rubber gasket for proper sealing.
3. If the cable connectors are not sealing, apply RTV or Silicon II (non acetic acid) sealant around the cable.

   Some silicone sealants release acetic acid while curing. This can cause corrosion and damage the control. Let the silicone cure completely (one to three days) with the cover open and ensure no moisture enters the control. Failure to do this might damage the control and void the warranty.



4. Open and inspect the control after two weeks to verify it is sealing properly.

Open and inspect the control for moisture once a year. Proper care and maintenance will extend the life of the control.

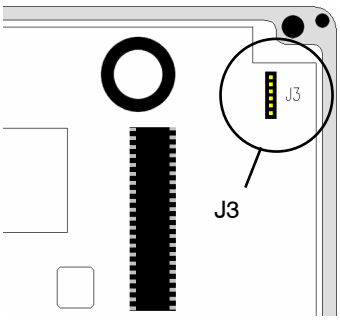
Saving and restoring settings

The PLC Saver stores a complete copy of a PLC's configuration and settings in only seconds. This allows you to keep a backup of your configuration and lighting programs. You can also use the PLC Saver to transfer the information to other PLCs. This means you can set up a PLC in seconds!

The PLC Saver works with the both the PLC-1 and PLC-2 Programmable Lighting Controls.

To save or restore your settings

1. Loosen the four screws holding the cover in place and then gently remove the display from the unit. Be careful not to disconnect the ribbon cable.
2. Locate connector J3 as shown to the right.
3. Insert the PLC Saver into the connector.
4. Scroll to Configuration and then press **Select**.
5. Scroll to PLC Saver and then press **Select**.
6. Press **Up** or **Down** to select:
   - Save if you want to save the settings from the PLC to the PLC Saver
   - Restore if you want to transfer the settings from the PLC Saver to the PLC
7. Press **Select**.
8. Press **Up** or **Down** to select Yes and then press **Select.**
9. The PLC transfers your settings. This takes three to five seconds. The display will show Done when the process is complete.
10. Remove the PLC Saver.
11. Place the cover on the control and then fasten it using the four screws.



On the back of the PLC Saver is a white label. Write down a description of the settings on the PLC Saver.

This helps identify which settings belong to which control.

PLC settings—brooder room 1

Displaying the firmware version

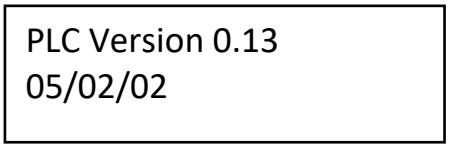
Firmware is similar to operating system software for a computer. Firmware contains instructions that tell the PLC how it operates. Just like computer operating systems (such as Windows™ XP have version numbers, the firmware has a version number.

If you need to contact Phason Customer Support about your PLC, you might need to provide them with the firmware version of your control. For more information about technical support, see **Service and technical support** at the front of the manual.

When you display the firmware version, the PLC screen looks similar to the one below. The V#.## is the version number.

To display the firmware version

1. Scroll to the Configuration menu and then press **Select**.
2. Scroll to Show Version and then press **Select**.
   The PLC displays the firmware version.
3. Press **Back** twice to return to the Main menu.

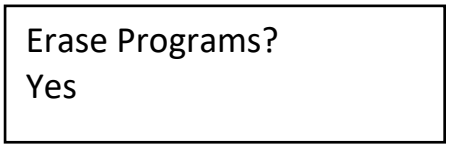


Restoring factory defaults

Restoring the factory settings erases all configuration and settings you have programmed.

To erase your programs

1. Scroll to the Configuration menu and then press **Select**.
2. Scroll to Erase Programs and then press **Select**.
3. Press **Up** or **Down** to select Yes and then press **Select**.



Erasing the programs erases *all configuration and lighting programs* you have entered into in the PLC.

Appendices

The Appendices section contains useful information to help you get the most out of your PLC.

- **Appendix A: Worksheets** below
- **Appendix B: Troubleshooting** on page 46
- **Appendix C: Hints, tips, and frequently asked questions** on page 47
- **Appendix D: Glossary** on page 48

Appendix A: Worksheets

Appendix A contains worksheets designed to help you configure the PLC and create lighting programs. Use these worksheets to help plan how you will configure the control and how you will set up your lighting programs.

- **Program group worksheet** on page 39
- **Segment worksheets** on page 40
- **Trigger worksheets** on page 41

Program group worksheet

Use the program group worksheet to help configure your program groups and relay trip levels. For more information, see **Assigning outputs to program groups** on page 22 and **Setting relay trip levels** on page 23.

	Program group		
Output	**Group A**	**Group B**	**Independent**
Variable1 (AC)			
Variable2 (AC)			
Variable3 (DC)			
Variable4 (DC)			
Relay1			
Relay2			

Relay	**Program group**	**ON level**	**OFF level**
Relay1			
Relay2			

Segment worksheets

Use the segments worksheets to help create your lighting programs. For more information, see **Adding segments** on page 27.

Group A	
Segment	**Start day**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Group B	
Segment	**Start day**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Relay1	
Segment	**Start day**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Relay2	
Segment	**Start day**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

Trigger worksheets

Use the trigger worksheets to help create your lighting programs. For Group A or B programs, use the Group A/B worksheets. For independent relay programs, use the independent relay worksheets.

Below are examples of each type of trigger worksheet. For more information, see **Setting up triggers on page 28**.

Group A/B worksheets

Segment	*1*		
Trigger	**Start time** (hh:mm)	**Light level** (0 to 100)	**Ramp time** (min)
1	*06:00*	*80*	*30*
2	*09:00*	*50*	*30*

Independent relay worksheets

Segment	*1*	
Trigger	**Start time** (hh:mm)	**Relay position** (ON/OFF)
1	*06:00*	*ON*
2	*09:00*	*OFF*

There are also chart-format worksheets included. Use the type of worksheet that works best for you.

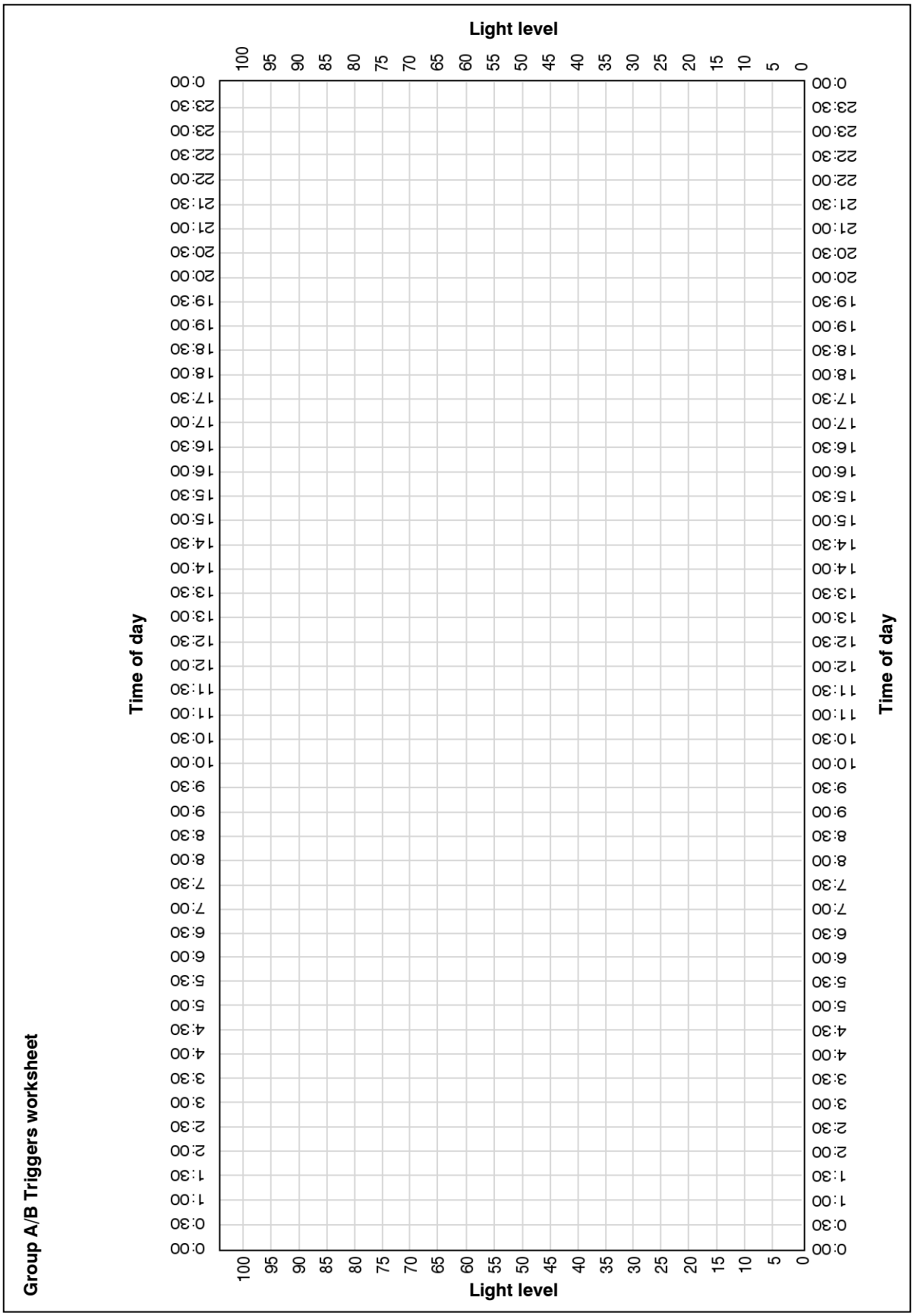
It is not possible to put a worksheet in the manual for each possible set of triggers (4 groups × 20 segments = 80 worksheets).

Make copies of the blank worksheets before entering the information in them. You can download additional PDF versions of the worksheets from Downloads section of Phason's web site at www.phason.ca.

Group A/B worksheets

Segment			
Trigger	**Start time** (hh:mm)	**Light level** (0 to 100)	**Ramp time** (h:mm)
1	:		
2	:		
3	:		
4	:		
5	:		
6	:		
7	:		
8	:		
9	:		
10	:		
11	:		
12	:		
13	:		
14	:		
15	:		
16	:		
17	:		
18	:		
19	:		
20	:		
21	:		
22	:		
23	:		
24	:		
25	:		
26	:		
27	:		
28	:		
29	:		
30	:		
31	:		
32	:		

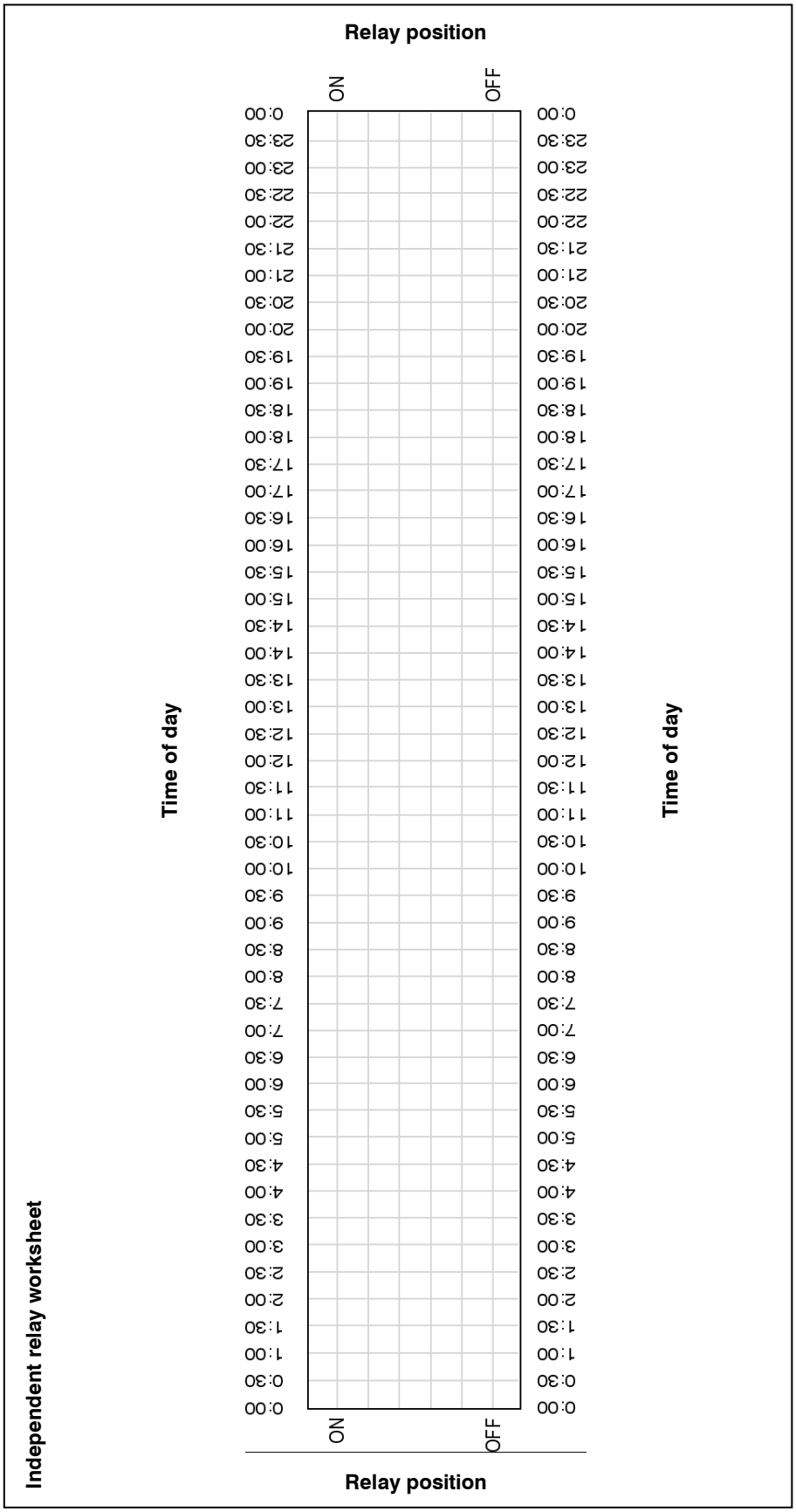
Segment			
Trigger	**Start time** (hh:mm)	**Light level** (0 to 100)	**Ramp time** (h:mm)
1	:		
2	:		
3	:		
4	:		
5	:		
6	:		
7	:		
8	:		
9	:		
10	:		
11	:		
12	:		
13	:		
14	:		
15	:		
16	:		
17	:		
18	:		
19	:		
20	:		
21	:		
22	:		
23	:		
24	:		
25	:		
26	:		
27	:		
28	:		
29	:		
30	:		
31	:		
32	:		


Group A/B Triggers worksheet
Light level
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
Time of day
0:00 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00 5:30 6:00 6:30 7:00 7:30 8:00 8:30 9:00 9:30 10:00 10:30 11:00 11:30 12:00 12:30 13:00 13:30 14:00 14:30 15:00 15:30 16:00 16:30 17:00 17:30 18:00 18:30 19:00 19:30 20:00 20:30 21:00 21:30 22:00 22:30 23:00 23:30 0:00
Light level
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
Time of day
0:00 0:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00 5:30 6:00 6:30 7:00 7:30 8:00 8:30 9:00 9:30 10:00 10:30 11:00 11:30 12:00 12:30 13:00 13:30 14:00 14:30 15:00 15:30 16:00 16:30 17:00 17:30 18:00 18:30 19:00 19:30 20:00 20:30 21:00 21:30 22:00 22:30 23:00 23:30 0:00

Independent relay worksheets

Segment		
Trigger	**Start time** (hh:mm)	**Relay position** (ON/OFF)
1	:	
2	:	
3	:	
4	:	
5	:	
6	:	
7	:	
8	:	
9	:	
10	:	
11	:	
12	:	
13	:	
14	:	
15	:	
16	:	
17	:	
18	:	
19	:	
20	:	
21	:	
22	:	
23	:	
24	:	
25	:	
26	:	
27	:	
28	:	
29	:	
30	:	
31	:	
32	:	

Segment		
Trigger	**Start time** (hh:mm)	**Relay position** (ON/OFF)
1	:	
2	:	
3	:	
4	:	
5	:	
6	:	
7	:	
8	:	
9	:	
10	:	
11	:	
12	:	
13	:	
14	:	
15	:	
16	:	
17	:	
18	:	
19	:	
20	:	
21	:	
22	:	
23	:	
24	:	
25	:	
26	:	
27	:	
28	:	
29	:	
30	:	
31	:	
32	:	


Relay position
ON
OFF
Time of day
0:00
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
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17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
0:00
Time of day
Independent relay worksheet
ON
OFF
Relay position

Appendix B: Troubleshooting

- If you are having problems using the PLC, look up the problem in the table below and then follow the instructions to resolve the problem.
- If you have a problem that is not listed here, try to determine what might be causing the problem.
- If you cannot resolve the problem, call your dealer or Phason's customer support (see **Service and technical support** at the front of the manual).

Problem	Possible cause	Possible resolution
The display does not light up or display text.	No power to the unit.	◇ Make sure there is power to the unit.
	The ribbon cable is not connected.	◇ Make sure the ribbon cable is connected. For more information, see **PLC-1 layout** on page 12 or **PLC-2 layout** on page 13.
The lamps are not at the expected intensity	The time on the PLC clock is incorrect.	◇ Make sure the time on the PLC clock is correct. For more information, see **Setting the current time** on page 25.
	The programs are not running.	◇ Start the programs. For more information, see **Starting and stopping the lighting programs** on page 31.
	The control is in manual mode.	◇ Exit manual mode. For more information, see **Using manual override mode** on page 33.
	Triggers are overlapping.	◇ Make sure all segments and triggers are correct and that there are no overlapping triggers. For more information, see **Creating lighting programs** on page 26.
The outputs are not following the lighting program.	The outputs are not assigned a program group.	◇ Assign the outputs to the correct program group. For more information, see **Assigning outputs to program groups** on page 22.

Appendix C: Hints, tips, and frequently asked questions

Hints and tips

- Use the worksheets in **Appendix A: Worksheets** on page 38 to help you configure the control and create the lighting programs. This can save you time when initially setting up the PLC.
- Use a PLC Saver to store your settings. The PLC Saver allows you to keep a backup of your configuration and lighting programs. In addition, you can use the PLC Saver to transfer the information to other PLCs. This can save you time if you need to restore your settings or set up new PLCs.

Common questions

How do I restart the lighting programs?

Start them again and change the current day to '1'. This will start the programs at segment 1, day 1.

What happens if the power goes out?

The PLC retains its settings, program information, and current program day. When the power is restored, the lights and other equipment will adjust to the settings they should be at according to the lighting programs.

Appendix D: Glossary

AC	Alternating current
DC	Direct current
Foot-candle	A measure of light intensity. One foot-candle equals 10.76 lux.
Light level	A value from 0 to 100 the PLC uses to measure the intensity of light. Zero is off and 100 is fully on.
Light intensity	The amount or brightness of light. Light intensity is usually measured in foot-candles or lux. You can measure ambient light using an ambient light meter.
Lighting program	The settings (duration, segments, triggers, light levels, etc.) the PLC uses to control the outputs to during the period.
Lux	The metric measure of light intensity. One lux equals 0.0929 foot-candles.
Period	The duration (up to 365 days) of the lighting program.
Program group	A collection of outputs that follow the same lighting program.
Ramp time	The amount of time the PLC takes to adjust the light from one light level to the next.
Relay trip level	The light level at which a relay turns on or off if it is assigned to program Group A or Group B.
Segment	A part of the lighting program where all the days have the same triggers. There can be up to 20 segments per lighting program.
Trigger	An event in the lighting program that causes the light level to change, or a relay to change position (ON/OFF).
VAC	Volts of alternating current
VDC	Volts of direct current

Index

A

AC outputs ..... See variable AC outputs
accessories 3
adding
  lighting programs 26–30
  segments 27–28
  triggers 28–30
advancing lighting programs 32
alarm relay
  electrical ratings 3, 10
  installation 17
  location (PLC-1) 12
  location (PLC-2) 13
alarm system 17
ambient light 4–5
assigning outputs to program groups 22

B

ballasts 16
brightness ..... *See* light intensity
buttons 6

C

cleaning your PLC 34
clock ..... 1, 22, 31, *See also* time
configuring ..... *See also* setup process
  current time 25
  frequency 22
  lighting programs 26–30
  relay trip levels 23
  segments 27–28
  triggers 28–30
creating
  lighting programs ..... 26–30, *See also* setup process
  segments 27–28
  triggers 28–30
current day 32
current time 25

D

day ..... 25, 32, *See also* start day
DC outputs ..... See variable DC outputs
disabling
  segments 28
  triggers 30
disconnect switch 14

E

electrical ratings 3, 10
erasing
  lighting programs 37
  segments 28
  triggers 30

F

features 1
firmware version 36
fluorescent ballasts 16
foot-candles 4
frequency ..... 22, *See also* electrical ratings
fuses 3, 10, 12, 13

G - I

groups ..... *See* program groups
incandescent lamps 14
input frequency .... 22, *See also* electrical ratings
installation
  alarm system 17
  completing 19
  fluorescent ballasts 16
  incandescent lamps 14–15
  mounting 14
  power 18
  requirements 8, 14
  variable AC outputs 14–15

variable DC outputs 16
verifying connections 18

L

lamps 14
last day setting 24
light duration
about 1, 4
adjusting ..... *See* lighting programs
light intensity ..... 1, *See also* light levels
light levels ..... *See also* light intensity
changing *See* manual mode, *See also* lighting programs
example 29
understanding 4–5
lighting programs ..... *See also* program groups
about 26–27
adding segments 27–28
adding triggers 28–30
advancing days 32
creating ..... 26–30, *See also* setup process
example 27, 29
last day setting 24
overriding ..... *See* manual mode
starting 31
stopping 31
luminance ..... *See* light intensity
lux 4

M

maintaining your PLC 34–35
manual mode 33
menu 7
mounting the PLC 14

N - O

normally open/closed ..... *See* alarm system
outputs. *See* specific output, *See* specific output
overriding lighting programs 33

P

period 24, 26, 27
PLC
about 1–3
accessories 3
buttons 6
closing the cover 19
electrical ratings 3, 10
features 1
layout (PLC-1) 12
layout (PLC-2) 13
maintaining 34–35
menu 7
servicing 34–35
setup 20
slave units 3, 18, 22
PLC Saver 3
power ..... 18, *See also* electrical ratings
power surges 9
program day 25, 32
program duration 24, 26, 27
program groups ..... *See also* lighting programs
about 22

R

ramp time ..... 26, *See also* triggers
ratings (electrical) 3, 10
relay outputs ..... See also alarm relay
assigning to program groups 22
dependency 15, 16, 22–24
electrical ratings 3, 10
location (PLC-1) 12
location (PLC-2) 13
trip levels 23
restarting programs 24

S

segments
about 26–27, 27–28
adding 27–28
disabling 28
example 27
servicing your PLC 34–35

settings .....*See* specific setting
setup process 20
slave units 3, 18, 22
start day 32
starting lighting programs 31
stopping lighting programs 31
surge suppression 9

T

three-phase power 18
time .....25, *See also* clock
triggers
  about 26–27, 28–29
  adding 28–30
  disabling 30
  examples 29
trip levels 23

U

understanding
  configuration process 19–20
  light levels 4–5
  menu system 7
  setup process 20

V

variable AC outputs
  assigning to program groups 22
  electrical ratings 3, 10
  installation 14–15
  location (PLC-1) 12
  location (PLC-2) 13
variable DC outputs
  assigning to program groups 22
  electrical ratings 3, 10
  installation 16
  location (PLC-1) 12
  location (PLC-2) 13
version 36
voltage .....*See also* power
voltage requirements 3, 10

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