DTD-1

LIGHT PROGRAM CONTROLLER

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DTD-1:   LIGHT PROGRAM CONTROLLER

GENERAL

1. INTRODUCTION

The DTD-1 is a light program controller designed for livestock buildings. Light intensities vary according to a light program sequence. Up to 12 dusk-to-dawn programs and 20 light peaks can be programmed per period with up to 20 different periods in one year. The controller includes a four-digit display, function pilot lights, two adjustment knobs and a push-button for easy programming. Additional features include:

- gradual increasing and decreasing of light intensity to simulate sunrises and sunsets
- minimum and maximum intensities specified as a percentage of full lamp intensity
- display of current time, day, light intensity and period
- step-by-step programming
- minimum inertia method used to smooth sudden transitions in light intensity
- manual mode
- an auxiliary output switches off the lights below a threshold value.
- an alarm output
- a real-time clock with backup battery for keeping time in case of a power failure
- overload protection on the output
- a 115/230 VAC - 50/60Hz power supply
- the unit can be connected to a computer communications module

2. PRECAUTIONS

> **Although fuses at the input and outputs of the controller protect its circuits in case of an overload or overvoltage, we recommend installing an additional protection device on the controller's supply circuit.**
>
> **The room temperature where the controller is located MUST ALWAYS REMAIN BETWEEN 32°F AND 104°F (0°C TO 40°C).**
>
> **To avoid exposing the controller to harmful gases or excessive humidity, it is preferable to install it in a corridor.**
>
> **DO NOT SPRAY WATER ON THE CONTROLLER**

3. MOUNTING INSTRUCTIONS

Open the latch on the right and lift the cover. Mount the enclosure on the wall using four screws. Be sure the electrical knockouts are at the bottom of the enclosure in order to prevent water from entering the controller. Insert the screws in the mounting holes provided and tighten. Fasten the black caps provided with the controller onto the mounting holes.

4. CONNECTIONS

To connect the controller, refer to the wiring diagram enclosed with this user's manual.

⇨ Set the voltage switch to the appropriate voltage.

⇨ Use the electrical knockouts provided at the bottom of the enclosure. Do not make additional holes in the enclosure, particularly on the top of the enclosure when using a computer communications module.

⇨ Two types of alarms are currently available on the market. The first type is activated when current is cut off at the source; the other is activated when current is supplied to the input. Use the NC terminal for an alarm of the first type; otherwise use the NO terminal.

Voltage Selector
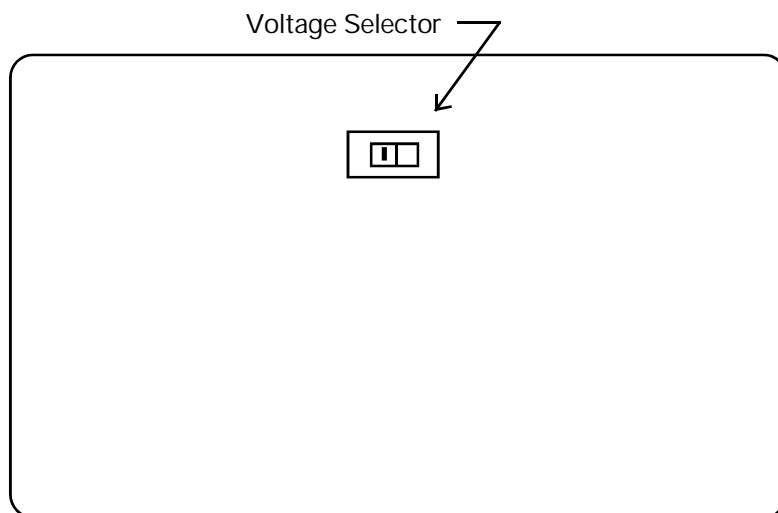
WARNING ALL WIRING MUST BE DONE BY AN AUTHORIZED ELECTRICIAN AND MUST COMPLY WITH APPLICABLE CODES, LAWS AND REGULATIONS. BE SURE POWER IS OFF BEFORE DOING ANY WIRING TO AVOID ELECTRICAL SHOCKS AND EQUIPMENT DAMAGE.

5. LOCATION OF THE CONTROLS
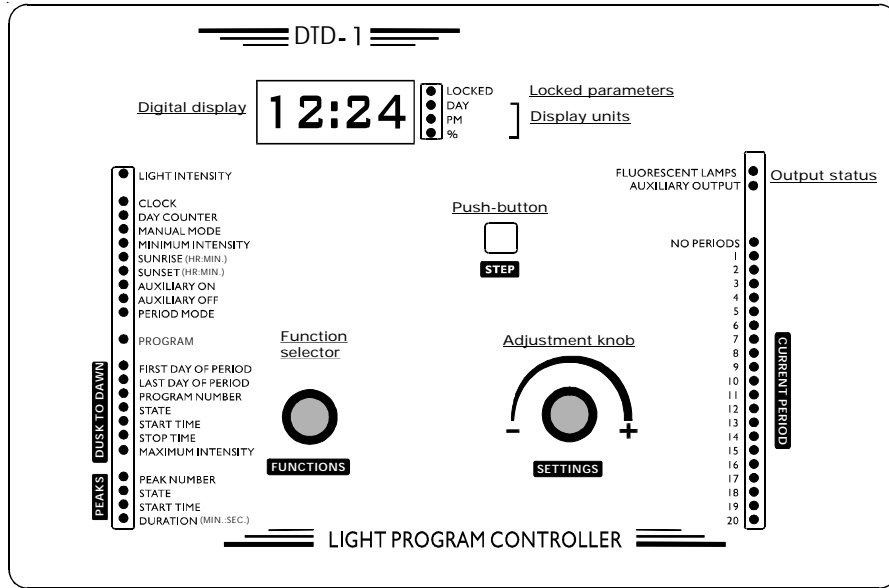
The pilot lights on the left indicate which function is currently active on the digital display. When the function has a corresponding value associated to it (for example, Start Time), the value appears on the display. The **function selector** changes the current function. The **adjustment knob** is used to adjust the currently displayed parameter value. The Day, PM and % pilot lights to the right of the display indicate the unit of the value currently displayed. If no user activity is recorded after one minute while inside a function other than CLOCK or MANUAL MODE, the display returns to the clock time.

Internal Switches:
located inside the
front cover.

#	OFF	ON
1	UNLOCKED PARAMETERS	LOCKED PARAMETERS
2	CLOCK MODE 12H	CLOCK MODE 24H
3	INCANDESCENT CURVE	FLUORESCENT CURVE
4	0-10V	1-10V
5	MANUAL ON/OFF MODE	MANUAL PROGRESSIVE MODE
6	SUNSET PERFORMED AFTER THE STOP TIME	SUNSET PERFORMED BEFORE THE STOP TIME
7-12	RESERVED	

When switch #1 is ON, the timer parameters are locked and can only be displayed (except the clock time). When switch #2 is ON, the display shows 24-hour time. Otherwise, the display shows 12 hour time (AM / PM). Use switch #3 to select a curve (ON = fluorescent curve, OFF = incandescent curve). The switch #4 determines the output operation mode (ON = 1-10V, OFF = 0-10V). The switch #5 determines the progression of lights intensity on manual mode. The switch #6 determines whether the sunset is performed before or after the Stop Time (ON= before the stop time, OFF = after the stop time).

6. OVERVIEW
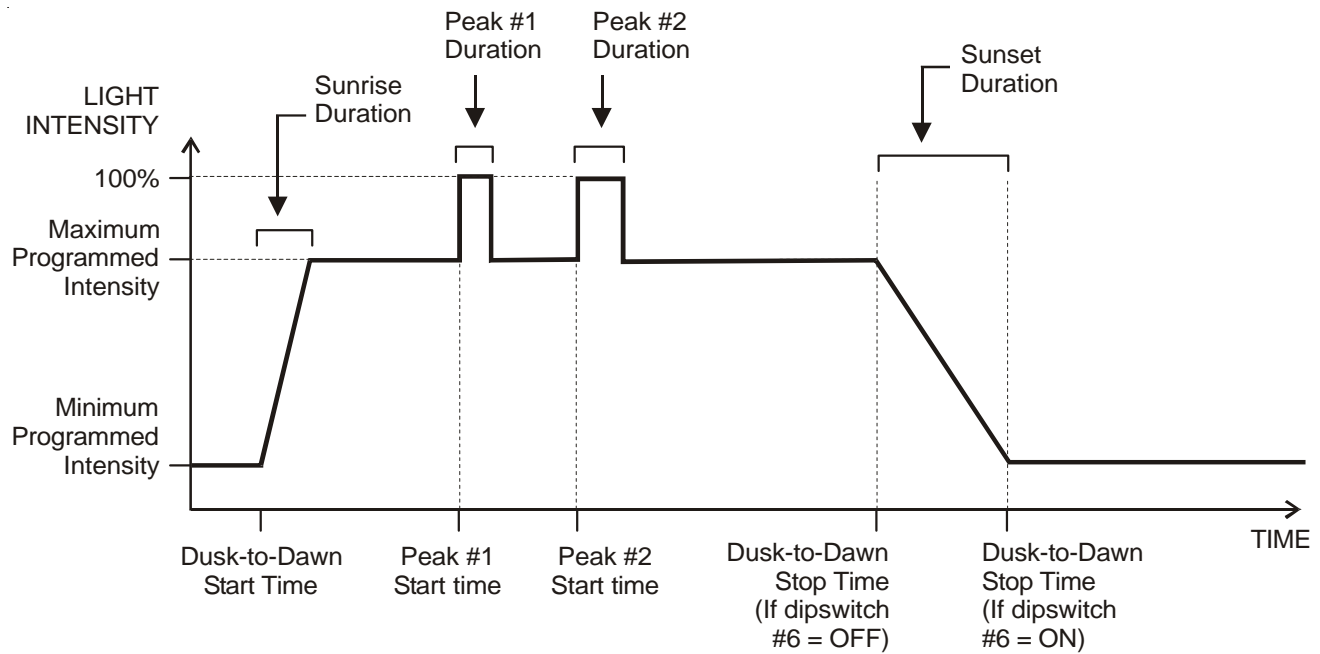
Notes:

(i) The minimum programmed intensity, sunrise duration and sunset duration are common to all light programs.

(ii) Peaks are programmed separately for each period using a start time and a duration and assume that the current intensity is at its maximum programmed intensity. If this is not the case, the peak is not executed.

(iii) Light intensity between programs never drops below the minimum programmed intensity.

(iv) The slope of the transition curve is exponential rather than linear so that the perceived transition in light intensity is equally distributed over the duration.

USING AND PROGRAMMING

7. QUICK START-UP

Follow these basic steps for activating the controller. If necessary, consult the indicated reference for each step to get detailed informations.

ADJUSTING COMMON PARAMETERS

1. Connect the control according to the wiring diagram enclosed with this manual.

2. Turn the power ON.

3. Adjust the clock (see sec. 8.2).

4. Adjust the day counter. This counter is used to activate the light programs (see sec. 8.3).

5. Adjust the minimum light intensity. This is the lowest level of lighting used when no programs are currently active (see sec. 8.4).

6. Adjust the sunrise duration. This is the duration of the transition from minimum to maximum light intensity in a light program (see sec. 8.5).

7. Adjust the sunset duration. This is the duration of the transition from maximum to minimum light intensity in a program (see sec. 8.6).

8. Adjust the percentage used for activating the auxiliary output. (see. sec 8.7).

9. Adjust the percentage used for deactivating the auxiliary output (see sec. 8.8).

10. Set the period menu to On or Off depending if you are planning to use periods or not. The controller uses periods to automatically change the lighting programs based on the animal age (see sec. 8.8).

STEP BY STEP PROGRAMMING:

Once step 1 to 10 are done, the user must enter the programming mode to adjust the periods, dusk-to-dawn and peak parameters. The first example shows the key sequence for programming 2 dusk-to-dawn programs without periods. The second example illustrates the key sequence for programming 2 periods with 2 dusk-to-dawn programs.

EXAMPLE 1 : Two dusk-to-dawn programs without periods.

Dusk-to-Dawn Program 1:

    start time: 6:30am
    stop time: 10:30am
    maximum light intensity: 80%

Dusk-to-Dawn Program 2

    start time: 12:45pm
    stop time: 3:10pm
    maximum light intensity: 75%

NB. The numbers shown in **bold** characters flash on the display.

STEP	ACTION	DISPLAY	LEDs	MEANING
1	Turn selector to PROGRAM	PUSH STEP TO ENTR PROG		Entering Program Mode
2	Press push-button	dd.**1**		Dusk-to-Dawn Program 1
3	Press push-button	**Off**		Dusk-to-Dawn Program 1 State
4	Adjust to ON	**On**		Continue with next program
5	Press push-button	**12** : 00		Program Start Time (hours; min)
6	Adjust hours	**6** :00		
7	Press push-button	6 **:00**		
8	Adjust minutes	6 **:30**		
9	Press push-button	**12** :00		Program Stop Time (hours; min)
10	Adjust hours	**10** :00		
11	Press push-button	10 **:00**		
12	Adjust minutes	10 **:30**		
13	Press push-button	**0**	%	Max intensity for Program 1
14	Adjust maximum light intensity	**80**	%	
15	Press push-button	dd.**2**		Dusk-to-Dawn Program 2
16	Press push-button	**Off**		Dusk-to-Dawn Program 2 State
17	Adjust to ON	**On**		Continue with next program

STEP	ACTION	DISPLAY	LEDs	MEANING
18	Press push-button	**12** : 00		Program Start Time (hours; min)
19	Adjust hours	**12** :00	pm	
20	Press push-button	12 **:00**	pm	
21	Adjust minutes	12 **:45**	pm	
22	Press push-button	**12** :00	pm	Program Stop Time (hours; min)
23	Adjust hours	**3** :00	pm	
24	Press push-button	3 **:00**	pm	
25	Adjust minutes	3 **:10**	pm	
26	Press push-button	**0**	%	Max intensity for Program 2
27	Adjust maximum light intensity	**75**	%	
28	Press push-button	dd.**3**		Dusk-to-Dawn Program 3
29	Press push-button	**OFF**		
30	Adjust program state to Off	**OFF**		End of Dusk-to-Dawn Programs
31	Adjust program to PE.1	PE.**1**		Light Peak Program 1
32	Press push-button	**On**		Light Peak Program 1 State
33	Adjust program PE.1 to Off	**Off**		End of Light Peak Programs
34	Press push-button	PUSH STEP TO ENTR PROG		
35	Turn the selector to another function			

EXAMPLE 2 : Two periods with 2 Dusk-to-Dawn programs

PERIOD 1
Dusk-to-Dawn 1
start time: 6:30am
stop time: 10:30am
maximum light intensity: 80%

PERIOD 2
Dusk-to-Dawn 1
start time: 6:00am
stop time: 11:30am
maximum light intensity: 85%

Dusk-to-Dawn 2
start time: 12:45pm
stop time: 3:10pm
maximum light intensity: 75%

Dusk-to-Dawn 2
start time: 1:45pm
stop time: 4:30pm
maximum light intensity: 80%

NB. The numbers shown in **bold** characters flash on the display.

STEP	ACTION	DISPLAY	LEDs	MEANING
1	Turn selector to PROGRAM	PUSH STEP TO ENTR PROG		Entering Program Mode
2	Press push-button	1	day	First day of Period 1 (day 1 by default)
3	Press push-button	**365**	day	Last day of Period 1
4	Adjust last day of Period 1	**40**	day	
5	Press push-button	dd.**1**		Dusk-to-Dawn Program 1
6	Press push-button	**Off**		Dusk-to-Dawn Program 1 State
7	Adjust to ON	**On**		Continue with next program
8	Press push-button	**12** : 00		Program Start Time (hours; min)
9	Adjust hours	**6** :00		
10	Press push-button	6 :**00**		
11	Adjust minutes	6 :**30**		
12	Press push-button	**12** :00		Program Stop Time (hours; min)
13	Adjust hours	**10** :00		
14	Press push-button	10 :**00**		
15	Adjust minutes	10 :**30**		
16	Press push-button	**0**	%	Max intensity for Program 1
17	Adjust maximum light intensity	**80**	%	
18	Press push-button	dd.**2**		Dusk-to-Dawn Program 2
19	Press push-button	**Off**		Dusk-to-Dawn Program 2 State
20	Adjust to ON	**On**		Continue with next program

STEP	ACTION	DISPLAY	LEDs	MEANING
21	Press push-button	**12** : 00		Program Start Time (hours; min)
22	Adjust hours	**12** :00	pm	
23	Press push-button	12 :**00**	pm	
24	Adjust minutes	12 :**45**	pm	
25	Press push-button	**12** :00	pm	Program Stop Time (hours; min)
26	Adjust hours	**3** :00	pm	
27	Press push-button	3 :**00**	pm	
28	Adjust minutes	3 :**10**	pm	
29	Press push-button	**0**	%	Max intensity for Program 2
30	Adjust maximum light intensity	**75**	%	
31	Press push-button	dd.**3**		Dusk-to-Dawn Program 3
32	Press push-button	**OFF**		
33	Adjust program state to Off	**OFF**		End of Dusk-to-Dawn Programs
34	Adjust program to PE.1	PE.**1**		Light Peak Program 1
35	Press push-button	**On**		Light Peak Program 1 State
36	Adjust program PE.1 to Off	**Off**		End of Light Peak Programs
37	Press push-button	41	day	First day of Period 2
38	Press push-button	**365**	day	Last day of Period 2
39	Adjust the last day of period 2	**365**	day	
40	Press push-button	dd.**1**		Dusk-to-Dawn Program 1
41	Press push-button	**Off**		Dusk-to-Dawn Program 1 State
42	Adjust to ON	**On**		Continue with next program
43	Press push-button	**12** : 00		Program Start Time (hours; min)
44	Adjust hours	**6** :00		
45	Press push-button	6 :**00**		
46	Adjust minutes	6 :**00**		
47	Press push-button	**12** :00		Program Stop Time (hours; min)
48	Adjust hours	**11** :00		

STEP	ACTION	DISPLAY	LEDs	MEANING
49	Press push-button	11 :**00**		
50	Adjust minutes	11 :**30**		
51	Press push-button	**0**	%	Max intensity for Program 1
52	Adjust maximum light intensity	**85**	%	
53	Press push-button	dd.**2**		Dusk-to-Dawn Program 2
54	Press push-button	**Off**		Dusk-to-Dawn Program 2 State
55	Adjust to ON	**On**		Continue with next program
56	Press push-button	**12** : 00		Program Start Time (hours; min)
57	Adjust hours	**1** :00	pm	
58	Press push-button	1 :**00**	pm	
59	Adjust minutes	1 :**45**	pm	
60	Press push-button	**12** :00	pm	Program Stop Time (hours; min)
61	Adjust hours	**4** :00	pm	
62	Press push-button	4 :**00**	pm	
63	Adjust minutes	4 :**30**	pm	
64	Press push-button	**0**	%	Max intensity for Program 2
65	Adjust maximum light intensity	**80**	%	
66	Press push-button	dd.**3**		Dusk-to-Dawn Program 3
67	Press push-button	**OFF**		
68	Adjust program state to Off	**OFF**		End of Dusk-to-Dawn Programs
69	Adjust program to PE.1	PE.**1**		Light Peak Program 1
70	Press push-button	**On**		Light Peak Program 1 State
71	Adjust program PE.1 to Off	**Off**		End of Light Peak Programs
72	Press push-button	PUSH STEP TO ENTR PROG		
73	Turn the selector to another function			

8. DESCRIPTION OF COMMON PARAMETERS

8.1 LIGHT INTENSITY

The current light intensity. Values range from 0 to 100 % of full lighting intensity.

- Turn the function selector until the LIGHT INTENSITY pilot light turns on. The current intensity is displayed. This parameter can only be displayed.

8.2 CLOCK

The clock time for operating the light programs.

- Turn the function selector until the CLOCK pilot light turns on. The current time is displayed. When 12-hour time is used, the PM pilot light to the right of the display turns on when the time displayed is PM time.

- To change the time setting, press the push-button. The hours value flashes.

- Use the adjustment knob to set the hours. Press the push-button to store the hours in memory. The minutes value flashes.

- Use the adjustment knob to set the minutes.

- Press the push-button to store the minutes in memory and reset the seconds to zero.

8.3 DAY COUNTER

The day number for operating the light programs. Values range from 1 to 365.

- Turn the function selector until the DAY COUNTER pilot light turns on. The current day is displayed.

- To change the day counter, press the push-button. The value flashes.

- Use the adjustment knob to set the day. Press the push-button. If the change in the day counter implies a jump to a new period, the light programs for the new period will be executed. If the change in the day counter implies a change in the period, the new period pilot light will turn on.

8.4 MINIMUM LIGHT INTENSITY

The lowest level of lighting used by the controller when no programs are currently active. It is expressed as a percentage of full intensity. Values range from 0 to 100%.

■   Turn the function selector until the MINIMUM INTENSITY pilot light turns on. The current value of the minimum intensity is displayed.

■   Press the push-button. The current value of the minimum intensity flashes.

■   Using the adjustment knob, adjust the minimum intensity to the desired value.

8.5 SUNRISE

The duration of the transition from minimum to maximum light intensity in a light program. Values range from 0 to 11 hours 59 minutes.

■   Turn the function selector until the SUNRISE pilot light turns on. The current value of the rising transition is displayed.

■   Press the push-button. The hours value flashes.

■   Use the adjustment knob to set the hours. Press the push-button to store the hours in memory. The minutes value flashes.

■   Use the adjustment knob to set the minutes.

■   Press the push-button to store the minutes in memory.

8.6 SUNSET

The sunset is the duration of the transition from maximum to minimum light intensity in a program. Values range from 0 to 11 hours 59 minutes.

■   Turn the function selector until the SUNSET pilot light turns on. The current value of the rising transition is displayed.

■   Press the push-button. The hours value flashes.

■   Use the adjustment knob to set the hours. Press the push-button to store the hours in memory. The minutes value flashes.

■   Use the adjustment knob to set the minutes.

■   Press the push-button to store the minutes in memory.

8.7 AUXILIARY LIGHT OUTPUT

Most fluorescent light models have a power supply terminal on which full voltage must be applied to during normal operation. The power supply terminal must be cut off when the fluorescent lights power down.

The auxiliary output is used to program the fluorescent's light intensity on which full voltage must be activated or deactivated.
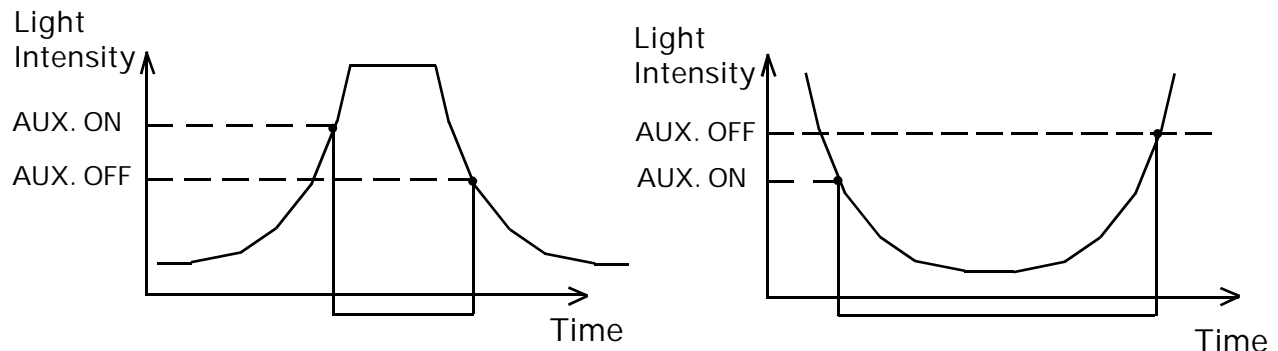
Values for both values range from 0 to 100%. <u>Note that to disable this feature, the on and off values must be set to the same value.</u>

- Turn the function selector until the AUXILIARY ON pilot light turns on. The current value of the intensity is displayed.

- Press the push-button. The current value of the intensity flashes.

- Using the adjustment knob, adjust the intensity to the desired value.

- Press the push-button to store the value in memory.

- Turn the function selector until the AUXILIARY OFF pilot light turns on. The current value of the intensity flashes on the display.

- Press the push-button. The current value of the intensity flashes on the display.

- Using the adjustment knob, adjust the intensity to the desired value.

- Press the push-button to store the value in memory.

8.8 PERIOD MODE

This parameter allows to activate or deactivate the controller's operation in period mode. If the period mode is activated, the controller will automatically change the dusk-to-dawn programs according to the animal age. For example, the controller can operate this way:

Period	Age	Hours of Operation	Lighting Time
1	Day 1 to day 5	6h00 - 16h00	10h
2	Day 6 to day 20	6h00 - 18h00	12h
3	Day 21 to day 45	6h00 - 22h00	16h

If the period mode is deactivated, the same dusk-to-dawn program will operate each day. The animal age will not influence the programming.

Refer to section 9.2 to set a programming using periods.

9. OVERVIEW OF PROGRAMMING SEQUENCE

The DTD-1 is programmed in sequential fashion using the push-button to advance to the different steps in the program. Two basic program units are defined: dusk-to-dawn programs and light peaks. Once inside a program unit, the user must step through all the parameters defined for the unit before stepping to another unit. This ensures that program definitions are always complete. However, all program units do not have to be entered at once. The user can add program units by stepping through the initial program and adding new units as required. The diagram below shows how programs are organized. The highest level of definition in a program is the period number. Each period contains a number of dusk-to-dawn programs followed by a number of light peaks. These units are ordered according to the order in which they were entered. When stepping through an existing program for a given period, all the dusk-to-dawn programs are presented, followed by all the light peaks. If you continue stepping through, the following period is presented.

> DUSK-TO-DAWN PROGRAM 1
> DUSK-TO-DAWN PROGRAM 2
> DUSK-TO-DAWN PROGRAM 3
> etc.
>
> LIGHT PEAK 1
> LIGHT PEAK 2
> etc.

Selecting a program unit: When you are at the top of a program level — for example, period 1, dusk-to-dawn program 1 or light peak 1 — the adjustment knob (on the right) can be used to select a program unit. For example, when you enter program mode, before you step through the first program unit, you can select the period you want to display. The adjustment knob allows you to go forwards and backwards in the list.

Adding a program unit: To add a new program unit to an existing program, step to the end of the list for that type of program unit (e.g. dusk-to-dawn program). The last item displayed is always a blank program used for adding new program units. Press the step push-button to step to the state (which is OFF) and change the state to ON. Follow through the parameter sequence by pressing the push-button and adjusting the parameters using the adjustment knob.

9.1 SETTING THE NO PERIOD MODE

- Turn the function selector until the PERIOD MODE pilot light turns on. The current state of the controller is displayed. When **OFF** is displayed, the controller does not use periods (the NO PERIOD pilot light is turned on). When **ON** is displayed, the controller is in period mode.

- Using the adjustment knob, adjust the controller state to **OFF**.

9.1.1 Dusk-to-Dawn Programs ⟶ (dd)

- Turn the function selector until the PROGRAM pilot light turns on. The message "PUSH STEP TO ENTR PROG" (PUSH STEP TO ENTER PROGRAM) is displayed.

- Press the push-button. The PROGRAM pilot light turns off and the PROGRAM NUMBER pilot light turns on.

Program number: Programs are numbered from 1 to 12 for each period. The display shows **dd . 1** where 1 (flashing) is the dusk-to-dawn program number. If no dusk-to-dawn programs have yet been entered in the controller, the user must start by entering program 1. Otherwise, the user can select the program using the adjustment knob. If you turn the adjustment knob past the currently defined dusk-to-dawn programs, the program will jump to the light peaks (i.e. **PE . 1** etc.). You can backtrack by turning the knob in the opposite direction.

Press the push-button to step to the program state.

Program state: The program state is used to signal the end of the dusk-to-dawn programs. As long as the program state is ON, the user can continue adding programs. When a dusk-to-dawn program is turned off, the user exits the dusk-to-dawn program cycle and enters the light peak cycle. The current state of the dusk-to-dawn program flashes on the display. Use the adjustment knob to set the state of the program.

If the program state is ON, push the push-button to step to the start time. Otherwise, push the push-button to step to light peak #. ⟶ (PE)
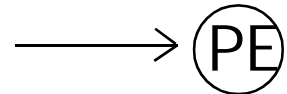
Start time: The start time is entered as a clock time. The hours value flashes on the display. Use the adjustment knob to set the hours. Press the push-button. The minutes flash on the display. Use the adjustment knob to set the minutes.

Press the push-button to step to the stop time.

Stop time: The stop time is entered as a clock time. The hours value flashes on the display. Use the adjustment knob to set the hours. Press the push-button. The minutes flash on the display. Use the adjustment knob to set the minutes.
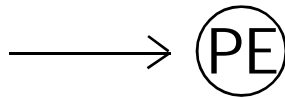
Press the push-button to step to the maximum intensity.

Maximum intensity: This is the maximum light intensity for the current light program. Use the adjustment knob to set the value as required. Values range from 0 to 100% of full intensity.

Press the push-button to step to the next dusk-to-dawn program in this period.
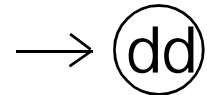
9.1.2 Light Peaks   ⟶ (PE)

Peak #: Light peaks are numbered from 1 to 20 for each period. The display shows **PE . 1** where 1 (flashing) is the light peak number. If no light peaks have yet been entered in the controller, the user must start by entering light peak 1. Otherwise, the user can select the light peak using the adjustment knob. If you turn the adjustment knob past the currently defined light peaks, the program will jump to the dusk-to-dawn programs. You can backtrack by turning the knob in the opposite direction.

Press the push-button to step to the state.   ⟶ (dd)

State: The program state is used to signal the end of the light peaks. As long as the state is ON, the user can continue adding light peaks. When a light peak is turned off, the user exits the light peak cycle and enters a new period. The current state of the light peak flashes on the display. Use the adjustment knob to set the state.

If the state is ON, push the push-button once to step to the start time.

Otherwise, push the push-button to exit programming mode.   ⟶ (EXIT)
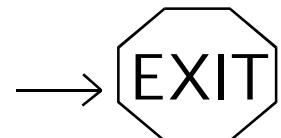
Start time: The start time is entered as a clock time. The hours value flashes on the display. Use the adjustment knob to set the hours. Press the push-button once. The minutes flash on the display. Use the adjustment knob to set the minutes.

👆 *STEP* Press the push-button to step to the duration.
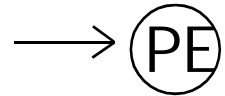
Duration: The duration is the duration of the light peak. It is measured in minutes and seconds and ranges from 0 to 15 minutes. Use the adjustment knob to set the duration. When the duration is greater than one minute, the adjustment knob increments the value in steps of five seconds.

👆 *STEP* Press the push-button to step to the next light peak.   ⟶ (PE)

## 9.2 SETTING THE PERIOD MODE

9.2.1 Adjusting the Period Mode

■ Turn the function selector until the PERIOD MODE pilot light turns on. The current state of the controller is displayed. When **OFF** is displayed, the controller does not use periods (the NO PERIOD pilot light is turned on). When **ON** is displayed, the controller is in period mode (the PERIOD 1 pilot light is turned on).

■ Using the adjustment knob, adjust the controller state to **ON**.

Programming:

■ Turn the function selector until the PROGRAM pilot light turns on. The message "PUSH STEP TO ENTR PROG" (PUSH STEP TO ENTER PROGRAM) is displayed.

■ Press the push-button. The PROGRAM pilot light turns off and the FIRST DAY OF PERIOD pilot light turns on. The appropriate PERIOD pilot light flashes to indicate which period is currently being programmed.

■ Use the push-button to step to the different program functions.

Selecting a period: If no periods are currently programmed in the system, the user must start with the first period starting on day 1. If periods have been programmed, the user can step to a particular period by using the adjustment knob on the right. The flashing PERIOD pilot lights on the right indicate the current period being programmed. The steady PERIOD pilot light represents the currently active period.

Periods $\longrightarrow$ (Pr)
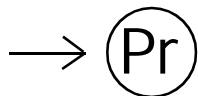
First day of period: This is the first day for the current period. If no programs have been entered, this value is set to 1 and cannot be changed. Otherwise, the first day is the day following the last day of the previous period. Use the adjustment knob to adjust the value as required.

Press the push-button to enter the last day for this period.

Last day of period: This is the last day for the current period. Use the adjustment

knob to adjust the value as required. If this is the last period needed, the last day must be 365. If this is not done, the controller will define an empty period ending on day 365.

👆 Press the push-button to enter the dusk-to-dawn programs for this period.

9.2.2 Dusk-to-Dawn Programs
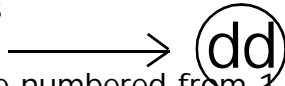
Program number: Programs are numbered from 1 to 12 for each period. The display shows **dd . 1** where 1 (flashing) is the dusk-to-dawn program number. If no programs have yet been entered in the controller, the user must start by entering program 1. Otherwise, the user can select the dusk-to-dawn program using the adjustment knob. If you turn the adjustment knob past the currently defined programs, the program will jump to the light peaks (i.e. **PE . 1** etc.). You can backtrack by turning the knob in the opposite direction.

👆 Press the push-button to step to the program state.

Program state: The program state is used to signal the end of the dusk-to-dawn programs. As long as the program state is ON, the user can continue adding programs. When a dusk-to-dawn program is turned off, the user exits the dusk-to-dawn program cycle and enters the light peak cycle. The current state of the dusk-to-dawn program flashes on the display. Use the adjustment knob to set the state of the program.

👆 If the program state is ON, push the push-button to step to the start time. Otherwise, push the push-button to step to peak #.

Start time: The start time is entered as a clock time. The hours value flashes on the display. Use the adjustment knob to set the hours. Press the push-button. The minutes flash on the display. Use the adjustment knob to set the minutes.

👆 Press the push-button to step to the stop time.

Stop time: The stop time is entered as a clock time. The hours value flashes on the display. Use the adjustment knob to set the hours. Press the push-button. The minutes flash on the display. Use the adjustment knob to set the minutes.

STEP Press the push-button to step to the maximum intensity.

Maximum intensity: This is the maximum light intensity for the current dusk-to-dawn program. Use the adjustment knob to set the value as required. Values range from 0 to 100% of full intensity.

STEP Press the push-button to step to the next dusk-to-dawn program in this period.

9.2.3 Light Peak ⟶ PE

Peak #: Light peaks are numbered from 1 to 20 for each period. The display shows **PE . 1** where 1 (flashing) is the light peak number. If no light peaks have yet been entered in the controller, the user must start by entering light peak 1. Otherwise, the user can select the light peak using the adjustment knob. If you turn the adjustment knob past the currently defined light peaks, the program will jump to the dusk-to-dawn programs. You can backtrack by turning the knob in the opposite direction.

STEP Press the push-button to step to the state.

State: The program state is used to signal the end of the light peaks. As long as the state is ON, the user can continue adding light peaks. When a light peak is turned off, the user exits the light peak cycle and enters a new period. The current state of the light peak flashes on the display. Use the adjustment knob to set the state.

STEP If the state is ON, push the push-button to step to the start time. Otherwise, push the push-button to step to the next period (see First Day of period).

If this is the last period (i.e. the Last Day of Period entered is 365), programming mode is exited.

Start time: The start time is entered as a clock time. The hours value flashes on the display. Use the adjustment knob to set the hours. Press the push-button. The minutes flash on the display. Use the adjustment knob to set the minutes.

Press the push-button to step to the duration.

Duration: The duration is the duration of the light peak. It is measured in minutes and seconds and ranges from 0 to 15 minutes. Use the adjustment knob to set the duration.

Press the push-button to step to the next light peak.

10. DISPLAYING A PROGRAM UNIT

■ Turn the function selector until the PROGRAM pilot light turns on. The message "PUSH STEP TO ENTR PROG" (PUSH STEP TO ENTER PROGRAM) is displayed.

■ Press the push-button.

■ If you are using periods, the PROGRAM pilot light turns off and the FIRST DAY OF PERIOD pilot light turns on. The appropriate PERIOD pilot light flashes to indicate which period is currently being programmed. Use the adjustment knob to step to the appropriate period and press the push-button. If you are not using periods, the PROGRAM NUMBER pilot light turns on.

■ Press the push-button to step through the different program functions.

11. DELETING A PROGRAM UNIT

Individual program units can be deleted without affecting the other program units. The program units that follow the deleted item are moved up one knotch to fill the gap, as shown below:
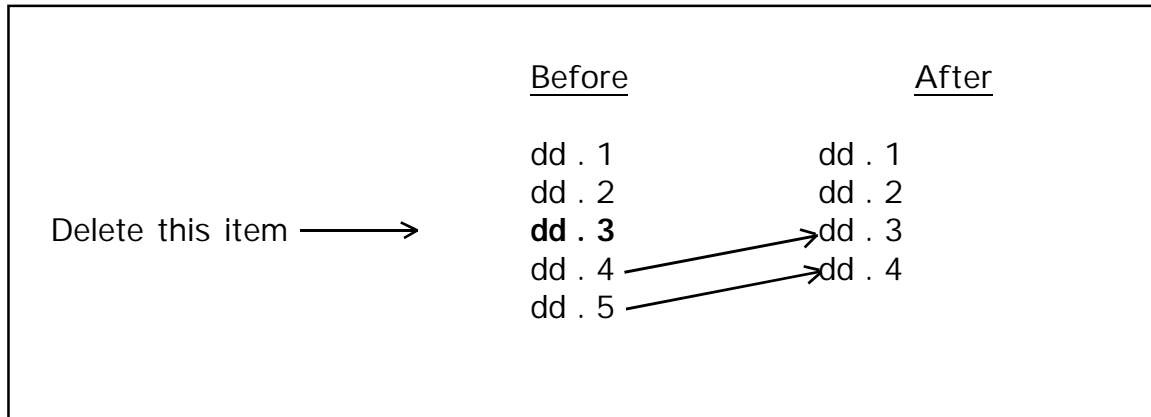
```
                              Before              After

                              dd . 1              dd . 1
                              dd . 2              dd . 2
    Delete this item  ─────→  dd . 3          ⟶ dd . 3
                              dd . 4  ⟋           dd . 4
                              dd . 5  ⟋
```
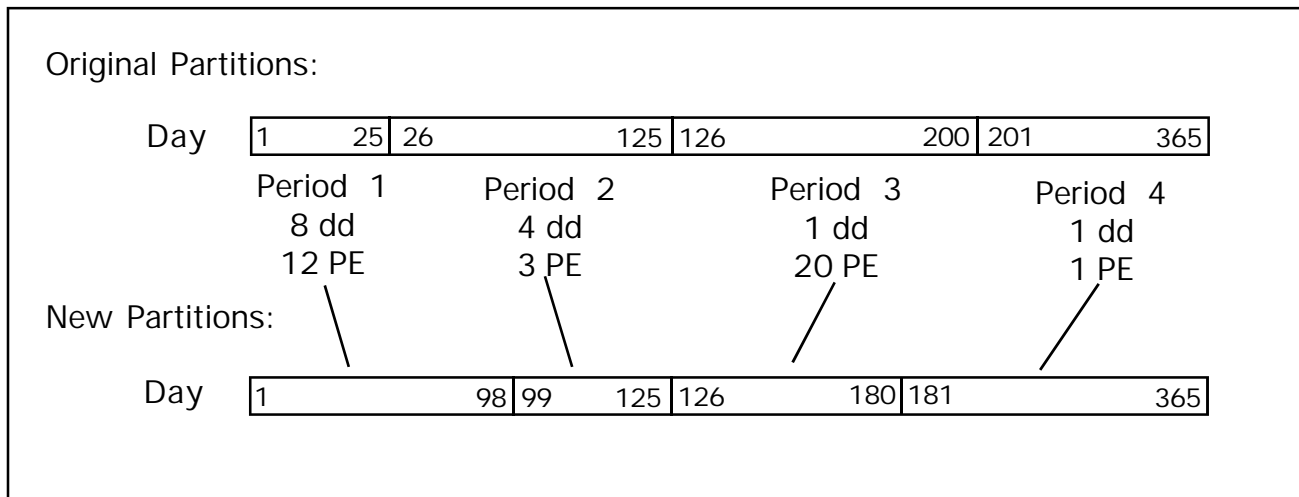
■   Turn the function selector until the PROGRAM pilot light turns on. The message "PUSH STEP TO ENTR PROG" (PUSH STEP TO ENTER PROGRAM) is displayed.

■   Press the push-button.

■   If you are using periods, the PROGRAM pilot light turns off and the FIRST DAY OF PERIOD pilot light turns on. The appropriate PERIOD pilot light flashes to indicate which period is currently being programmed. Use the adjustment knob to step to the appropriate period and press the push-button. If you are not using periods, the PROGRAM NUMBER pilot light turns on.

■   Use the adjustment knob to select the program unit to delete.

■   Press the push-button. The STATE pilot light turns on.

■   Use the adjustment knob to set the state to **OFF**.

■   Press the push-button.

The program returns to DUSK-TO-DAWN PROGRAM NUMBER or PEAK # depending on the type of program unit deleted. The display shows the first program unit (i.e. **dd.1** or **Pe.1**).

12. REPARTITIONING THE PERIODS

Periods can be repartitioned without affecting the program units defined for each period. For example:

```
Original Partitions:

     Day   │1       25│26              125│126          200│201        365│

           Period  1      Period  2        Period  3        Period  4
             8 dd           4 dd             1 dd             1 dd
            12 PE           3 PE            20 PE             1 PE
  New Partitions:

     Day   │1            98│99      125│126        180│181           365│
```

The values that cannot be changed are the first days of each period and the Last Day of the last period (always 365). Once you change the last day of a period, the first day of the next period is one greater than this value, etc.

■ Turn the function selector until the PROGRAM LED turns on. The message "PUSH STEP TO ENTR PROG" (PUSH STEP TO ENTER PROGRAM) is displayed.

■ Press the push-button.

■ The PROGRAM pilot light turns off and the FIRST DAY OF PERIOD pilot light turns on. Period 2 is defined to begin where Period 1 ends. The appropriate PERIOD pilot light flashes to indicate which period is currently being programmed. Use the adjustment knob to step to the appropriate period.

■ Press the push-button.

■ The LAST DAY OF PERIOD pilot turns on and the last day flashes on the display. Initially, the last day for period 2 is set to 365. Use the adjustment knob to change the last day to its new value. The program units defined previously for Period 2 are carried over to the new period definition as shown below. At this point, no other periods are defined. However, the program units defined for the remaining periods are still in memory. As each new period is defined, the program units stored in memory are assigned to it.

```
            Period  1              Period  2
              8 dd                   4 dd
             12 Pe                   3 Pe
    Day │1            98│99                        365│
```

- Press the push-button.

- The PROGRAM NUMBER pilot light turns on and the display shows: **"dd . 1"** where **"1"** (flashing) is the number of the dusk-to-dawn program. Turn the adjustment knob until you reach the last light peak for the current period (i.e. "**PE . x**" where **x** is the number of light peaks for the period).

- Press the push-button twice to advance to the next period.

- The FIRST DAY OF PERIOD pilot turns on for the next period. Period 3 is defined to begin where Period 2 ends.

- Press the push-button.

- The LAST DAY OF PERIOD pilot light turns on and the last day flashes on the display. Initially, the last day for period 3 is set to 365. Use the adjustment knob to change the last day to its new value. The program units defined previously for Period 3 are carried over to the new period definition, etc.

```
            Period  1        Period  2        Period  3
              8 dd             4 dd             1 dd
             12 PE            3 PE             20 PE
    Day │1          98│99        126│127                    365│
```

Notes:

(i) If you repartition so as to reduce the number of periods, the programs belonging to the deleted periods are kept in memory but are not executed. They can be retrieved at a later time by adding periods.

(ii) You can add a new period by repartitioning so as to increase the number of periods. New periods are added onto the end of the list.

13. MANUAL MODE

Manual mode is used to manually control the light intensity. When the controller is in manual mode, all light programs are stopped. When the user exits manual mode, programming is resumed according to the current clock time. If a power failure occurs while in manual mode, the controller will resume operation at the same light intensity when power is restored.

■   Turn the function selector until the MANUAL MODE pilot light turns on. The current light intensity expressed as a percentage of full intensity flashes on the display.

■   Use the adjustment knob to manually set the light intensity. Values range from 0 to 100 % of full intensity.

14. ALARM CONDITIONS

An alarm is set off when one of the following situations occurs:

(i)   the permanent memory chip is not working properly
(ii)   a power failure occurs
(iii)   the microprocessor is defective.

15. BACKUP BATTERY

A CR-2032 coin-type lithium battery is included with the controller. It is used to power the internal clock in the event of a power failure. None of the other functions will operate if this happens. When power is restored, the DTD-1 will resume activation of the dusk-to-dawn programs and peaks according to the current clock time.

16. TECHNICAL SPECIFICATIONS

Supply: 115/230 VAC, 50/60 Hz, overload and overvoltage protection fuse F11-1A fast blow.

Incandescent Output: Variable output, 115/230 VAC, 50/60 Hz, 1200W (120V) or 2400W (240V) RES, fuse F1-15A slow blow.

Auxiliary Output: ON-OFF output, 115/230 VAC, 50/60 Hz 10A, fuse F2-15A slow blow.

0-10V Output   0-10V: 20mA max.

Alarm: ON-OFF output, 115/230 VAC, 50/60 Hz, 30 VDC, 3A, fuse F8-3A slow blow.

Enclosure: ABS, moisture and dust-tight.

The room temperature where the controller is located
MUST ALWAYS REMAIN BETWEEN 32° AND 104°F (0° AND 40°C).

17. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
The display doesn't work.	Circuit breaker at the service panel is off or tripped.	Reset the circuit breaker.
	Wiring is incorrect.	Correct the wiring.
	F11 input fuse is blown.	Replace the fuse.
	Voltage selector switch is in the wrong position.	Set the switch to the correct position.
	Display board interconnect cable is unplugged from the power supply board.	Plug the cable in firmly.
The controller seems to be working by the lights don't turn on.	Wiring is incorrect or loose.	Check the wiring.
	F1 output fuse is blown	Replace the fuse.
The clock time flashes.	Clock has been reset.	Set the clock.
	Battery is defective.	Set the clock. Turn off power to the unit and turn it back on. If the clock time still flashes, ask your dealer to replace the battery.
The display flashes the letters "EEPR".	Memory chip may be defective.	Press and hold push-button unit display clears. Release the push-button. Controller resets and displays clock time. Programming may be lost.
The display flashes the letters "RTC"	Real-time clock chip is either missing or shorted.	Ask your dealer to replace the chip.