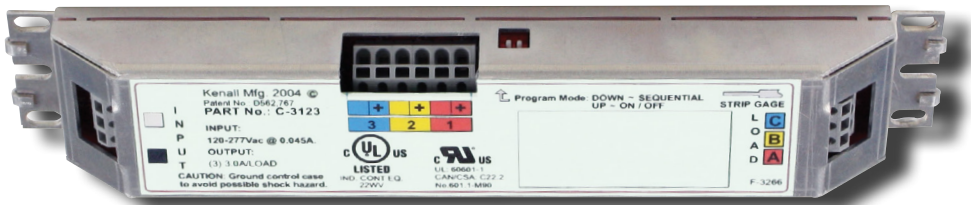


# LOW VOLTAGE CONTROLLER APPLICATION GUIDE



Technical Data

**TD**

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## Purpose of This Guide

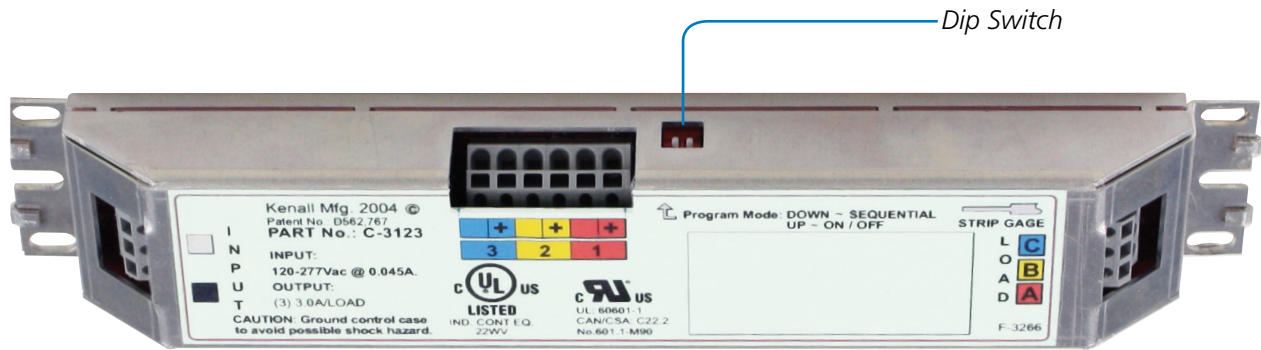
This guide explains the purpose and operation of the Kenall Low Voltage Controller (LVC).

## What is a Low Voltage Controller?

A Low Voltage Controller is a device that allows low voltage control of line voltage luminaires. Kenall's low voltage controller is a programmed interface module designed to operate up to three separate loads by the closure of low voltage momentary contact switches. These switches can be located on a patient hand held pillow device, bed side rails, or a wall.

## Control Modes: Individual vs. Sequential

Kenall's LVC has the ability to operate in 2 different modes; INDIVIDUAL or SEQUENTIAL. The 2 control modes are set using dip switches located next to the low voltage terminals. Both dip switches in the UP position (toward the label) will put the LVC in INDIVIDUAL MODE. Both dip switches in the DOWN position will be SEQUENTIAL MODE.



Individual mode allows control of 3 loads with 3 independent low voltage switches. (See Table 1)

LV Input	Loads
1	A
2	B
3	C

Table 1: Individual Mode Switching

Sequential mode allows control of 2 loads with 1 common low voltage switch and control of 1 additional load with a 2nd switch. (See Table 2)

LV Input	Loads	Sequence
1	A & B	A, B, A+B, OFF
2*	A	ON, OFF
3	C	ON, OFF

Table 2: Sequential Mode Switching

\* In sequential mode LV Input 2 provides an override control for Load A.

## Wiring the Low Voltage Controller

The LVC accepts a single universal voltage input of 120V through 277V. When the LVC is pre-installed into a Kenall light fixture, the ballasts will be pre-wired to the LVC outputs. The contractor will be responsible for connecting the incoming AC power to the LVC and connecting the low voltage wiring (Class 2) to the LVC in an isolated conduit. A low voltage wiring diagram will be supplied with the fixture and will match the intended control that was given on the questionnaire. See examples below and wiring diagrams provided by the Kenall Engineering Team.

## Electrical Specifications

### Input Voltage:

Range: 120 through 277 VAC  $\pm$ 10%  
50/60 Hertz

### Output Voltage (Relay Contacts):

Range: 120 through 277 VAC  $\pm$  10% (3 amps max per load)  
50/60 Hertz

### Low Voltage Circuits Operating Voltage

5 VDC

### Operating Temperature Range

32-176° F / 0-80° C

## Patent

U.S. Patent No. D562,767

## Listings

UL/CUL Recognized Component Medical/Dental 60601-1

UL Listed Industrial Control Device 22WV



# Individual & Sequential Load Examples

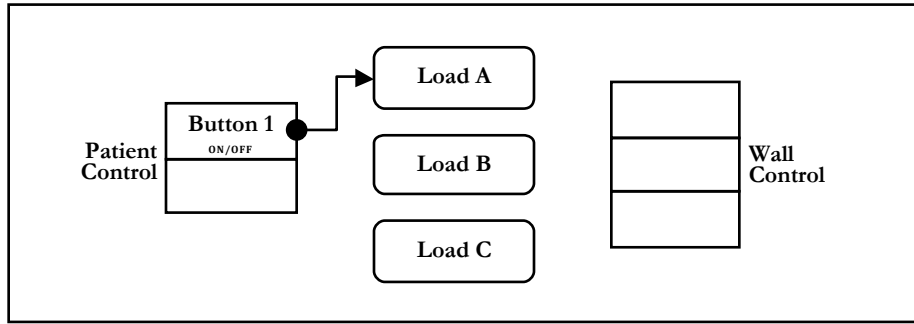


Figure 1: Individual Load, Single Button Patient Control and No Wall Control

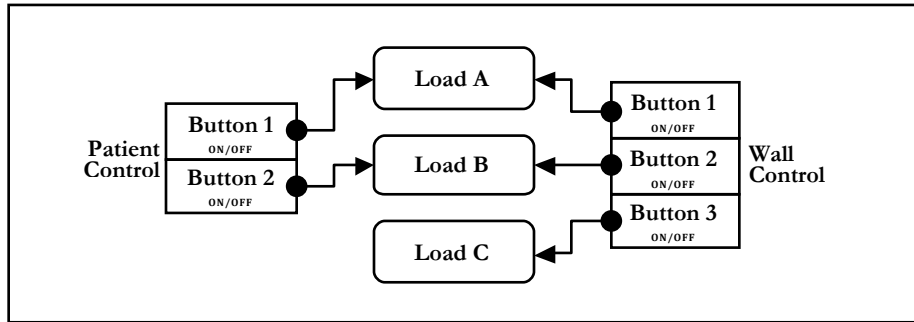


Figure 2: Individual Load, Two – Button Patient Control and Three Button Wall Control

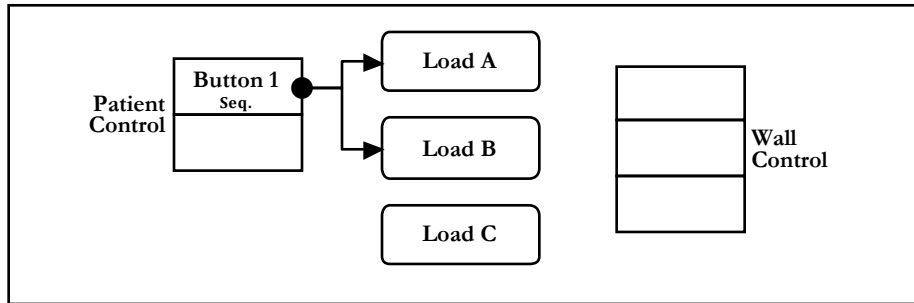


Figure 3: Sequential Load, One – Button Patient Control and No Wall Control

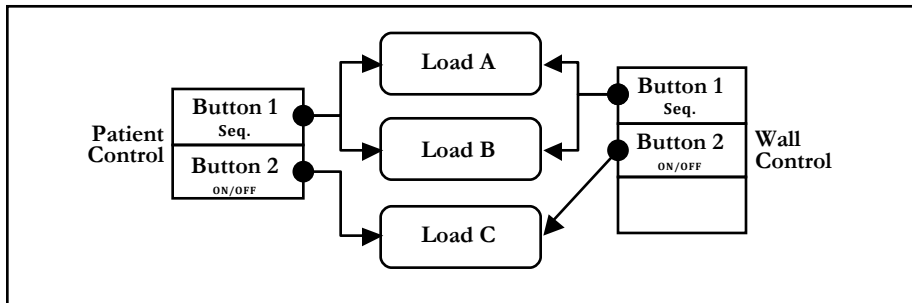


Figure 4: Sequential Load, Two – Button Patient Control and Two – Button Wall Control

## Control Questionnaire

Complete the control questionnaire below to identify your configuration and locate the corresponding drawing number found on pages 6-9. The LVC configuration description lists the luminaire(s) controlled by each of the three LVC switches and the program mode (UP or DN). In other words, the first position corresponds to the first wire pair, the second position to the second and so on. The final position describes the program mode. See the table below for luminaire description codes.

### Example Configuration

	[Load A + Load B]	[Load A]	[Load C]	[DN]	Configuration Number
Sequential	A + R	A	E	DN	F-3562

## Control Questionnaire

### A. Select Loads and Control Mode [Input luminaire codes]\*

<input type="text"/>	Load A Luminaire (required)	<b>A</b>	Ambient Light	<b>NL</b>	Night Light
<input type="text"/>	Load B Luminaire	<b>CL</b>	Chart Light	<b>O</b>	Other
<input type="text"/>	Load C Luminaire	<b>E</b>	Exam Light	<b>R</b>	Reading Light
<input type="text"/>	Individual Mode[UP] or Sequential Mode [DN] (required)	<b>UP</b>	Individual Mode	<b>DN</b>	Sequential Mode

### B. Complete one of the following:

- For Individual Mode (UP) configurations input selections from above then find your configuration in the Diagram Listing below.

	[Load A]	[Load B]	[Load C]	[UP]	Configuration Number
Individual				UP	

- For Sequential Mode (DN) configurations input selections from above then find your configuration in the Diagram Listing on opposite page.

	[Load A + B]	[Load A]	[Load C]	[DN]	Configuration Number
Sequential				DN	

Signature: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

PO#: \_\_\_\_\_ Fixture Type: \_\_\_\_\_

**\*\*By signing this, the signee gives approval of the above configuration for the LVC driver. The order will not be processed unless signed.**



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## Diagram Listing

This table lists each of the possible configurations of the Kenall LVC with the corresponding part number for the wiring diagram. Diagrams of three common configurations are found on pages 10-13.

**Description: [SW1] / [SW2] / [SW3] / [UP/DN]**

## Individual Mode Configurations

Configuration Number	Description	Configuration Number	Description	Configuration Number	Description
F-3335	A / - / - / UP	F-3369	R / NL / - / UP	F-3403	O / A / CL / UP
F-3336	CL / - / - / UP	F-3370	R / O / - / UP	F-3404	O / E / CL / UP
F-3337	E / - / - / UP	F-3371	CL / E / A / UP	F-3405	O / NL / CL / UP
F-3338	NL / - / - / UP	F-3372	CL / NL / A / UP	F-3406	O / R / CL / UP
F-3339	O / - / - / UP	F-3373	CL / O / A / UP	F-3407	R / A / CL / UP
F-3340	R / - / - / UP	F-3374	CL / R / A / UP	F-3408	R / E / CL / UP
F-3341	A / CL / - / UP	F-3375	E / CL / A / UP	F-3409	R / NL / CL / UP
F-3342	A / E / - / UP	F-3376	E / NL / A / UP	F-3410	R / O / CL / UP
F-3343	A / NL / - / UP	F-3377	E / O / A / UP	F-3411	A / CL / E / UP
F-3344	A / O / - / UP	F-3378	E / R / A / UP	F-3412	A / NL / E / UP
F-3345	A / R / - / UP	F-3379	NL / CL / A / UP	F-3413	A / O / E / UP
F-3346	CL / A / - / UP	F-3380	NL / E / A / UP	F-3414	A / R / E / UP
F-3347	CL / E / - / UP	F-3381	NL / O / A / UP	F-3415	CL / A / E / UP
F-3348	CL / NL / - / UP	F-3382	NL / R / A / UP	F-3416	CL / NL / E / UP
F-3349	CL / O / - / UP	F-3383	O / CL / A / UP	F-3417	CL / O / E / UP
F-3350	CL / R / - / UP	F-3384	O / E / A / UP	F-3418	CL / R / E / UP
F-3351	E / A / - / UP	F-3385	O / NL / A / UP	F-3419	NL / A / E / UP
F-3352	E / CL / - / UP	F-3386	O / R / A / UP	F-3420	NL / CL / E / UP
F-3353	E / NL / - / UP	F-3387	R / CL / A / UP	F-3421	NL / O / E / UP
F-3354	E / O / - / UP	F-3388	R / E / A / UP	F-3422	NL / R / E / UP
F-3355	E / R / - / UP	F-3389	R / NL / A / UP	F-3423	O / A / E / UP
F-3356	NL / A / - / UP	F-3390	R / O / A / UP	F-3424	O / CL / E / UP
F-3357	NL / CL / - / UP	F-3391	A / E / CL / UP	F-3425	O / NL / E / UP
F-3358	NL / E / - / UP	F-3392	A / NL / CL / UP	F-3426	O / R / E / UP
F-3359	NL / O / - / UP	F-3393	A / O / CL / UP	F-3427	R / A / E / UP
F-3360	NL / R / - / UP	F-3394	A / R / CL / UP	F-3428	R / CL / E / UP
F-3361	O / A / - / UP	F-3395	E / A / CL / UP	F-3429	R / NL / E / UP
F-3362	O / CL / - / UP	F-3396	E / NL / CL / UP	F-3430	R / O / E / UP
F-3363	O / E / - / UP	F-3397	E / O / CL / UP	F-3431	A / CL / NL / UP
F-3364	O / NL / - / UP	F-3398	E / R / CL / UP	F-3432	A / E / NL / UP
F-3365	O / R / - / UP	F-3399	NL / A / CL / UP	F-3433	A / O / NL / UP
F-3366	R / A / - / UP	F-3400	NL / E / CL / UP	F-3434	A / R / NL / UP
F-3367	R / CL / - / UP	F-3401	NL / O / CL / UP	F-3435	CL / A / NL / UP
F-3368	R / E / - / UP	F-3402	NL / R / CL / UP	F-3436	CL / E / NL / UP
				F-3437	CL / O / NL / UP



Configuration Number	Description
F-3438	CL / R / NL / UP
F-3439	E / A / NL / UP
F-3440	E / CL / NL / UP
F-3441	E / O / NL / UP
F-3442	E / R / NL / UP
F-3443	O / A / NL / UP
F-3444	O / CL / NL / UP
F-3445	O / E / NL / UP
F-3446	O / R / NL / UP
F-3447	R / A / NL / UP
F-3448	R / CL / NL / UP
F-3449	R / E / NL / UP
F-3450	R / O / NL / UP
F-3451	A / CL / O / UP
F-3452	A / E / O / UP
F-3453	A / NL / O / UP
F-3454	A / R / O / UP
F-3455	CL / A / O / UP

Configuration Number	Description
F-3456	CL / E / O / UP
F-3457	CL / NL / O / UP
F-3458	CL / R / O / UP
F-3459	E / A / O / UP
F-3460	E / CL / O / UP
F-3461	E / NL / O / UP
F-3462	E / R / O / UP
F-3463	NL / A / O / UP
F-3464	NL / CL / O / UP
F-3465	NL / E / O / UP
F-3466	NL / R / O / UP
F-3467	R / A / O / UP
F-3468	R / CL / O / UP
F-3469	R / E / O / UP
F-3470	R / NL / O / UP
F-3471	A / CL / R / UP
F-3472	A / E / R / UP
F-3473	A / NL / R / UP

Configuration Number	Description
F-3474	A / O / R / UP
F-3475	CL / A / R / UP
F-3476	CL / E / R / UP
F-3477	CL / NL / R / UP
F-3478	CL / O / R / UP
F-3479	E / A / R / UP
F-3480	E / CL / R / UP
F-3481	E / NL / R / UP
F-3482	E / O / R / UP
F-3483	NL / A / R / UP
F-3484	NL / CL / R / UP
F-3485	NL / E / R / UP
F-3486	NL / O / R / UP
F-3487	O / A / R / UP
F-3488	O / CL / R / UP
F-3489	O / E / R / UP
F-3490	O / NL / R / UP

## Sequential Mode Configurations

Configuration Number	Description
F-3492	A+NL / - / - / DN
F-3493	A+O / - / - / DN
F-3494	A+R / - / - / DN
F-3495	CL+A / - / - / DN
F-3496	CL+NL / - / - / DN
F-3497	CL+O / - / - / DN
F-3498	CL+R / - / - / DN
F-3499	NL+A / - / - / DN
F-3500	NL+CL / - / - / DN
F-3501	NL+O / - / - / DN
F-3502	NL+R / - / - / DN
F-3503	O+A / - / - / DN
F-3504	O+CL / - / - / DN
F-3505	O+NL / - / - / DN
F-3506	O+R / - / - / DN
F-3507	R+A / - / - / DN
F-3508	R+CL / - / - / DN
F-3509	R+NL / - / - / DN
F-3510	R+O / - / - / DN
F-3511	A+CL / A / - / DN

Configuration Number	Description
F-3512	A+NL / A / - / DN
F-3513	A+O / A / - / DN
F-3514	A+R / A / - / DN
F-3515	CL+A / CL / - / DN
F-3516	CL+NL / CL / - / DN
F-3517	CL+O / CL / - / DN
F-3518	CL+R / CL / - / DN
F-3519	NL+A / NL / - / DN
F-3520	NL+CL / NL / - / DN
F-3521	NL+O / NL / - / DN
F-3522	NL+R / NL / - / DN
F-3523	O+A / O / - / DN
F-3524	O+CL / O / - / DN
F-3525	O+NL / O / - / DN
F-3526	O+R / O / - / DN
F-3527	R+A / R / - / DN
F-3528	R+CL / R / - / DN
F-3529	R+NL / R / - / DN
F-3530	R+O / R / - / DN
F-3531	CL+NL / CL / A / DN

Configuration Number	Description
F-3532	CL+O / CL / A / DN
F-3533	CL+R / CL / A / DN
F-3534	NL+CL / NL / A / DN
F-3535	NL+O / NL / A / DN
F-3536	NL+R / NL / A / DN
F-3537	O+CL / O / A / DN
F-3538	O+NL / O / A / DN
F-3539	O+R / O / A / DN
F-3540	R+CL / R / A / DN
F-3541	R+NL / R / A / DN
F-3542	R+O / R / A / DN
F-3543	A+NL / A / CL / DN
F-3544	A+O / A / CL / DN
F-3545	A+R / A / CL / DN
F-3550	NL+A / NL / CL / DN
F-3551	NL+O / NL / CL / DN
F-3552	NL+R / NL / CL / DN
F-3553	O+A / O / CL / DN
F-3554	O+NL / O / CL / DN
F-3555	O+R / O / CL / DN



Configuration Number	Description	Configuration Number	Description	Configuration Number	Description
F-3556	R+A / R / CL / DN	F-3602	NL+CL / NL / O / DN	F-3644	R+A / - / CL / DN
F-3557	R+NL / R / CL / DN	F-3603	NL+R / NL / O / DN	F-3645	R+NL / - / CL / DN
F-3558	R+O / R / CL / DN	F-3604	O+A / O / O / DN	F-3646	R+O / - / CL / DN
F-3559	A+CL / A / E / DN	F-3605	O+CL / O / O / DN	F-3647	A+CL / - / E / DN
F-3560	A+NL / A / E / DN	F-3606	O+NL / O / O / DN	F-3648	A+NL / - / E / DN
F-3561	A+O / A / E / DN	F-3607	O+R / O / O / DN	F-3649	A+O / - / E / DN
F-3562	A+R / A / E / DN	F-3608	R+A / R / O / DN	F-3650	A+R / - / E / DN
F-3563	CL+A / CL / E / DN	F-3609	R+CL / R / O / DN	F-3651	CL+A / - / E / DN
F-3564	CL+NL / CL / E / DN	F-3610	R+NL / R / O / DN	F-3652	CL+NL / - / E / DN
F-3565	CL+O / CL / E / DN	F-3611	A+CL / A / R / DN	F-3653	CL+O / - / E / DN
F-3566	CL+R / CL / E / DN	F-3612	A+NL / A / R / DN	F-3654	CL+R / - / E / DN
F-3567	NL+A / NL / E / DN	F-3613	A+O / A / R / DN	F-3655	NL+A / - / E / DN
F-3568	NL+CL / NL / E / DN	F-3614	CL+A / CL / R / DN	F-3656	NL+CL / - / E / DN
F-3569	NL+O / NL / E / DN	F-3615	CL+NL / CL / R / DN	F-3657	NL+O / - / E / DN
F-3570	NL+R / NL / E / DN	F-3616	CL+O / CL / R / DN	F-3658	NL+R / - / E / DN
F-3571	O+A / O / E / DN	F-3617	NL+A / NL / R / DN	F-3659	O+A / - / E / DN
F-3572	O+CL / O / E / DN	F-3618	NL+CL / NL / R / DN	F-3660	O+CL / - / E / DN
F-3573	O+NL / O / E / DN	F-3619	NL+O / NL / R / DN	F-3661	O+NL / - / E / DN
F-3574	O+R / O / E / DN	F-3620	O+A / O / R / DN	F-3662	O+R / - / E / DN
F-3575	R+A / R / E / DN	F-3621	O+CL / O / R / DN	F-3663	R+A / - / E / DN
F-3576	R+CL / R / E / DN	F-3622	O+NL / O / R / DN	F-3664	R+CL / - / E / DN
F-3577	R+NL / R / E / DN	F-3623	CL+NL / - / A / DN	F-3665	R+NL / - / E / DN
F-3578	R+O / R / E / DN	F-3624	CL+O / - / A / DN	F-3666	R+O / - / E / DN
F-3579	A+CL / A / NL / DN	F-3625	CL+R / - / A / DN	F-3667	A+CL / - / NL / DN
F-3580	A+O / A / NL / DN	F-3626	NL+CL / - / A / DN	F-3668	A+O / - / NL / DN
F-3581	A+R / A / NL / DN	F-3627	NL+O / - / A / DN	F-3669	A+R / - / NL / DN
F-3582	CL+A / CL / NL / DN	F-3628	NL+R / - / A / DN	F-3670	CL+A / - / NL / DN
F-3583	CL+O / CL / NL / DN	F-3629	O+CL / - / A / DN	F-3671	CL+O / - / NL / DN
F-3584	CL+R / CL / NL / DN	F-3630	O+NL / - / A / DN	F-3672	CL+R / - / NL / DN
F-3589	O+A / O / NL / DN	F-3631	O+R / - / A / DN	F-3673	O+A / - / NL / DN
F-3590	O+CL / O / NL / DN	F-3632	R+CL / - / A / DN	F-3674	O+CL / - / NL / DN
F-3591	O+R / O / NL / DN	F-3633	R+NL / - / A / DN	F-3675	O+R / - / NL / DN
F-3592	R+A / R / NL / DN	F-3634	R+O / - / A / DN	F-3676	R+A / - / NL / DN
F-3593	R+CL / R / NL / DN	F-3635	A+NL / - / CL / DN	F-3677	R+CL / - / NL / DN
F-3594	R+O / R / NL / DN	F-3636	A+O / - / CL / DN	F-3678	R+O / - / NL / DN
F-3595	A+CL / A / O / DN	F-3637	A+R / - / CL / DN	F-3679	A+CL / - / O / DN
F-3596	A+NL / A / O / DN	F-3638	NL+A / - / CL / DN	F-3680	A+NL / - / O / DN
F-3597	A+R / A / O / DN	F-3639	NL+O / - / CL / DN	F-3681	A+R / - / O / DN
F-3598	CL+A / CL / O / DN	F-3640	NL+R / - / CL / DN	F-3682	CL+A / - / O / DN
F-3599	CL+NL / CL / O / DN	F-3641	O+A / - / CL / DN	F-3683	CL+NL / - / O / DN
F-3600	CL+R / CL / O / DN	F-3642	O+NL / - / CL / DN	F-3684	CL+R / - / O / DN
F-3601	NL+A / NL / O / DN	F-3643	O+R / - / CL / DN	F-3685	NL+A / - / O / DN





Configuration Number	Description	Configuration Number	Description
F-3686	NL+CL / - / O / DN	F-3694	CL+A / - / R / DN
F-3687	NL+R / - / O / DN	F-3695	CL+NL / - / R / DN
F-3688	R+A / - / O / DN	F-3696	CL+O / - / R / DN
F-3689	R+CL / - / O / DN	F-3697	NL+A / - / R / DN
F-3690	R+NL / - / O / DN	F-3698	NL+CL / - / R / DN
F-3691	A+CL / - / R / DN	F-3699	NL+O / - / R / DN
F-3692	A+NL / - / R / DN	F-3700	O+A / - / R / DN
F-3693	A+O / - / R / DN	F-3701	O+CL / - / R / DN
		F-3702	O+NL / - / R / DN



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# LVC Wiring Diagrams of Common Configurations



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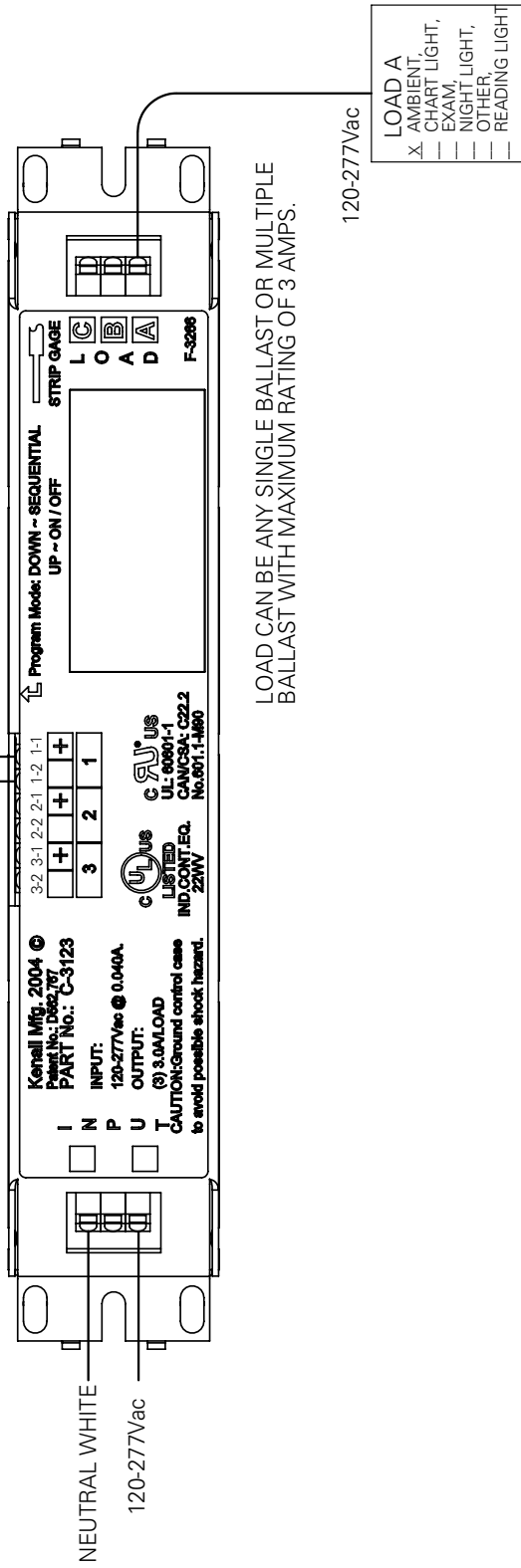
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MOMENTARY CONTACT WIRE (6 VOLT SUPPLY) HOOK-UP			
3-2	3-1	2-2	1-1
RETURN (BLUE)	SUPPLY (BLUE)	RETURN (YELLOW)	SUPPLY (RED)
↓	↑	↓	↑

LEGEND KEY	
PS	PATIENT SWITCH (AT THE BED)
	N.O. MOMENTARY CONTACT
WS	WALL SWITCH N.O. MOMENTARY CONTACT
PROGRAM MODE:	
	DOWN (SEQUENTIAL)
X	UP (ON/OFF)

LOW VOLTAGE WIRING SECTION  
\*WS - OPTIONAL

ALL NEUTRAL WIRES NEED TO BE TIED INTO THE SAME CIRCUIT.



LOAD CAN BE ANY SINGLE BALLAST OR MULTIPLE BALLAST WITH MAXIMUM RATING OF 3 AMPS.

120-277Vac

\*TOGGLE ON/OFF

SW POS.	WS #1 (1-1, 1-2)
SEQUENCE	PS #1 (1-1, 1-2)
1	LOAD A
2	ON
3	OFF
4	



A/-/UP

F-3335

041510



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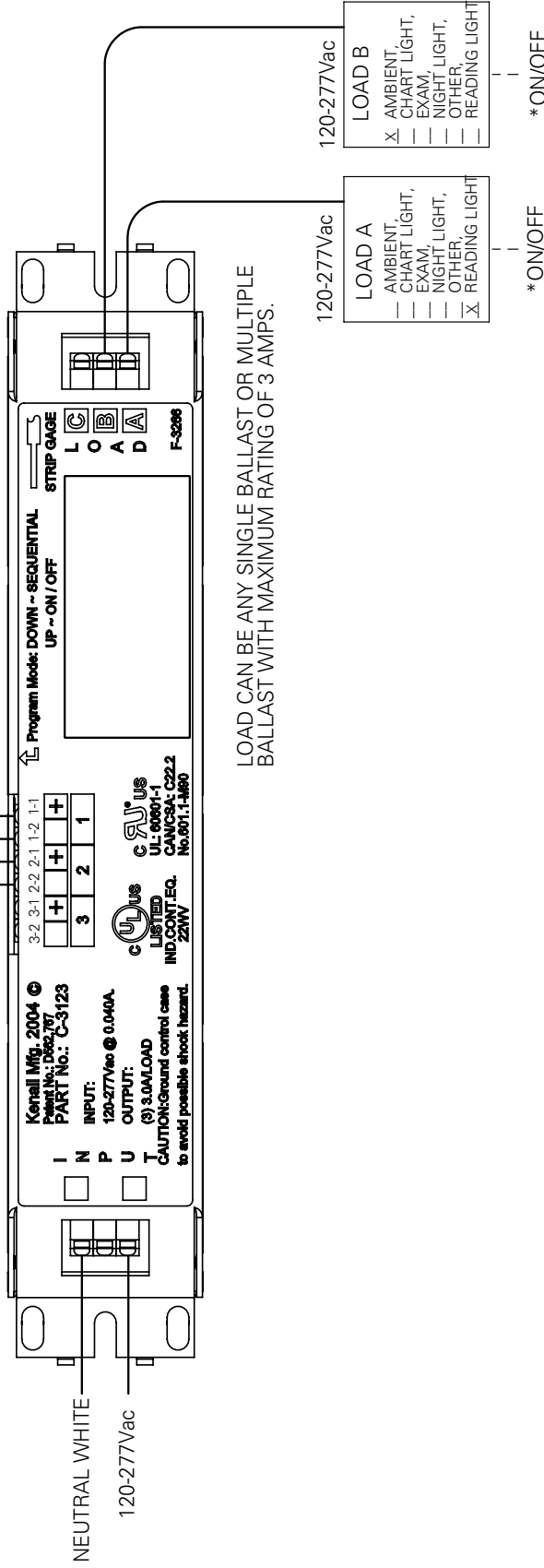
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MOMENTARY CONTACT WIRE (5 VOLT SUPPLY) HOOK-UP				
3-2	3-1	2-2	2-1	1-2
RETURN (BLUE)	SUPPLY (BLUE)	RETURN (YELLOW)	SUPPLY (YELLOW)	RETURN (RED)
↓	↑	↓	↑	↓
				↑

LEGEND KEY	
PS	PATIENT SWITCH (AT THE BED) N.O. MOMENTARY CONTACT
WS	WALL SWITCH N.O. MOMENTARY CONTACT
PROGRAM MODE:	
X	DOWN (SEQUENTIAL) UP (ON/OFF)

LOW VOLTAGE WIRING SECTION  
\*WS - OPTIONAL

ALL NEUTRAL WIRES NEED TO BE TIED INTO THE SAME CIRCUIT.



LOAD CAN BE ANY SINGLE BALLAST OR MULTIPLE BALLAST WITH MAXIMUM RATING OF 3 AMPS.

SW POS.	WS #1 (1-1, 1-2)	WS #2 (2-1, 2-2)
SEQUENCE	PS #1 (1-1, 1-2)	PS #2 (2-1, 2-2)
	LOAD A	LOAD B
1	ON	ON
2	OFF	OFF
3		
4		



R/A-/UP  
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MOMENTARY CONTACT WIRE (5 VOLT SUPPLY) HOOK-UP				
3-2	3-1	2-2	2-1	1-2
RETURN (BLUE)	SUPPLY (BLUE)	RETURN (YELLOW)	SUPPLY (YELLOW)	RETURN (RED)
↓	↑	↓	↑	↓
				↑

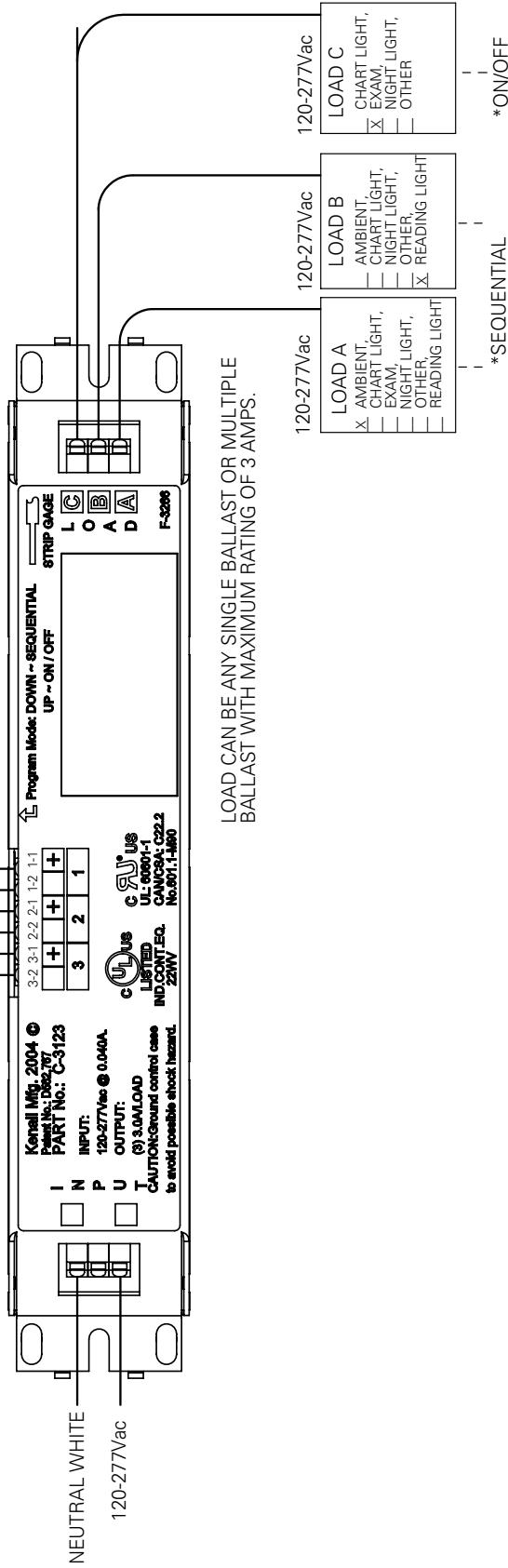
LEGEND KEY	
PS	PATIENT SWITCH (AT THE BED) N.O. MOMENTARY CONTACT
WS	WALL SWITCH N.O. MOMENTARY CONTACT

PROGRAM MODE:	
	DOWN (SEQUENTIAL)
	UP (ON/OFF)

LOW VOLTAGE WIRING SECTION  
\*WS - OPTIONAL

ALL NEUTRAL WIRES NEED TO BE TIED INTO THE SAME CIRCUIT.



LOAD CAN BE ANY SINGLE BALLAST OR MULTIPLE BALLAST WITH MAXIMUM RATING OF 3 AMPS.

SW POS.	WS #1 (1-1, 1-2)	WS #2 (2-1, 2-2)	WS #3 (3-1, 3-2)
SEQUENCE	PS #1 (1-1, 1-2)	PS #2 (2-1, 2-2)	PS #2 (3-1, 3-2)
	LOAD A	LOAD A	LOAD C
1	ON	ON	ON
2	OFF	OFF	OFF
3	ON	ON	ON
4	OFF	OFF	OFF

**KENALL**  
A+R/A/E/DN  
F-3562  
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LVC\_AppGuide-080410



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