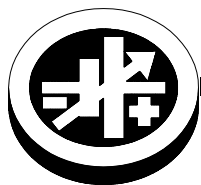


# OPERATOR MANUAL



**KEPCO** An ISO 9001 Company.

**KDA 24  
SERIES**

## KDA 24 SERIES ALARM MODULE

### I — INTRODUCTION

**SCOPE OF MANUAL.** This Operator Manual covers the installation, checkout and operation of the KDA 24 Series Alarm Modules.

**DESCRIPTION.** The Kepco KDA 24 Series Alarm modules are designed to monitor two 24V power supplies, and provide an alarm indication (both visual and Form "C" relay) when voltage is not within a preset range. The KDA 24R models contain built-in blocking (also called ORing or isolation) diodes needed for parallel-redundant configurations. KDA 24A is designed to monitor two independent power supplies; it includes neither blocking diodes nor reverse protection diodes.

Each alarm module has two identical circuits (A and B), one for each input. For KDA 24R these circuits are internally connected for parallel redundancy of the two input power supplies (see Figure 2). For KDA 24A the two circuits are completely independent (see Figure 3).

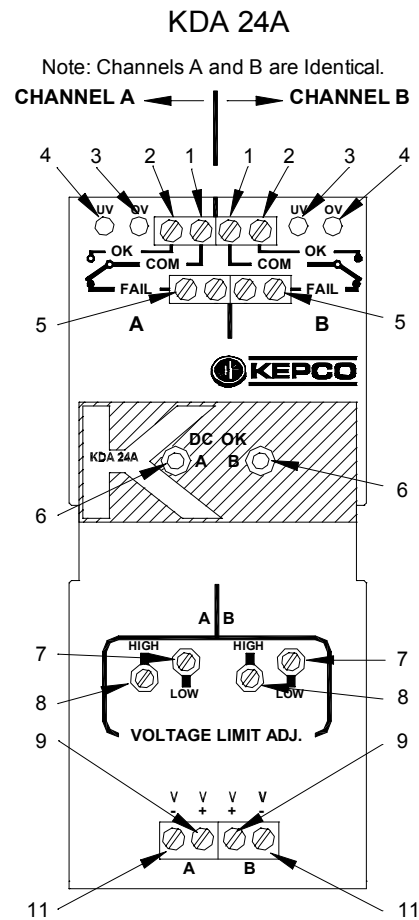
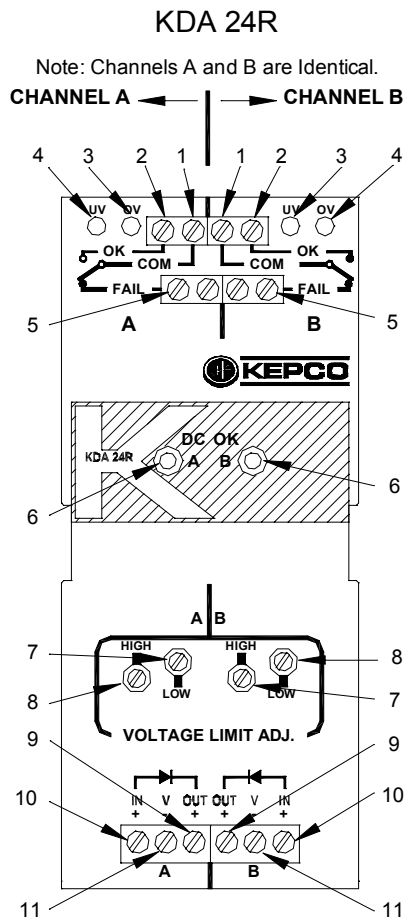
Trimpot adjustments from the front (see Figure 1) allow independent adjustment of high and low alarm ranges for both inputs. When input voltage is within the preset range, the internal alarm relay energizes and the OK contact is connected to COM. If voltage is out of range, the relay de-energizes and the FAIL contact is connected to COM. In addition, the DC OK indicator turns off and the appropriate OV (overvoltage) or UV (undervoltage) indicator turns on.

Screw terminal connections available at the front panel (top) provide easy access to FAIL, OK, and COM relay contacts.

**USER CONFIGURABLE OPTIONS.** KDA 24 Series are supplied with the DIN Rail clips rotated 180 degrees. Plugs are included to cover the HIGH and LOW trimpots if desired to prevent unauthorized adjustments once they have been preset.

### II — FEATURES

- Screw terminals for easy access wiring connections (see "Connections" on page 4 for details).
- Case acts as heat sink with no external fins or extrusions.
- Dual Input.
- Wide Input Operating Range: 12 - 35V d-c.
- Alarm settings maintained within  $\pm 1\%$  after setting.
- Suitable for n+1 redundancy applications of 24V d-c power systems (KDA 24R).
- Built-in isolation (ORing) diodes (KDA 24R).
- Alarm relay, isolated contact outputs: N.C., COM, N.O.
- Mounting: DIN rail NS35 MM styles or G-32MM styles or panel/chassis screw mounting; DIN clips are reversible.
- Dual DC OK LED (green).
- Dual Undervoltage LEDs (yellow).
- Dual Overvoltage LEDs (red).



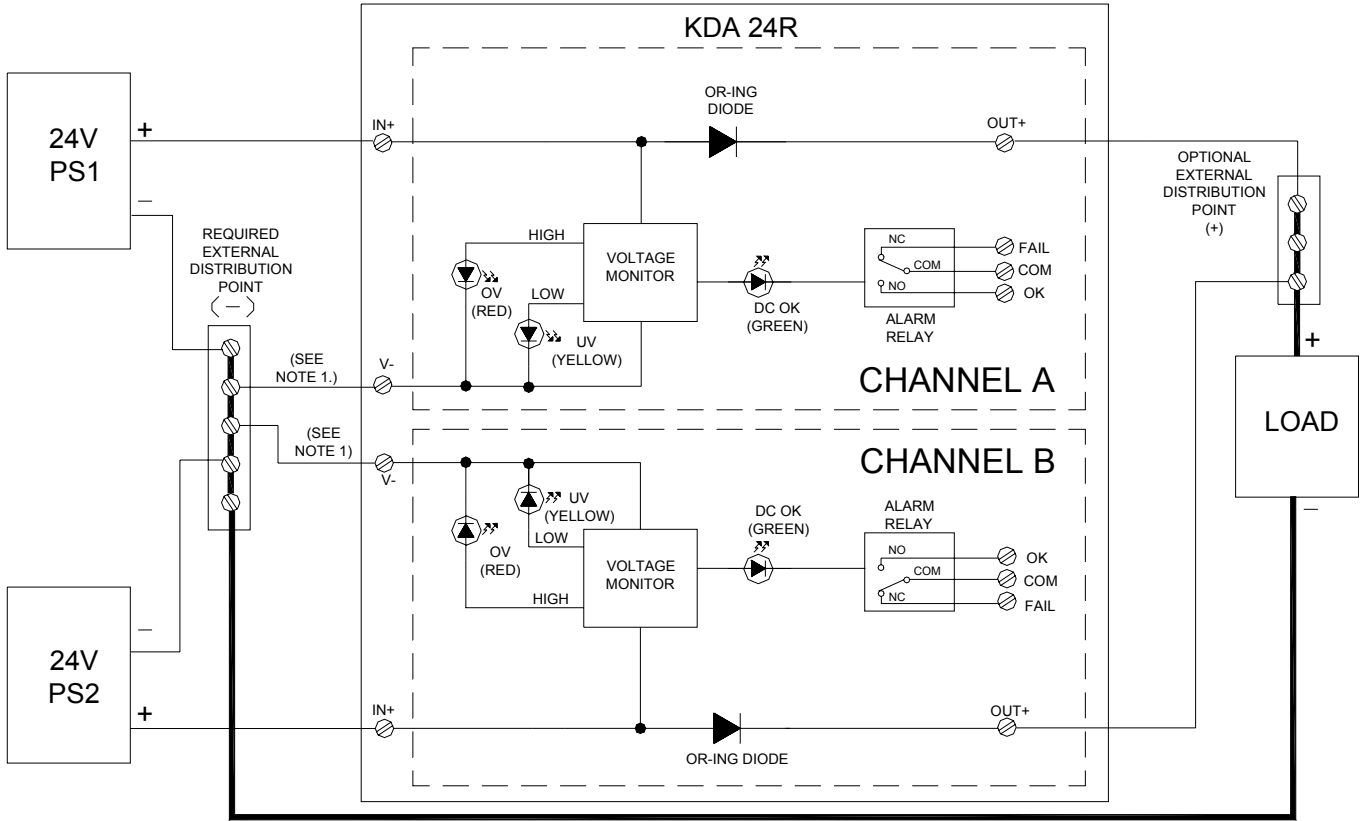
**LEGEND:**

- 1 COM Terminal (Alarm Relay Common)**  
Wire routed from top.
- 2 OK Terminal (Alarm Relay N.O contact)**  
Relay normally energized when input power OK; provides connection from COM to OK. Wire routed from top.
- 3 UV Indicator**  
Lights yellow when input voltage is below LOW setting.
- 4 OV Indicator**  
Lights red when input voltage is above HIGH setting.
- 5 FAIL Terminal (Alarm Relay N.C contact)**  
Relay deenergizes for alarm; provides connection from COM to FAIL. Wire routed from top.
- 6 DC OK Indicator**  
Lights green when input voltage is within HIGH and LOW settings.  
Light goes off if alarm detected.

- 7 LOW trimpot**  
Adjusts undervoltage (UV) setpoint.
- 8 HIGH trimpot**  
Adjusts overvoltage (OV) setpoint.
- 9 OUT+ Terminal (KDA 24R only)**  
**V+ Terminal (KDA 24A only)**  
Wire routed from bottom; see appropriate connection diagram.
- 10 IN+ Terminal (KDA 24R only)**  
Wire routed from bottom; see appropriate connection diagram.
- 11 V- Terminal**  
Wire routed from bottom; see appropriate connection diagram.

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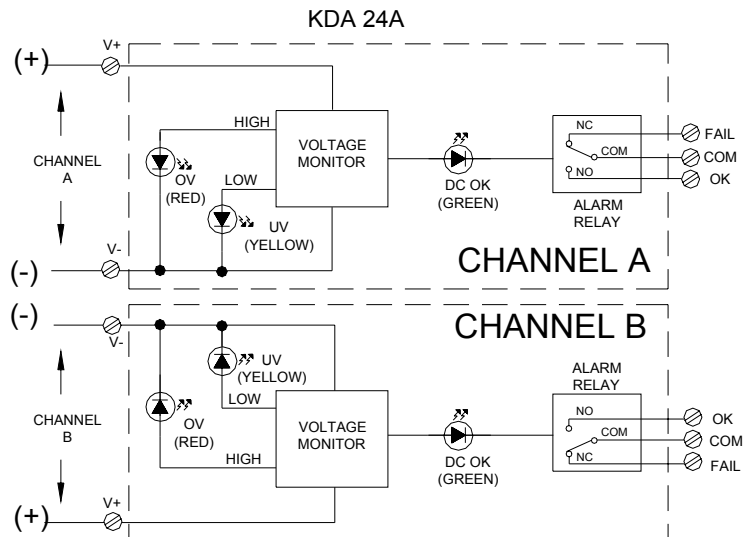
**FIGURE 1. KDA 24 SERIES COMPONENT LOCATIONS**



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- NOTES:  
 1. V. TERMINAL MUST NOT BE USED AS DISTRIBUTION POINT.  
 2. WIRES CONNECTED TO KDA 24-R MUST BE RATED FOR MAXIMUM CURRENT OF POWER SUPPLY.  
 3. WIRES CONNECTED TO LOAD MUST BE RATED FOR AT LEAST TWICE MAXIMUM CURRENT OF POWER SUPPLY.

**FIGURE 2. KDA 24R, TYPICAL CONNECTION DIAGRAM**



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**FIGURE 3. KDA 24A TYPICAL CONNECTION DIAGRAM**

### III — SPECIFICATIONS

Specifications for each model are listed below.

**TABLE 1. FEATURE SUMMARY, KDA 24 SERIES**

SPECIFICATION	KDA 24A Independent	KDA 24R Parallel Redundant
Reverse Voltage Protection	Yes	Yes
ORing (blocking) diodes	No	Yes
Undervoltage LED	Yellow = Alarm	Yellow = Alarm
Overvoltage LED	Red = Alarm	Red = Alarm
Input DC OK LED	Green = DC OK	Green = DC OK

#### INPUT CHARACTERISTICS:

##### INPUT VOLTAGE:

Nominal 24V d-c, Operating Range: 12V\*\* to 35V d-c  
 \*\* Consult factory for operation below 24V nominal.

##### NUMBER OF INPUTS:

Two (2): A and B

##### INPUT AND OUTPUT CURRENT: Per input:

30A max.

NOTE: For parallel operation of both circuits maximum output current of each circuit must not exceed 30A.

##### VOLTAGE DROP: Input to Output

0.5V d-c typ.

##### REVERSE OUTPUT VOLTAGE:

45V d-c max

##### ALARM, INPUT VOLTAGE (UNDERVOLTAGE):

Indicators (A and B): UV LED

- Relays (A and B): isolated contacts rated at 28V d-c/1A or 115V a-c/0.5A
- Range: See Figure 5 and Table 2.
- Factory preset: See Figure 5 and Table 2.
- Hysteresis: See Figure 5 and Table 2.

##### ALARM, INPUT VOLTAGE (OVERVOLTAGE):

- Indicators (A and B) OV LED
- Relays (A and B): isolated contacts rated at 28V d-c/1A or 115V a-c/0.5A
- Range: See Figure 5 and Table 2.
- Hysteresis: See Figure 5 and Table 2.
- Factory preset: See Figure 5 and Table 2.

#### ENVIRONMENTAL CHARACTERISTICS

##### OPERATING TEMPERATURE (35V INPUT MAX.):

- KDA 24A: -10 to +60°C (all orientations)
- KDA 24R: -10 to +50°C (100% load, Figure 7)
- 10 to +60°C (60% load, Figure 7)
- 10 to +30°C (mounting other than shown in Figure 4.)

##### STORAGE TEMPERATURE: -25°C to +85°C

##### COOLING: Natural convection.

#### GENERAL CHARACTERISTICS

##### ISOLATION VOLTAGE:

- Between input and ground: 500V.
- Between output and ground: 500V.
- Relay contacts are galvanically isolated.

**SAFETY:** All units designed to meet UL 508, UL 60950, TÜV Rheinland EN60950 and EN 60529 (category IP 20); KDA 24 units are CE marked per the Low Voltage Directive (LVD), EN60950.

**CONNECTIONS:** Screw terminals: M3 slotted (use cabinet tip screwdriver, flat, (0.125" [3mm] x 0.020" [0.5mm])); Wire gage: solid/stranded AWG (mm<sup>2</sup>): 24-12 (0.25-2.5); strip length: 5/16 in. [8mm], max torque: 5 lb.-in [0.5Nm].

##### WARRANTY: One year.

**WEIGHT:** KDA 24A: 0.5 lbs. (0.255 kg.)  
 KDA 24R: 1.0 lbs. (0.454 kg.)

##### DIMENSIONS:

See Figure 6.

## IV — INSTALLATION

**MOUNTING.** The KDA 24 Series Alarm modules come with DIN Rail mounting clips that accommodate: NS 35mm and 32 mm G DIN rails. DIN clips may be reversed for convenience. The unit may also be chassis mounted by removing the two clips and using four 4-40 screws where the clips were installed. See Figure 6 for outline dimensions. Refer to Figure 4 for operating temperature derating of KDA 24R models only.

**INPUT CONNECTIONS.** Input connections are routed from the bottom and secured via screw terminals from the front.

**KDA 24R.** This model consists of two identical channels (A and B) that connect two power supplies in parallel as shown in Figure 2. ORing (blocking) diodes are built-in. Connections to the load must be made through external distribution points. V- terminal must not be used as distribution points. See Figure 2 for connections; see Figure 1 for component locations.

**KDA 24A.** This model consists of two independent identical channels (A and B). Each channel may be used to monitor a voltage for overvoltage and undervoltage. See Figure 3 for connections; see Figure 1 for component locations.

**ALARM CONNECTIONS.** Alarm connections are routed from the top and secured via screw terminals from the front.

**ALARM RELAY.** The alarm relay is normally energized as long as input power is within the HIGH and LOW alarm setting. Isolated alarm relay contacts of each channel are

## V — OPERATION

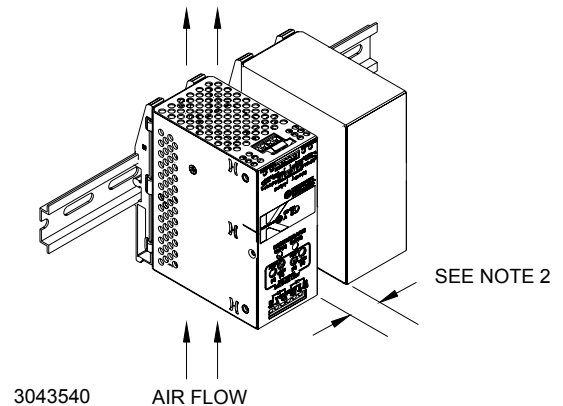
**SETTING HIGH AND LOW ALARMS.** High (overvoltage) and low (undervoltage) alarms for channels A and B are set independently. To set the alarm limits for a channel, connect a variable +24V power supply to the channel input as described in the paragraph titled "Input Connections." on page 5 and monitor the power supply output voltage using a DVM. Hysteresis causes the alarm to trip at a slightly different value depending on whether the voltage is decreasing or increasing. Hysteresis must be taken into account when setting the alarm trip points. Figure 5 shows this effect. The factory default adjustment values are shown in Table 2, as well as the guaranteed adjustment range (actual adjustment range may slightly exceed guaranteed values).

available from the front panel: COM (common), Normally Closed (FAIL) and Normally Open (OK).

**DC OK INDICATOR.** As long as input voltage is within the High and Low alarm settings the DC OK indicator lights green. If an alarm occurs (either undervoltage or overvoltage detected) the DC OK indicator of KDA 24A and KDA 24R models goes from green to off. DC OK returns to green when input voltage is again within range.

### NOTES:

1. FOR MOUNTING OF KDA 24R IN ORIENTATION OTHER THAN SHOWN BELOW, MAX. OPERATING TEMPERATURE IS 30°C. RESTRICTION DOES NOT APPLY TO KDA 24A.
2. 1/2 INCH MINIMUM SEPARATION REQUIRED BETWEEN KDA 24R AND ANY OTHER HEAT-PRODUCING MODULE ON THE DIN RAIL.



**FIGURE 4. RECOMMENDED MOUNTING ORIENTATION OF MODEL KDA 24R**

To change the HIGH and/or LOW trimpot settings (within the ranges listed in Table 2) Kepco recommends using an insulated adjustment tool, Bourns H-90 (Kepco P/N 218-1185 or equivalent). In addition, a variable output power supply with a range exceeding the minimum and maximum values listed in Table 2 is required. A DVM may be necessary to monitor the power supply output.

Each channel is independent and may be adjusted in any order.

**NOTE:** Once all LOW and HIGH alarm adjustments are acceptable, refer to "Securing Alarm Adjustments" on page 7 to secure the adjustments.

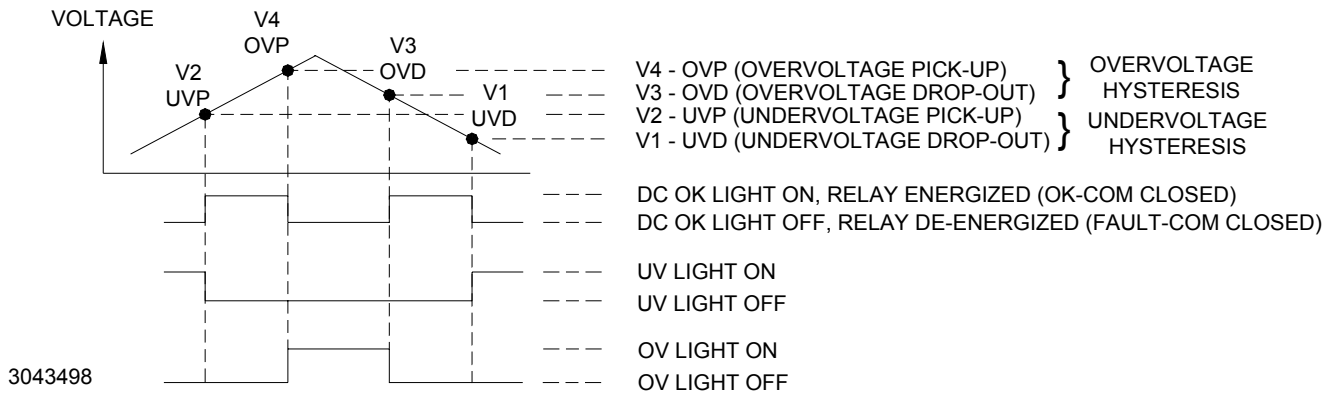


FIGURE 5. DEFAULT SETTINGS FOR HIGH/LOW ALARMS SHOWING HYSTERESIS EFFECTS

TABLE 2. HIGH AND LOW ALARM ADJUSTMENT SETTINGS

VOLTAGE CONDITION (ADJUSTMENT POT)	SETTING (SEE FIGURE 5)	GUARANTEED ADJUSTMENT RANGE		FACTORY DEFAULT VALUES ( $\pm 2\%$ )
		MIN	MAX	
UNDervOLTAGE (LOW)	V2: UVP (UNDervOLTAGE PICK-UP)	16.9V *	21.8V *	19.0V
	V1: UVD (UNDervOLTAGE DROP-OUT)	16.5V *	21.2V *	18.4V
OVERVOLTAGE (HIGH)	V4: OVP (OVERVOLTAGE PICK-UP)	27.3V *	31.8V *	30.2V
	V3: OVD (OVERVOLTAGE DROP-OUT)	26.5V *	31.0V *	29.4V

\* Contact factory for alarm settings outside tested max./min. range.

**Low Alarm (Undervoltage) Adjustment.** If the factory adjusted values are not acceptable, proceed as follows to adjust the low alarm pick-up and drop-off voltages (V2 and V1 of Figure 5). See Table 2 for the adjustment range

Note: Once all LOW and HIGH alarm adjustments are acceptable, refer to "Securing Alarm Adjustments" on page 7 to secure the adjustments

1. Connect a variable output power supply (with a range exceeding the minimum and maximum values listed in Table 2) to the channel input as described in the paragraph titled "Input Connections." on page 5. Toggle voltage points may be monitored using the visual indicators (yellow UV, green DC OK and red OV lights) or monitoring the relay contacts.
2. Turn the LOW trimpot fully CW, then adjust the power supply to the desired LOW threshold voltage (UVP, V2

shown in Figure 5). If necessary, use a DVM to monitor the power supply voltage.

3. Observe that the UV (yellow) light is lit; no other lights are lit (relay is deenergized). Slowly (approximately one complete turn in five seconds) turn the LOW trim pot CCW until the toggle point (yellow UV LED goes out, green DC OK goes on, and the relay energizes). This is V2 - UVP (undervoltage pick-up voltage) as indicated in Figure 5 and Table 2.
4. To verify the settings lower the voltage of the variable power supply by about 1.2V. Observe that the yellow UV light is lit; no other lights are lit (relay is deenergized).
5. Then slowly increase the voltage until the toggle point occurs (yellow UV LED goes out, green DC OK light goes on, and the relay energizes).

6. Verify that this toggle point is the desired value for UVP voltage. If this voltage is not correct, proceed to step 7 for fine tuning. If this voltage is correct, slowly lower the variable power supply voltage and verify that value of UVD (V1, Figure 5) is adequate (Hysteresis value 0.6V typ. see Figure 5)
7. If the toggle point is missed, fine tune as follows: Adjust power supply voltage to the desired UVP value (Under-voltage pick-up voltage). Turn the LOW trimpot CW about two to three turns until the system toggles back again (yellow UV light on, DC OK light off, relay deenergized). *Very slowly* turn LOW trimpot CCW until the toggle point is reached: yellow UV light goes out, green DC OK light goes on, and the relay energizes. Reverify again per step 6.

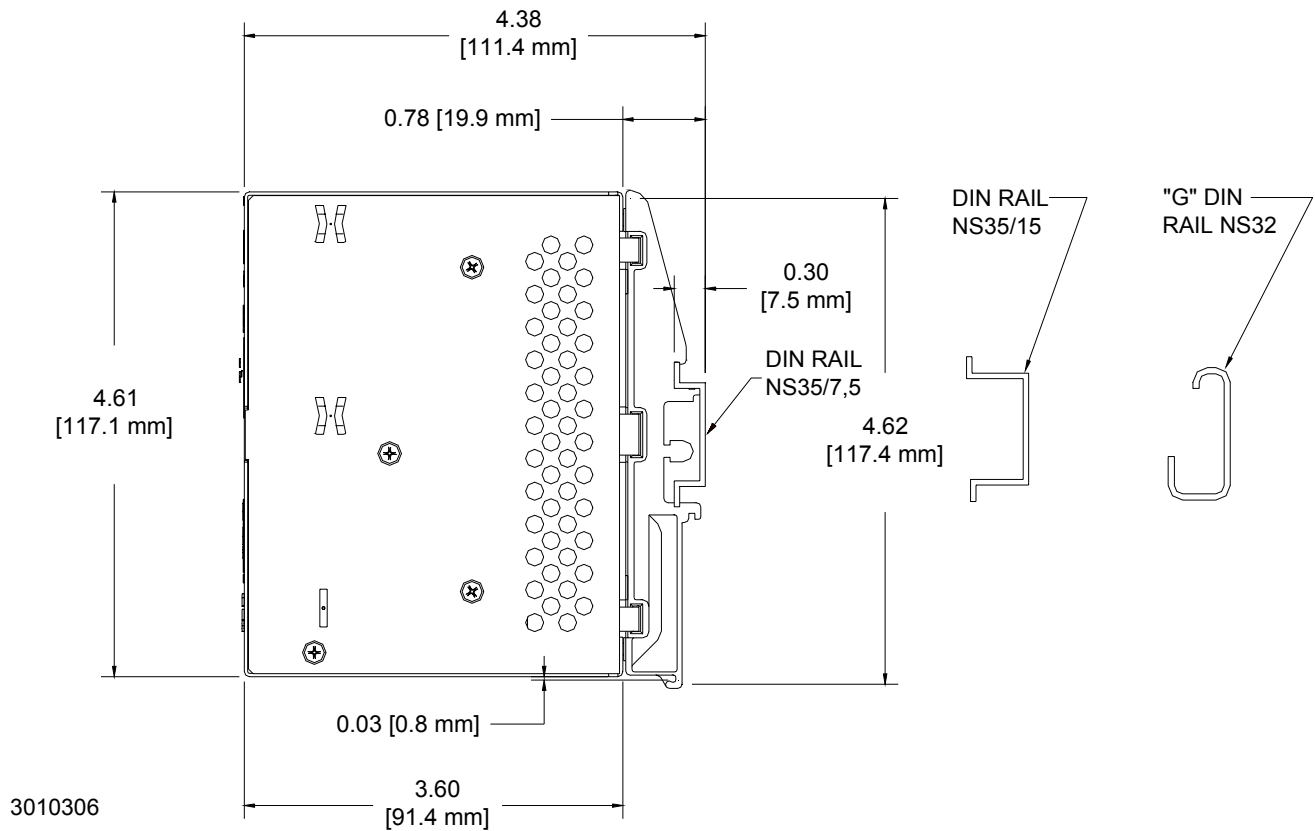
**High Alarm (Overvoltage) Adjustment.** If the factory adjusted values are not acceptable, proceed as follows to adjust the high alarm pick-up and drop-off voltages (V3 and V4 of Figure 5). See Table 2 for the adjustment range

NOTE: Once all LOW and HIGH alarm adjustments are complete, refer to “Securing Alarm Adjustments” on page 7 to secure the adjustments.

1. Connect the variable power supply described above to the channel input as described in the paragraph titled “Input Connections.” on page 5. Toggle voltage points may be monitored using the visual indicators (yellow UV, green DC OK and red OV lights) or monitoring the relay contacts.
2. Turn the HIGH trimpot fully CW, then adjust the power supply to the desired HIGH threshold voltage (OVP, V4 shown in Figure 5). If necessary, use a DVM to monitor the power supply voltage.
3. Observe that the green DC OK light is lit and relay is deenergized. Slowly (approximately one complete turn in five seconds) turn the HIGH trim pot CCW until the toggle point (red OV LED goes on, no other lights are lit and the relay deenergizes).

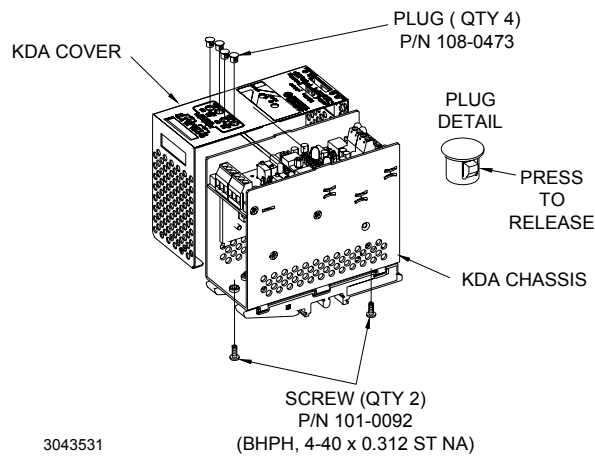
4. To verify the settings lower the voltage of the variable power supply by about 2V. Observe that the green DC OK light is lit, relay is deenergized and red OV LED is off.
5. Slowly increase the voltage until the toggle point occurs (red OV LED goes on, no other lights are lit and the relay deenergizes).
6. Verify that this toggle point is the desired value for OVP voltage. If this voltage is not correct, proceed to step 7 for fine tuning. If this voltage is correct, slowly lower the variable power supply voltage and verify that value of OVD (V3, Figure 5) is adequate (Hysteresis value 0.9V typ. see Figure 5)
7. If the toggle point is missed, fine tune as follows: Adjust power supply voltage to the desired OVP value (Over-voltage pick-up voltage). Turn the HIGH trimpot CW about two or three turns until the system toggles back again (green DC OK light is lit, relay is deenergized and red OV LED is off). *Very slowly* turn HIGH trimpot CCW until the toggle point is reached: red OV LED goes on, no other lights are lit and the relay deenergizes. Reverify again per step 6.

**Securing Alarm Adjustments.** Once HIGH and LOW alarm settings for both channels are acceptable, the adjustments can be covered to prevent tampering by installing four plugs (supplied) into the trimpot adjustment access holes (see Figure 7). Once these plugs have been installed, they can only be removed by first removing the KDA cover (remove two screws and slide cover off) and then releasing the plug prongs while pushing the plug out.



**FIGURE 6. KDA 24 SERIES OUTLINE DIMENSIONS**

NOTE: TO REMOVE PLUG, REMOVE TWO SCREWS AND SLIDE KDA COVER OFF CHASSIS. THEN RELEASE PLUG PRONGS WHILE PUSHING PLUG OUT.



**FIGURE 7. SECURING ALARM ADJUSTMENTS**