



CEN offers multiple voltage regulator options to meet the needs of every type of charging system in the transit industry. In addition to conventional regulator options, CEN offers Smart regulators designed to further increase battery life and improve diagnostics and telematics capabilities. The following information explains and summarizes the advanced features of CEN Smart regulator technology. **See regulator model-specific characteristics drawings for more detailed information.**

CEN Voltage Regulator Standard Features

All CEN voltage regulators for the transit industry share the following standard features:

- **IGN** terminal/pin (required): Vehicle must supply battery voltage to IGN terminal to energize charging system (See Figure 1).
- **D+** output terminal/pin (optional): D+ circuit supplies DC battery voltage for use with charge indicator light or multiplex charge warning input.
- **Phase** output (optional): Phase terminal/pin taps AC voltage from alternator phase for use with relay or tachometer. Output is typically half of the output voltage at a frequency ratio of 10:1 of alternator speed.
- **Over-voltage cut out (OVCO)**: Regulator shuts off field switching circuit if it senses 32 volts or higher for 3 seconds or longer.
- **Adjustable voltage** set points via 4-position switch at bottom of regulator (See Figure 2 and Table 1).

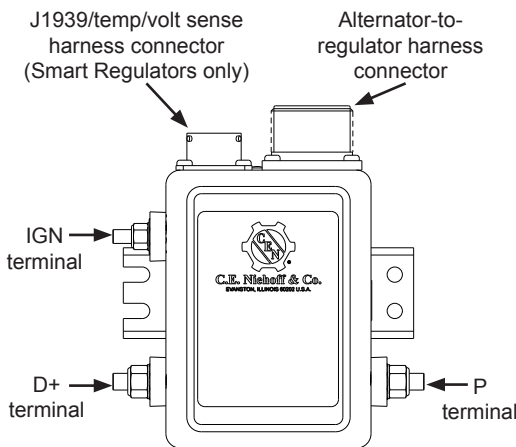


Figure 1: Typical Regulator Connections

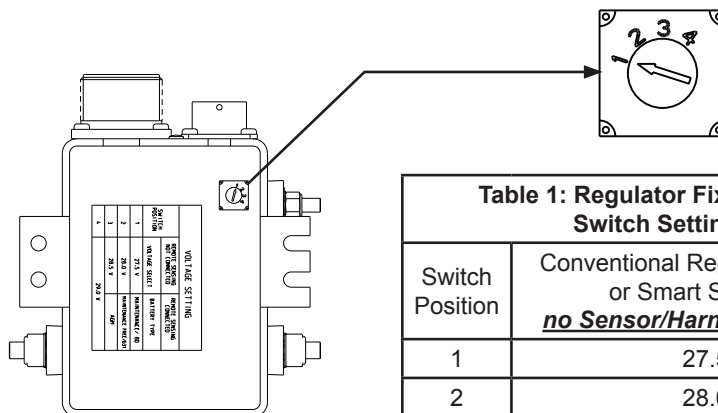


Figure 2: Regulator Voltage Selection Switch

Switch Position	Conventional Regulator Set Point or Smart Series with <i>no Sensor/Harness Connected</i>
1	27.5 V
2	28.0 V
3	28.5 V
4	29.0 V

CEN Smart Regulator Advanced Features

In addition to the many standard features listed above, CEN Smart regulators also include the following advantages:

- **Soft Start**: After the regulator detects shaft rotation, it gradually applies field current, preventing an abrupt mechanical load on accessory drive system. Soft start may take up to 20 seconds after rotation and energize signals are sensed.
- **J1939** communication via 10 pin connector. Regulator broadcasts the following messages (See regulator model-specific characteristics for complete message table):

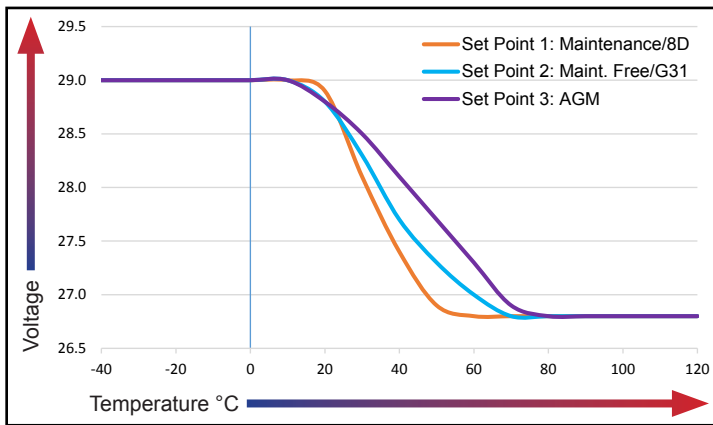
- | | | | |
|------------------------|---------------------|-------------------------|-------------------------------|
| -Alternator speed | -Alternator voltage | -Alternator temperature | -Alternator output percentage |
| -Regulator Temperature | -Battery voltage | -Battery Temperature | -Voltage set point |
| -Software revision | -Hour runtime meter | -Leader/follower status | -Various flags |

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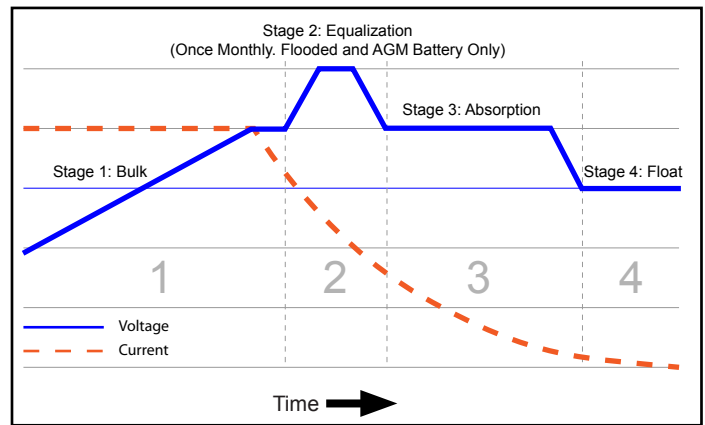
CEN Smart Regulator Advanced Features (cont.)

- Remote **temperature compensation** (optional): **When used with compatible CEN remote harness or sensor**, regulator will automatically adjust voltage setting (continuously variable between **26.8-29.0 ±0.2VDC**) based on regulator switch position and feedback from battery temperature sensor. (See Table 2 and Graphs 1 and 2). Multi-stage charging requires CEN Smart Battery Sensor (SBS) and compatible regulator.

Table 2: Regulator Battery Profile Switch Settings	
Switch Position	Battery profile for Smart Series Regulators <u>with Sensor/Harness Connected</u>
1	Maintenance (D category)
2	Maintenance-free (Group 31)
3	AGM
4	29.0 fixed

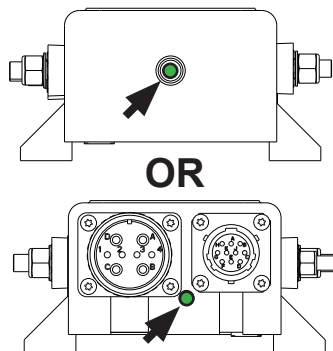


Graph 1: Voltage vs Temperature Set Point



Graph 2: Multi-stage Charging with Compatible CEN Smart Regulator and Smart Battery Sensor

- Remote **voltage compensation** (optional): **When used with compatible CEN remote harness or sensor**, regulator will automatically boost voltage to batteries up to one volt over set point (will not exceed $29.0 \pm 0.2\text{VDC}$ regardless of switch position) if/when required to compensate for voltage drop across power output cables.
- Parallel operation** (optional): Alternator can be used in tandem with another compatible CEN alternator when interconnected by compatible communication harness. This will result in shared distribution of vehicle load proportionally between both alternators based on speed, temperature, and output capabilities.
- 65 hr **data log** accessible via J1939.
- Charging system **status LED** indicator (See Figure 3 and Table 2).



LED COLOR	ALTERNATOR / REGULATOR STATUS
GREEN (Solid)	Alternator and regulator operating normally.
GREEN (Flashing)	Surge suppression circuit disabled; alternator still charging battery.
AMBER (Solid)	Voltage is below 25.0 V
AMBER (Flashing)	No rotation detected.
RED (Solid)	Field coil out of specification.
RED (Flashing)	OVCO condition detected.

Table 2: Regulator Status LED Definitions

Figure 3: Typical Status LED Locations

If you have questions about your alternator or any of these instructions, or if you need to locate a Factory authorized Service Distributor, please contact us at:
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