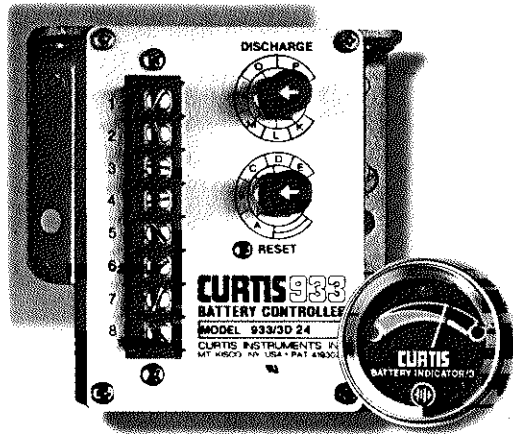


ELECTRIC "FUEL" GAGE & BATTERY CONTROLLER

MODEL 933/3D



DESCRIPTION

Curtis Model 933/3D is a battery "fuel" gage and controller with lift lockout and adjustable reset and discharge settings. These proven instruments, with more than a half-million units installed, feature a rugged aluminum controller for reliable operation, even in the most severe conditions.

WARRANTY

One year from date of delivery.

Application

The Curtis Model 933/3D prolongs battery life and protects vehicle components from the effects of deep discharge in material handling and other battery powered industrial vehicles.

Features

- Flashing red LED signals "energy reserve" warning at 75% discharge.
- At 80% discharge this instrument locks out the lift coil circuit on industrial lift trucks and provides optional warning signals in other vehicles.
- If 80% discharge is reached during a lift, the lift is completed before the lift circuit is locked out.

CURTIS

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- Recognizes improperly charged battery.
- Internal battery with typical 10-year life retains "state-of-charge" level memory when external power is removed.
- Adjustable reset level and discharge profile (lockout point). (Factory settings are: Reset level at 2.09VPC. Lockout at 1.73VPC).
- Controller is easy to install and mounts to body of truck with two 1/4" bolts. The gage is installed in the dash in a standard 2-1/16" round cut-out.

Options

- Dual-voltage models can be used with either of two different system voltages selectable with jumpers.
- Auto ranging, dual-voltage models automatically adjust to the correct system voltage.
- High voltage reset is available for vehicles in which the controller stays connected to the battery during charging.
- 933/3D XX **AV** has an isolated N.C. relay with 150 VA max. resistive load capacity. It can be installed in any portion of the lift coil circuit. **AR** provides a signal to drive an external multi-pole form C relay. **AW** is similar to option AV except it is a low power relay with 10 VA max. resistive load capacity. **AX** output is similar to model AW except it is N.O. and closes at lockout. **AF** has a discharge profile for applications involving high peak currents. Other output options are available.

Specifications

- Operating Temperature -20 to +85°C
- Storage Temperature -55 to +85°C
- Discharge Level (standard) 1.56 to 1.82VPC, factory set to 1.73VPC
- Reset Level (standard) 2.00 to 2.18VPC, factory set to 2.09VPC

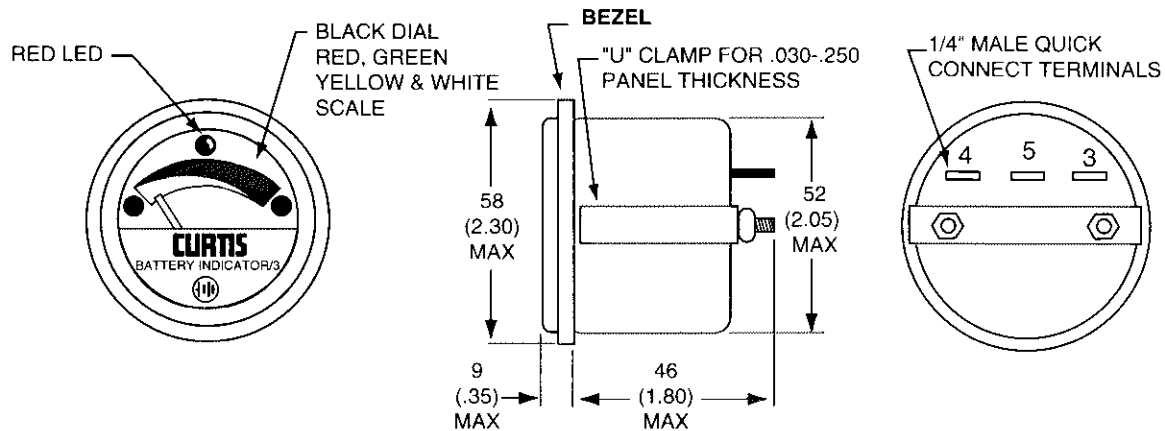
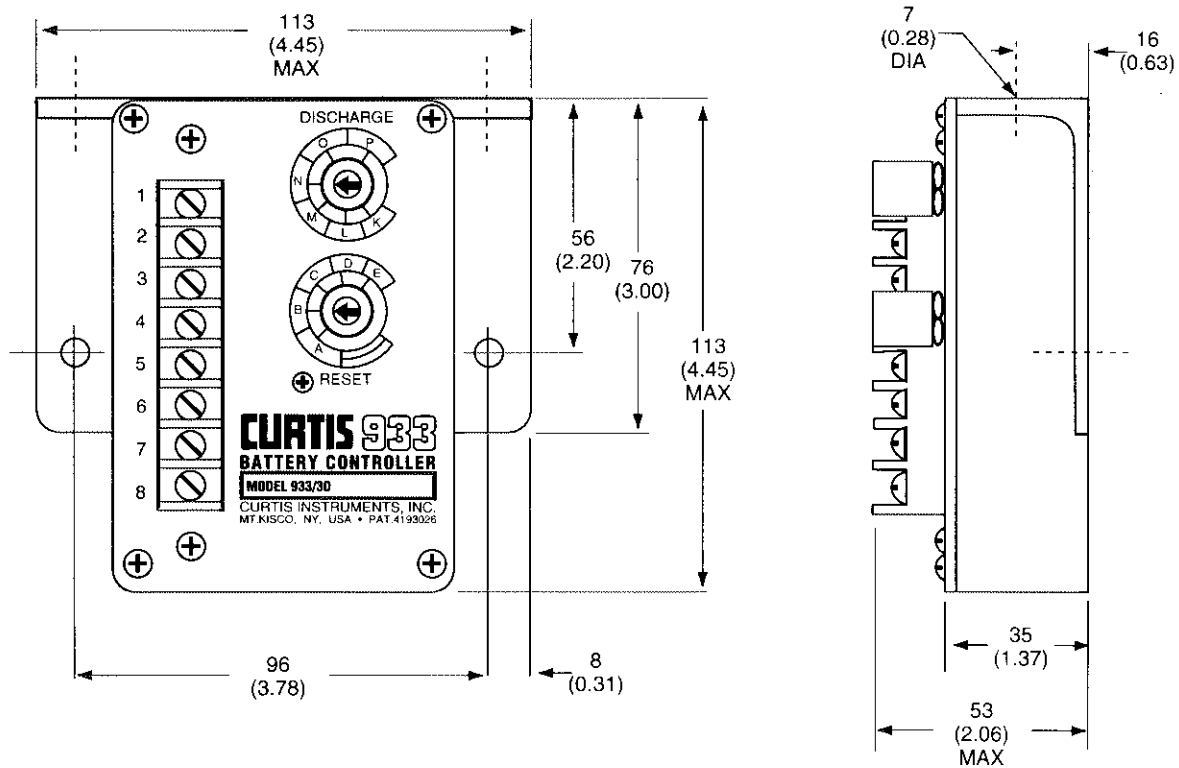
System Voltages

- Available in voltages from 12 to 96 volts, and dual voltage models in 24/36, 36/48 and 72/80. Consult factory for other voltages.

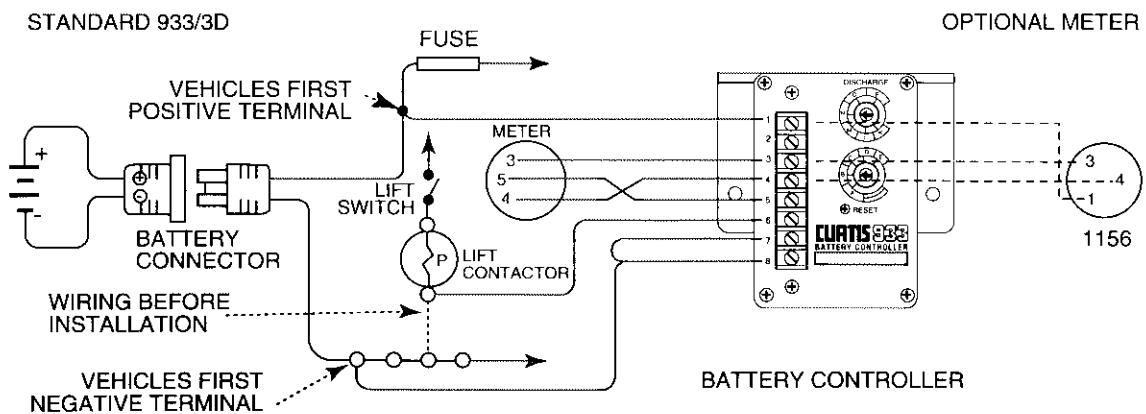
Model Encodement

933/3	48	X	X
Model	System Voltage(s)	Non-Standard Reset Option	Non-Standard Output or Discharge Option

Dimensions: mm (inches)



Typical Wiring Diagram



Using the Curtis 933/3 Controller Potentiometers (Pots)



Approximately 90% of Curtis users in the field have found that the factory settings of the DISCHARGE and RESET pots on the 933/3 Controller — DISCHARGE at “N”; RESET at “B” — have been more than satisfactory in meeting typical battery power consumption patterns.

However, one of the distinguishing features of the 933/3 that makes it the world's leading instrument of its kind are the user-adjustable Controller pots, permitting selection of the points at which lockout occurs (DISCHARGE) and at which the gage resets to “Full” when a charged battery is installed on the equipment (RESET).

For those special occasions that may require adjustment of the 933/3 in meeting atypical conditions (for example, the need to use a partially charged battery, or to extend the work period and discharge the battery deeper than usually, quick and simple action can be taken, as described herein.

Adjustment of the pots is done by first unscrewing by hand the outer pot protector and then turning by hand the pot with the arrow to the desired calibrated marking. The pot makes a single revolution. The arrow aids in precision setting of the pot. The alphabetic settings and linear markings are accurately calibrated and are precision-repeatable unit to unit.

The RESET pot on all Curtis 933/3 units leaves the factory set at RESET “B”, which means the Curtis “Fuel” Gage will reset to “Full” if the voltage of a newly installed battery is above 2.09 VPC.

Turning the pot clockwise from “B” to “E” increases the voltage per cell required to reset the gage. Turning it counter-clockwise toward “A” decreases the voltage per cell required to reset the gage.

Example: With the new generation batteries, particularly those of the high acid type, open circuit voltage can be a bit higher than in lower acid batteries. In such cases, to properly align the 933/3 to the particular battery characteristics, simply adjust the RESET pot to a level above the “C” marking for reset to occur when the battery's voltage is above 2.12 VPC, the higher open circuit voltage.

Example: In those circumstances when shutdowns cannot be tolerated because of the negative effect on productivity and it is necessary to use a partially charged battery, the gage reset level can be decreased from 2.09 VPC to as low as 2.00 VPC. Though the gage initially reads “Full” once it resets, as the equipment is used it will quickly catch up with the battery and provide a correct reading of the actual state-of-charge of the partially charged battery.

Keep in mind that RESET adjustments must be made prior to connecting the battery to the equipment. RESET adjustments made after battery/equipment connection have no effect. The RESET action is instantaneous. The gage will reset or not within seconds. If reset does not occur and it is necessary to readjust the pot setting, first unplug the battery and equipment, wait at least 10 seconds, adjust pot to new setting, and replug.

The **DISCHARGE** pot on all Curtis 933/3 units leaves the factory set at DISCHARGE "N", which means the discharge profile is set for a final end point of 1.73 VPC, where lockout will occur. This profile has proven to be the most common.

Turning the pot clockwise from "N" to "P" decreases the depth of discharge and, in turn, the operating time of the equipment. Turning it counter-clockwise from "N" to "K" increases the depth of the discharge and, in turn, the operating time of the equipment.

Example: On occasion, equipment is required for work beyond its normally assigned work cycle and time does not permit changing of battery. In these cases, lift lockout can be delayed by increasing the depth of discharge from the standard 1.73 VPC ("N" setting) to as low as 1.56 VPC ("beyond K" setting).

Example: Equipment and battery are sized for the type of work they are used for. On occasion, equipment designated for heavy work might be used for light tasks. Lighter work means low-current drain which, in turn, means the recommended 80% depth of discharge lockout point will be at a higher voltage level. In these cases, to properly align the low-current work profile and the required higher lift lockout point, the DISCHARGE pot can be adjusted to the "O" (1.78 VPC) or the "P" (1.82 VPC) settings.

It is **IMPORTANT** to **NOTE** that adjustments of the DISCHARGE pot can be made at any time during a work cycle prior to lift lockout. However, DISCHARGE pot adjustments made late in a work cycle have little or no effect in delaying lift lockout in that particular work cycle. In most cases, DISCHARGE pot adjustments are made prior to or at the beginning of a work cycle to effectively change the discharge profile of that work cycle. Once lift lockout does occur, the gage must be reset before DISCHARGE pot adjustments can have an effect.

TABLE OF POT SETTINGS AND ASSOCIATED VOLTAGES PER CELL			
DISCHARGE		RESET	
P	1.82 VPC *	E	2.18 VPC
O	1.78	D	2.15
N (Factory set)	1.73	C	2.12
M	1.68	B (Factory set)	2.09
L	1.63	A	2.06
K	1.57	beyond A	2.00
beyond K	1.56		

* The DISCHARGE voltage of the 933/3 is not an instantaneous voltage, nor a measure of the open circuit voltage at the time of lift lockout.