



SUPPORT

BATTERY CHARGER

Figure 1 illustrates a temperature compensated battery charger for applications with lead acid batteries. Diode D1, placed between the power supply and battery, blocks current from flowing from the battery to the power supply. This eliminates any loading on the battery when the power supply is off, but more importantly, prevents the battery from charging the power supply's output capacitors. With deployment of diode D1, remote sensing should be applied across the battery terminals to compensate for the diode drop. By setting the voltage and current to the bulk charge voltage and maximum charge current, the power supply will initially charge the batteries in current mode control and then automatically crossover to voltage mode control when the batteries reach the desired set point. The power supply can be programmed for time dependent, sequential step operation to equalize and float charge the batteries after bulk charging. Equalization is generally not required for every charge cycle. Table 1 illustrates the different charging steps and Table 2 provides the recommended charging voltage per cell for different battery technologies.



Caution: All battery parameters presented in this section are guidelines and the user should refer to and use manufacturer's specifications in any battery charging application.

A temperature detector can be applied to the modulation input to adjust the set point voltage with temperature. In this example, the temperature sensor, integrated circuit U1, is a two terminal device that produces a current proportional to temperature. This device, AD592, is manufactured by Analog Devices. The temperature detector is placed in series with resistor R1 and the temperature dependent voltage is measured between terminals 25 and 1,2, or 20 of connector JS1. Table 3 provides the recommended charge voltage deviation per cell as a function of temperature. Table 4 defines the modulation parameters for applying temperature compensation to a standard 12 V lead acid battery using a PQD16-200 power supply. The modulation control parameter should be set to voltage control and modulation type should be set to 1.

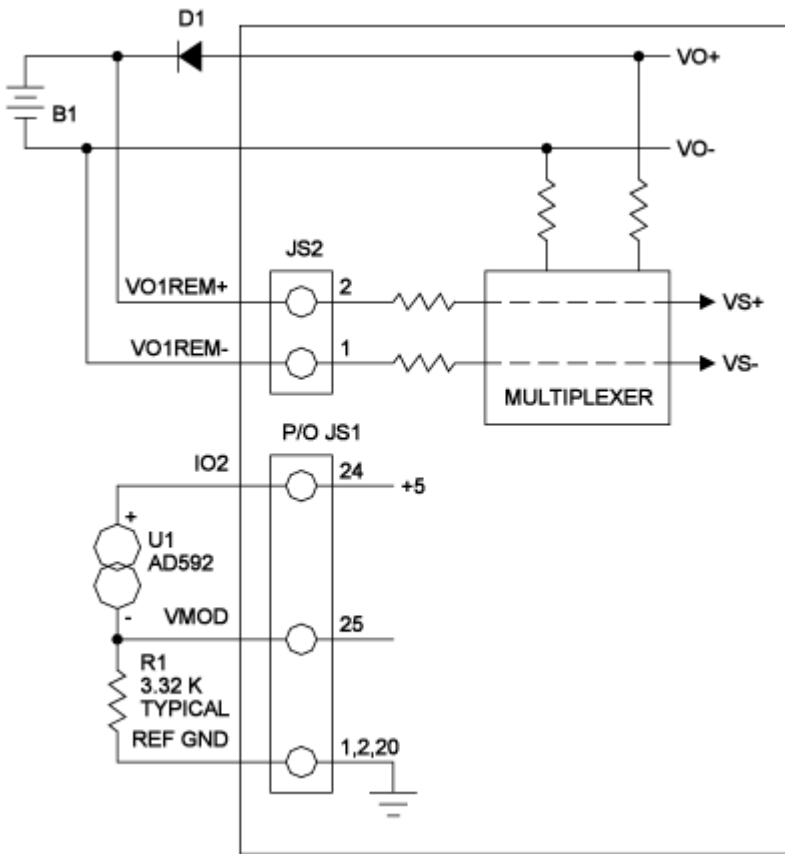


Figure 1. Battery Charger with Temperature Compensation

Parameter	Step 1 Bulk Charge	Step 2 Absorption Charge	Step 3 Equalization Charge	Step 4 Float Charge
MEMORY STEP	0	0	1	2
VOLTAGE SET	Vbc	Vbc	Vec	Vfc
CURRENT SET	Imbc	Imbc	Imec	Imec
OVT	105% • Vbc	105% • Vbc	105% • Vbc	105% • Vbc
OCT	110% • Imbc	110% • Imbc	110% • Imbc	110% • Imbc
PERIOD	6 hours	6 hours	1 hours	
MODE OF CONTROL	Current	Voltage	Voltage/Current	Voltage

Vbc: Bulk charge voltage

Vec: Equalize charge voltage

Vfc: Float charge voltage

Ibmc: Maximum bulk charge current (25% of AH capacity maximum)

Imec: Maximum equalization charge current (10% of AH capacity maximum)

Table 1. Charging Programming and Characteristics

Parameter	CHARGING VOLTAGE RANGE		
	BULK Vbc (Vdc)	EQUALIZE Vec (Vdc)	FLOAT Vfc (Vdc)
WET STANDARD (Sb/Sb) DEEP CYCLE	2.417-2.467	2.567-2.667	2.167-2.200
WET LOW MAINTENANCE (Sb/Ca)	2.400-2.433	2.517-2.733	2.183-2.200
WET MAINTENANCE FREE (Sb/Ca)	2.467	2.583-2.717	2.183-2.233

VRLA AGM	2.400-2.467	N/A	2.200-2.300
VRLA GEL CELL	2.350-2.400	N/A	2.200-2.300

Ca: Calcium

Sb: Antimony

VRLA: Valve regulated lead acid

AGM: Sealed absorbed Glass Mat, also known as started electrolyte

Table 2. Battery Charging Per Cell

Electrolyte Temperature (° F)	Electrolyte Temperature (° C)	Deviation in Charge Voltage (Vdc)	
		+ / -	Range
0	-17.8	+	.224 - .264
10	-12.2	+	.196 - .231
20	-6.7	+	.168 - .198
30	-1.1	+	.140 - .165
40	4.4	+	.112 - .132
50	10.0	+	.084 - .099
60	15.6	+	.056 - .066
70	21.1	+	.028 - .033
80	26.7		0.000
90	32.2	-	.028 - .033
100	37.8	-	.056 - .066
110	43.3	-	.084 - .099
120	48.9	-	.112 - .132
130	54.4	-	.140 - .165
140	60.0	-	.168 - .198
150	65.6	-	.196 - .231
160	71.1	-	.224 - .264

Deviation is 2.80 to 3.30 mV/°F/cell

Table 3. Battery Charging Temperature Compensation per Cell

Row	VMOD (Vdc)	Step 2 Absorption Charge	Step 3 Equalization Charge
1	0.000	0.183	16.10
2	0.851	0.183	16.10
3	1.148	-0.183	-13.18
4	2.000	-0.183	-13.18
5	9999	0.000	0.00

Set the program voltage to 14.64V

Table 4. Modulation Table for Temperature Compensated Battery Charger (Type 1)