



# MASTER CONTROL SYSTEMS, INC.

## MODEL MBC6

## AUTOMATIC MODE SWITCHING FLOAT-EQUALIZE BATTERY CHARGER

U.S. Pat. 3854082



This charger has been specifically designed for standby applications involving high battery loads of short duration which require fast recharging capability, such as heavy duty engine starting batteries. Long-term continuous loads should not exceed 50% of the charger rating.

Chargers are listed for NFPA 110, NFPA 20, Marine, and Industrial service.



### These Chargers Provide:

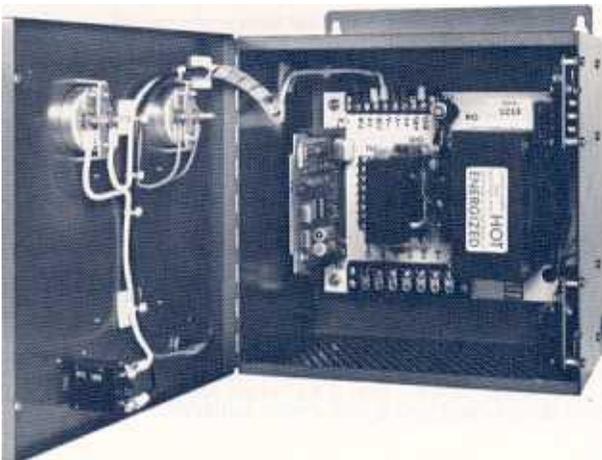
- Fully Automatic Operation — switches to float mode when battery is fully charged
- Automatic Two Rate, float-equalize
- Automatic Fast re-charging capability
- A.C. Line Voltage compensated
- D.C. Voltage regulated
- Current Limited at rated capacity

### CHARGER OPERATION

The Model MBC6 is a two rate charger (equalize and float). Switching from one rate to the other is fully automatic.

When first connected to a discharged battery, the charger will produce its maximum rated current until the battery terminal voltage increases to the desired equalize point. The charger will replace most of the missing charge in this manner. When the equalize voltage has been reached, the charger will reduce the current to the value required to maintain the equalize voltage. This voltage limiting mode will bring the battery to a fully charged condition. THIS FEATURE GIVES THE CHARGER THE CAPABILITY OF AUTOMATICALLY RECHARGING THE BATTERY IN LESS THAN 1/2 THE TIME REQUIRED BY OTHER CHARGERS OF EQUAL CAPACITY.

When the current required to maintain equalize voltage falls below a specific level, (approximately 1/2 of its rated current) the charger will change to the float mode. The charger will then supply whatever current is required to maintain float voltage. THERE IS PRACTICALLY NO GASSING OF THE BATTERY WHEN KEPT AT A TRUE FLOAT VOLTAGE SO THE BATTERY MAINTENANCE IS REDUCED TO A MINIMUM AND BATTERY LIFE WILL BE SUBSTANTIALLY INCREASED.



### EXTERNAL LOADS

The charger will carry external loads up to 100% of its rated current and still maintain the battery in the full charge condition. Continuous long-term loads, however, should be limited to 50% of the charger rated output in order to allow normal charger automatic mode switching operation.

Long-term continuous loads approaching 50% or more of charger rating will tend to delay or prevent the charger from switching back to the float mode after returning the battery to full charge. Keeping the charger in the high rate mode will cause excessive gassing and heating in the battery. Continuous loads well below 50% of charger rating will not interfere with normal mode-switching operation.

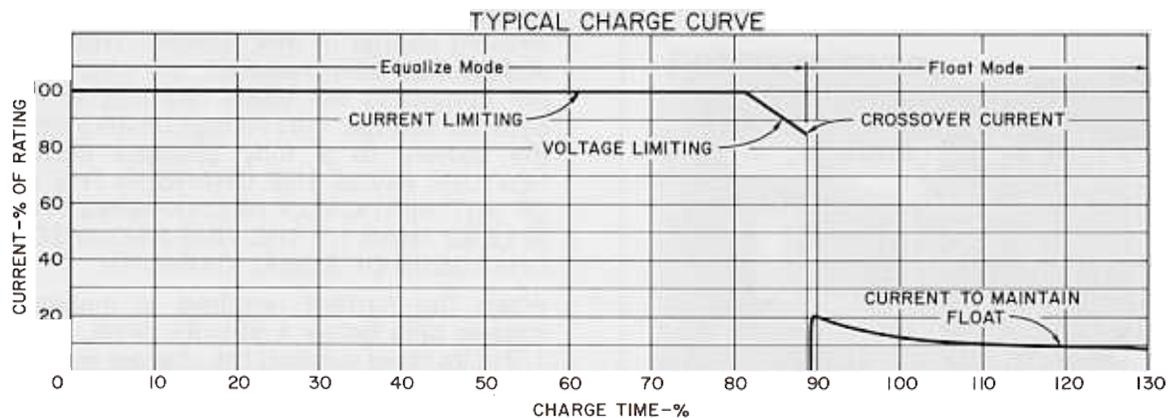
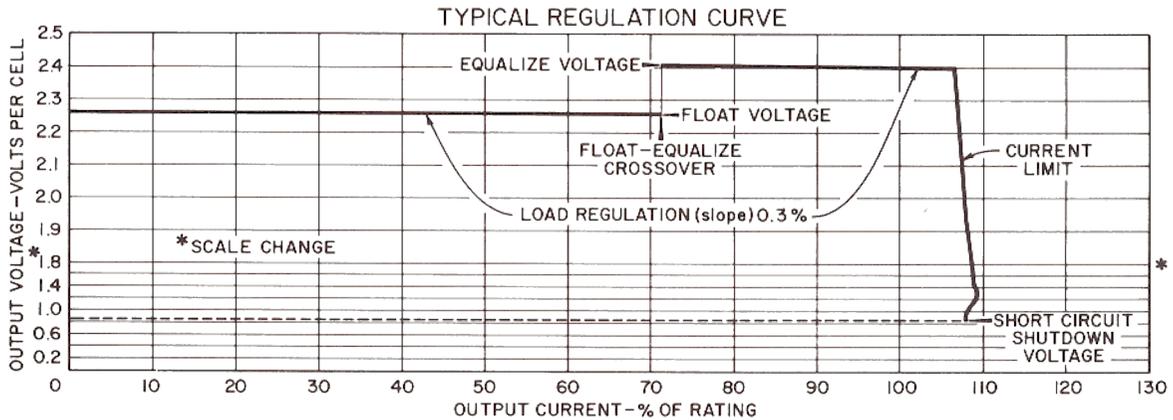
When a high current load is applied to the battery, (such as engine cranking) the charger will immediately switch to the equalize mode and operate at maximum capacity until it has returned all of the current into the battery. It will then switch back to the float mode in the manner previously described.

### CURRENT LIMITING

Overloads or even short circuits on the output of the charger will not damage the charger since it current limits at rated capacity. Because of this feature, the charger need not be disconnected during cranking on engine starting applications. Charger is polarity protected so that it will not be damaged if battery polarity is accidentally reversed.

### POWER FAILURE

Momentary power interruptions will cause the charger to be in the equalize mode when power is restored and will remain there for a length of time, dependent on the amount of discharge occurring during the interruption. If there was no discharge, the charger will remain in the equalize mode only momentarily. The charger will not discharge the battery, even on extended periods of power failure. Disconnecting the battery from the charger has the same effect as a power interruption.



Charge time is obtained by dividing battery capacity by charger rating. Thus, if a charger having a 10 ampere rating were connected to a completely discharged 200 ampere hour battery, 100% on the chart would represent 20 hours.

### Construction Features:

- Voltmeter and Ammeter are standard
- Both A.C. and D.C. Fuses are provided
- All semiconductors and integrated circuits are silicon and hermetically sealed
- Modular construction (Plug-in printed circuit regulator board)
- Remote sensing terminals are provided
- Float and equalize voltage levels are factory preset for the specific battery type
- No transformer tap settings are required
- Charge output is completely isolated from A.C. power

### CHARGER PERFORMANCE SPECIFICATIONS

MODE SWITCHING: Automatic — Mode depends on state of charge and use of battery.

INPUT LINE REQUIREMENTS: Nominal 117V. A.C. at 60 Hertz. Range of input voltage: 105-125V. A.C.

RECOMMENDED BATTERY CAPACITY: 5.0 to 23.0. Times rated current.

The following specifications apply at 117-125V. A.C. input at 25°C.

RECHARGING TIME: To obtain time required to recharge a fully discharged battery, take 1.2 times battery capacity in ampere hours (AH) divided by rated current (E.G. for 10A Charger and 200AH battery, rate =  $1.2 \times 200 \div 10 = 24$  hours).

MAXIMUM OUTPUT CURRENT: Current limited at rated current  $\pm 10\%$ .

OUTPUT VOLTAGE LIMITS: Nominal Value (Factory Set).

BATTERY TYPE:	LA (1.275 S.G.)	FL (1.220 S.G.)	NC (High Rate)
EQUALIZE:	2.34 V/Cell	2.29 V/Cell	1.50 V/Cell
FLOAT:	2.20 V/Cell	2.17 V/Cell	1.40 V/Cell

VOLTAGE REGULATION (LINE):  $\pm 0.2\%$  Maximum for  $\pm 10\%$  line change.

TEMPERATURE STABILITY: 0.08%/°C. Maximum.

OPEN CIRCUIT LEAKAGE: 50mA Maximum.

OUTPUT DRAIN (A.C. INPUT OFF): 10mA Maximum.

OUTPUT TERMINAL VOLTAGE FOR CHARGER SHUTDOWN (WITH SHUTDOWN OPTION): +4.0 Volts Maximum.

### MALFUNCTION ALARMS

NFPA 110 requires that chargers used on starting batteries for emergency generator sets contain provisions for operating an annunciator when the charger is malfunctioning. Master Control's option CFA has been designed to meet these requirements. Output contacts are SPDT and rated for 10A @ 115 V.A.C. These contacts transfer in event of A.C. power failure, low battery voltage, loss of charge current and lack of high rate charge after a heavy battery discharge. The system is unique in that the low voltage alarm is locked out as long as the charger is producing at least 75% of its rated output cur-

rent. This prevents the alarm contacts from transferring during heavy discharges such as engine cranking.

A low voltage alarm (LVA) for use with floating type systems is also available. This operates in the same manner as the CFA except that it is not locked out during periods of heavy battery discharge.

High voltage alarm (HVA) can also be supplied where the application necessitates its use.

### Sample Specifications

The Battery Charger shall be a Master Control Automatic Mode Switching, Model MBC6 or approved equal. The Charger shall have an output current rating of at least 1/20 of the rated ampere hour capacity of the battery to which it is applied and shall be capable of automatically switching from one rate to the other, according to the needs of the battery. Voltage settings for both ranges shall be factory preset for the specific battery type and shall not be field adjustable. It shall maintain its rated output voltage within  $\pm 0.2\%$  with A.C. input variation of  $\pm 10\%$ .

### The Charger shall have:

- Automatic Overload Protection (Current Limiting)
- Semiconductors and integrated circuits to be silicon and hermetically sealed
- D.C. Voltmeter and Ammeter
- Fused A.C. input and D.C. output
- Provisions for automatically switching to float mode when battery is fully charged

## MODEL DESIGNATION

CHARGER							BATTERY	
Model Number (*)	U.L.I. Listed (Δ)	D.C. OUTPUT		A.C. INPUT		Approx. Weight Lbs. (KG)	No. of LA Cells	Recommended Capacity Range (A.H.)
		Nominal D.C. Volts	Rated Amps.	Standard A.C. Volts	Max. Amps.			
MBC6-12-2		12	2 1/2	120	0.8	22(10)	6	10-55
MBC6-12-5	X	12	5	120	1.5	24(11)	6	25-115
MBC6-12-10	X	12	10	120	3	35(16)	6	50-230
MBC6-12-20		12	20	120	6	36(16)	6	100-460
MBC6-12-30		12	30	120	12	38(17)	6	150-600
MBC6-12-50		12	50	240	12	95(43)	6	200-1000
MBC6-24-2		24	2 1/2	120	1.5	24(11)	12	10-55
MBC6-24-5	X	24	5	120	3	35(16)	12	25-115
MBC6-24-10	X	24	10	120	6	36(16)	12	50-230
MBC6-24-20	X	24	20	120	12	38(17)	12	100-460
MBC6-24-30		24	30	240	8	95(43)	12	150-600
MBC6-24-50		24	50	240	15	165(75)	12	200-1000
MBC6-30-5		30	5	120	4	30(14)	15	25-115
MBC6-30-10		30	10	120	8	38(17)	15	50-230
MBC6-30-20		30	20	120	15	45(20)	15	100-460
MBC6-30-30		30	30	240	10	95(43)	15	150-600
MBC6-30-50		30	50	240	15	165(75)	15	200-1000
MBC6-32-5		32	5	120	4	30(14)	16	25-115
MBC6-32-10		32	10	120	8	38(17)	16	50-230
MBC6-32-20		32	20	120	15	45(20)	16	100-460
MBC6-32-30		32	30	240	10	95(43)	16	150-600
MBC6-32-50		32	50	240	15	165(75)	16	200-1000
MBC6-36-5		36	5	120	4	30(14)	18	25-115
MBC6-36-10		36	10	120	8	38(17)	18	50-230
MBC6-36-20		36	20	120	15	45(20)	18	100-460
MBC6-36-30		36	30	240	10	95(43)	18	150-600
MBC6-36-50		36	50	240	15	165(75)	18	200-1000
MBC6-48-2		48	2 1/2	120	3	26(12)	24	10-55
MBC6-48-5		48	5	120	6	36(16)	24	25-115
MBC6-48-10		48	10	120	12	38(17)	24	50-230
MBC6-48-20		48	20	240	12	95(43)	24	100-460
MBC6-48-30		48	30	240	20	165(75)	24	150-600
MBC6-130-2		130	2 1/2	120	7	39(18)	60	10-55
MBC6-130-5		130	5	120	15	46(21)	60	25-115
MBC6-130-10		130	10	120	30	121(55)	60	50-230
MBC6-130-20		130	20	240	30	185(84)	60	100-460
MBC6-130-25		130	25	240	40	225(105)	60	125-500
MBC6-130-30		130	30	480	25	245(111)	60	150-600

- (\*) Add suffix (LA) to model number when charger is for use with automotive (SLI) or truck type lead acid Antimony batteries having nominal 1.275 sp. gr. —or—  
 Add suffix (FL) for use with float service (stationary) lead acid batteries having nominal 1.210 sp. gr. —or—  
 Add suffix (NC) for use with Nickel Cadmium batteries —or—  
 (Δ) Consult factory for other types.

Battery manufacturers recommend that the equalizing current of the charger be not less than C/20 with C representing the ampere hour capacity of the battery. As an example, a 200 ampere hour battery would require that the charger have the capability of providing an equalizing current of 10 amperes. Design of the MBC6 Charger is based on this premise, therefore, it is most important that the charger rating be compatible with the recommended battery capacity as outlined in the above table. Use of these chargers on batteries that have either a **larger** or **smaller** capacity than recommended, may result in damage to the batteries.

### Ordering Information:

- Catalog no. and manufacturer of battery  
 or  
 — Ampere Hour Capacity of Battery
- For Nickel Cadmium specify whether high or low rate type
- Specific gravity and alloy of lead acid battery
- State Master Control's Model number
- A.C. input voltage, frequency and phase
- Number and type of battery cells
- Continuous D.C. load
- Allowable Recharging Time from full discharge
- Indicate application, i.e., Stationary, Mobile or Marine

Specifications subject to change without notice.



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