

FOR YOUR PROTECTION

1. Never reverse locomotives without stopping them first. To do so may damage locomotive engine.
2. Never connect locomotive to A. C. Terminals of your Controlmaster XI. This may damage your locomotive engine.
3. Turn power switch off at end of day's operation.
4. When a short circuit or current overload occurs and circuit protector trips, turn the Controlmaster XI off the correct the short or overload. Allow 5 minutes for the thermal circuit protector to reset before turning your unit back on, 5 seconds for the electronic protector.
5. Avoid prolonged overloads and short circuits. While your Controlmaster XI is equipped with several safety devices to prevent accidental damage due to short circuits and overloads, it is unwise to subject it to these frequently or often.
6. Do not store in damp area.
7. For best performance, keep wheel and track surfaces clean. Intermittents and "jerky" operation are often caused by an oxide coating which has formed on the track or wheels.
8. Before returning your unit for repair or servicing, make certain it is defective. Do not shut down your layout unnecessarily.
9. If it is necessary to return your unit, repack it in its original carton and then in an outer carton, placing at least four inches of packing material on each side. Mail the unit to

Model Rectifier Corporation
2500 Woodbridge Avenue
Edison, New Jersey 08817

Be certain to send the unit Parcel Post insured, and include a letter describing the problem you are experiencing.

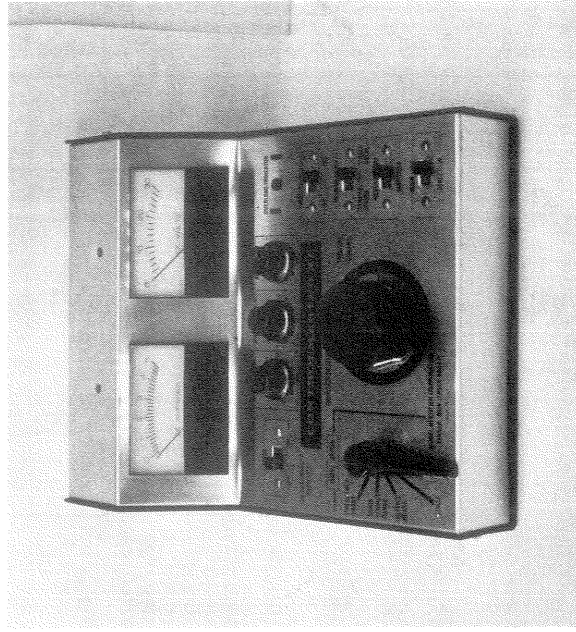
All of us at MRC would like to join in wishing you many happy years of model railroading with your new Controlmaster XI.

PARENTS, PLEASE NOTE: As with any electrically operated unit, it is always best to periodically examine it and have repaired or replaced any potentially hazardous part.



CONTROLMASTER XI

THE ULTIMATE IN MODEL TRAIN CONTROL



MODEL RECTIFIER CORPORATION
2500 WOODBRIDGE AVENUE EDISON, NEW JERSEY 08817

TRANSMISSION SWITCH

The Transmission Switch in your Controlmaster XI allows the unit to function in either of two modes. With the Transmission Switch in the "Direct Drive" position, a change in Throttle setting results in an immediate change in locomotive speed. In "Flywheel Action", loco response is slow, and simulates the acceleration of a prototype locomotive.

NOTE: These two modes are completely independent of each other. Therefore, your loco must be brought to a complete stop before switching from Direct Drive to Flywheel Action or vice versa. This means that when operating in the Direct Drive mode, the Throttle must be brought to "O" before switching to Flywheel Action. When operating in the Flywheel Action mode, the Throttle must be brought to "O" and the brake must be applied to bring the locomotive to a complete stop before switching to Direct Drive. This will act to prevent discontinuous operation of your locomotive when switching from one mode to the other.

DIRECTION SWITCH

The Direction Switch reverses the polarity of voltage applied to the track and thereby reverses the direction of the loco. Be certain to bring your loco to a stop before reversing it, as with any cab control or power pack.

REVERSE LOOP SWITCH

This switch operates in the same manner as the Direction Switch, but controls a separate, insulated loop in the track. The controlled loop MUST have both rails insulated. See "Function of Reverse Loop Terminals" for loop wiring instructions.

THROTTLE CONTROL

The Throttle is used to set the speed of the locomotive you are controlling. With the Transmission Switch in "Direct Drive", your loco will immediately accelerate to the speed dictated by the Throttle Setting. In "Flywheel Action", the acceleration will be gradual and prototypical. In "Flywheel Action", however, the Brake must be applied to slow the locomotive.

BRAKE

The brake in your Controlmaster XI has five positions. These positions and their functions are as follows:

RUN - In this position your loco will respond to changes in Throttle setting. The brake must be in this position for operation in the "Direct Drive" mode. No damage will occur if the brake is not in this position, but your locos will not operate.

COAST - When the brake is set in this position, your loco will continue to run indefinitely at the speed with which it was traveling when the brake was switched to "Coast".

SERVICE - This position will decelerate your loco at a slow steady rate until it stops.

QUICK SERVICE - The same as the Service position, only the rate of deceleration is more rapid.

EMERGENCY - This position will stop your loco immediately and is used to prevent accidental collisions and other accidents that might damage your layout.

It is sometimes more convenient, and prototypical, to operate your loco by using the brake only. This is accomplished by first setting the throttle to the maximum speed desired. If you wish to have the loco travel at a slower speed than maximum, switch from "Run" to "Coast" when the desired speed is attained. To slow your locos, use the "Service" or "Quick Service" position, then switch back to "Coast". To speed the locos, switch back to "Run".

PULSE WIDTH CONTROL

This control sets the width of the pulse being generated by the Controlmaster XI's circuitry. This pulse width automatically increases somewhat as the Throttle setting is increased to give a smooth, steady acceleration. Instructions for adjustment of this control are given below.

PULSE FREQUENCY CONTROL

This control determines the frequency of the pulses generated by the Controlmaster XI. Pulse frequency does not change with Throttle Setting.

ADJUSTMENT OF PULSE WIDTH AND PULSE FREQUENCY CONTROLS

Adjustment of the Pulse Width and Pulse Frequency Controls is accomplished in the following manner.

Set the controls as follows:

MASTER SWITCH - Off

THROTTLE - "O"

BRAKE - Run

PULSE SWITCH - On

TRANSMISSION SWITCH - Direct Drive

REVERSE LOOP SWITCH - Either Position

MAIN LINE SWITCH - Either Position

MOMENTUM ADJUSTMENT - "O"

PULSE WIDTH - "5"

PULSE FREQUENCY - "10" (Full Clockwise)

CONGRATULATIONS!

You have just purchased the finest Train Control available! The Controlmaster XI employs the latest State of the Art integrated circuit technology to obtain such features as automatic pulse generation and cutoff, adjustable pulse width, adjustable pulse frequency, adjustable momentum, a five position brake, programmable acceleration, and much, much more. In addition, the Controlmaster XI boasts a 2.5 ampere output, large built-in voltmeter and ammeter, and the popular Throttlemaster Knob. As you operate your layout with your new Controlmaster XI, you will grow to appreciate the engineering and thought that went into its design. The pinpoint control and innumerable features will satisfy the most avid model railroader. As always, our old friends will expect and receive the best in quality and performance. If this is your first purchase of an MRC product, we wish to welcome you to the ever growing ranks of those who purchase and use the best in Model Railroad Power Supplies: MRC.

OPERATION

The Controlmaster XI is designed to be placed on a flat working surface during operation. The meters are sloped upward to facilitate easy reading. All controls on the Controlmaster XI are external; no internal adjustments need be made and the unit should not be opened by anyone but an authorized service technician. To open the unit would expose 120 volts AC and subject an inexperienced repairman to danger.

Details of the controls, their functions, and how to use them are listed below.

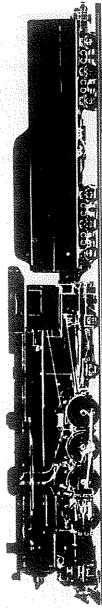
CONTROLS

MASTER SWITCH

The Master Switch disconnects the input power from your Controlmaster XI and shuts the unit down completely.

PULSE SWITCH

The Pulse Switch connects or disconnects the pulse generating circuitry of the Controlmaster XI from the rest of the unit. In the "Off" position, the output of the unit is pure D.C. only. In the "On" position, pulses are injected into the output to create excellent low speed locomotive characteristics. The frequency and width of these pulses is controlled by the Pulse Frequency and Pulse Width controls, which are explained later. It should be noted that the pulses are not always present, even with this switch "On". The Controlmaster XI automatically disconnects these pulses when sufficient locomotive speed has been gathered so that they are no longer needed. Also, the pulses are shut off when the Throttle is in the "O" position, unlike some solid state power packs that constantly subject your locomotive to pulses, even when the locos are stopped.



CAB CONTROLS - MRC has available several fine cab controls that are compatible with your Controlmaster XI, notably our Cab Control 55 and Cab Control 76. The Cab Control 55 is a basic solid state pack without momentum or pulse generation. The Cab Control 76 is very similar to the Controlmaster XI's circuitry, and has the same brake, a momentum control, a pulse width/frequency control, a thermal circuit protector, and more. The Cab Control 76 would be the perfect choice for running a second, independent block in the same realistic way as the main line is run with the Controlmaster XI.

MAINTENANCE - Your Controlmaster XI requires virtually no maintenance. However, upon opening the box, and before use, the slide switches should each be operated about one dozen times to break down any oxidation that might have formed on the switch contacts. This process should be repeated any time the Controlmaster XI is stored for more than 3 months without use. If the unit becomes dirty or dusty and must be cleaned, unplug the unit, then wipe with a soft, dry cloth. All controls on the Controlmaster XI are external and there should be no reason to open the cabinet. Do not store the Controlmaster XI in damp areas.

TROUBLESHOOTING GUIDE

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>
Train does not function at all	1. Unit not plugged in. 2. Master switch off. 3. Wiring to track not connected properly. 4. Overload. 5. Track wires to A.C. terminals. 6. Train defective. 7. Track dirty. 8. Transmission in "Direct Drive" and Brake not in "Run". 9. Speed Control set on "O".

Overload indicator comes on or meter lights cycle

1. Track is shorted by metal debris.
2. Wires on terminal strip shorting.
3. Wires attached between wrong terminals.
4. Load current is more than pack is designed for.
5. Reverse loop or cab control track sections are electrically connected to main line.
6. Too many trains on track.
7. Train motor shorted.

Train runs slowly, but will not run fast when throttle control is turned to "Full"

1. Poor wiring connection.
2. Transmission is in "Flywheel Action" and Brake is in "Coast".
3. Transmission is in "Flywheel Action" and not enough time has been allowed for acceleration.

Train runs quickly, but will not run slowly and does not respond to throttle control

1. Track attached to fixed D.C.
2. Transmission is in "Flywheel Action" and Brake is in "Coast".

Main Line Direction switch ineffective

1. Track connected to reverse loop terminals.
2. Track connected to fixed D.C. terminals.

Reverse loop direction switch ineffective

1. Reverse loop connected to Track D.C. terminals.
2. Reverse loop connected to fixed D.C. terminals.

Cab control does not function when attached to fixed D.C.

1. Cab control connected to wrong terminals.
2. Cab control input wires backwards-reverse.
3. Cab control block not completely insulated electrically.

Momentum does not function

1. Transmission switch on "Direct Drive".
2. Brake not on "Run".

Poor low speed characteristics

1. Pulse switch "Off".
2. Pulse Frequency or Pulse Width not properly adjusted.
3. Track is dirty.
4. Locomotive and/or pickups are dirty.

CONTROLMASTER XI

THE ULTIMATE IN MODEL TRAIN CONTROL

CAUTION - ELECTRICALLY OPERATED PRODUCT.

NOT RECOMMENDED FOR CHILDREN UNDER 12 YEARS OF AGE.
 AS WITH ALL ELECTRIC PRODUCTS,
 PRECAUTIONS SHOULD BE OBSERVED DURING HANDLING AND
 USE TO PREVENT ELECTRIC SHOCK.

SPECIFICATIONS

INPUT - 120 VAC, 60 Hz

OUTPUT - 16 VDC, 18.5 VAC

TOTAL OUTPUT - 33 VA, 2.5 amperes

OUTPUT WAVEFORM - Low throttle-pulse width modulated D.C. square waves
 High throttle-filtered D.C.

OUTPUT DEVICE - NPN power transistor, collector current rating -
 15 amperes

INTEGRATED CIRCUITS - 2 LM3900N quad operational amplifiers

TRANSISTORS - 3 small signal NPN, 1 small signal PNP, 1 high gain Darlington,
 1 15-ampere power transistor

OVERLOAD INDICATOR - Light emitting diode

PULSE FREQUENCY RANGE - 10 to 180 Hz

PULSE WIDTH RANGE - 0.8 to 4.8 m sec.
 (at minimum pulse "on" throttle setting)

MOMENTUM TIME REQUIRED TO REACH MAXIMUM SPEED - 18 to 95 seconds
 (when transmission is set on "Flywheel")