CROSSING BOOM CONTROL

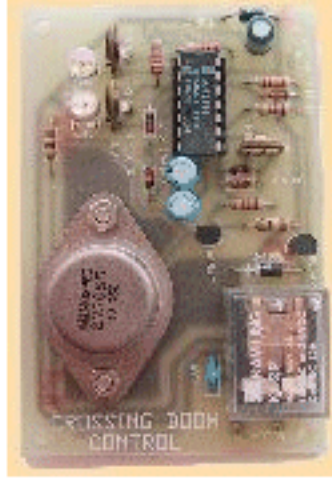
This kit is available from:

Talking Electronics

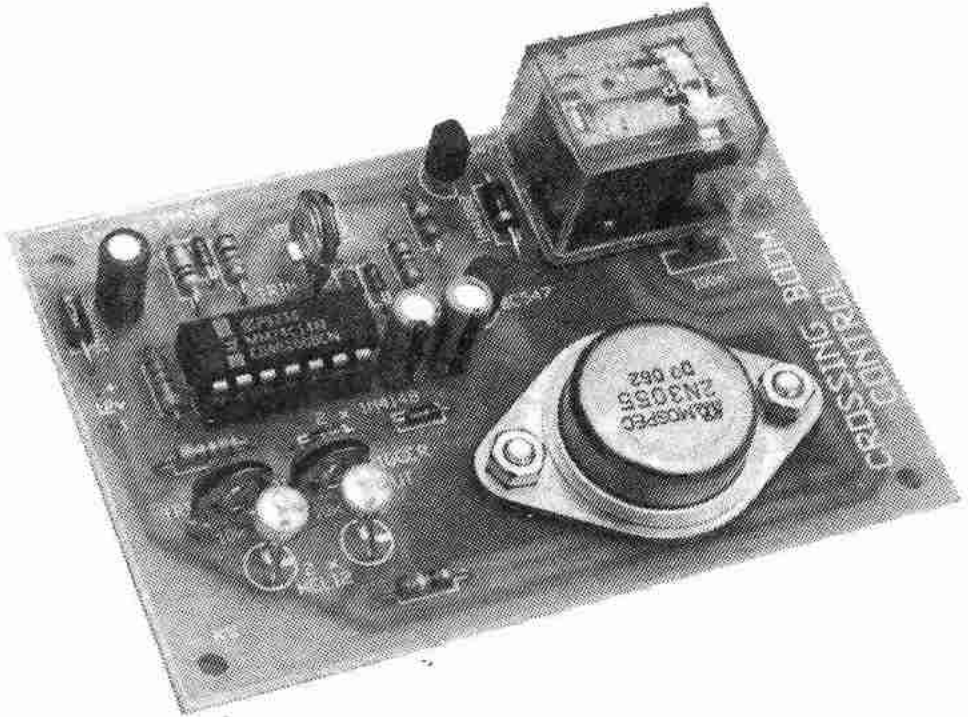
email Colin Mitchell:

talking@tpg.com.au

for pricing and postage.



CROSSING BOOM CONTROL



The power transistor on the Crossing Boom Control board should not need a heatsink unless a motor with a high current consumption is being used to drive the booms.

The module described here will make working boom gates a practical possibitity for model railways. It is designed for use in conjunction with the level crossing modules previously described.

The mechanical details will not be covered as these will vary with individual modelling methods. The prototype unit controlled a Mann Made 'point drive' which is a point motor that is actuated by a small electric motor driving a long threaded shaft. A plate containing limit switches is pushed back and forth by this shaft. Two tags on this plate are connected to the item that is being controlled, in this case the boom gates. Any similar motor drive with limits would work as well.

How it works

The Boom Control module can be looked at in three main blocks. They are track sensors, delay, and motor drive.

The track sensors are the same as described in both the Level Crossing and the Crossing Expansion units. They were included to use up spare schmitt

inverters that were not required by the rest of the circuit. They would be particularly useful if the booms were being used on a double track crossing.

The delay circuit provides a delay on the positive going enable signal from the Level Crossing board. This delay is the warning period where the bells ring for a short time before the booms lower, to allow traffic to move out of the way.

The delay drives a relay via a buffer transistor. It is this relay that switches power to the 'point drive' so that it will raise and lower the booms.

When the enable signal goes low, it immediately discharges the capacitor in the delay circuit via the diode so that the booms will be raised as soon as the bells stop ringing.

The remaining block is the pulse throttle. It is a low frequency variable mark-space ratio oscillator followed by two buffer transistors. Adjusting the mark-space ratio of the oscillator controls the amount of power reaching the motor operating the booms making it possible for them to move very slowly. The pulse throttle is a lot more reliable in this situation because with a normal voltage controlled throttle, the motor often fails to start at this low speed.

Construction

It may be necessary to enlarge several of the holes on the Crossing Boom Control PC board. These are the holes for the trim pots, the holes for the relay and the holes for the 2N3055 transistor.

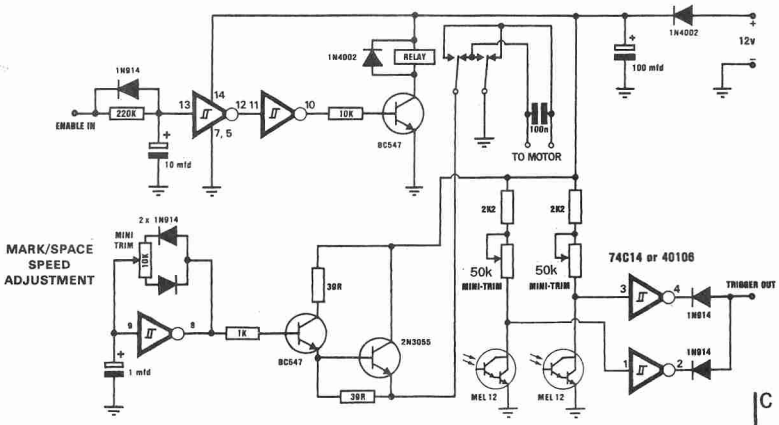
Mounting of the rest of the components is as usual. When mounting the relay, take care not to bend any of the leads as they may break off or cause internal damage to the relay. Insert the 2N3055 and bolt it to the board. Solder the pins and trim them. The connection to the collector is through the bolts. The unit will not be running enough to warrant heat-sinking the transistor.

It may be necessary to power the Crossing Boom Control module from an isolated supply if the Crossing Sound module is being used. A common earth should be used between the modules.

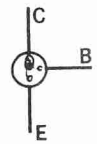
Connect the module to the Level Crossing unit to test it. The relay should switch a short while after the level crossing lamps start flashing. Connect the 'point drive' to the output from the relay and adjust the speed with the 10K trim pot. If it is too slow the 'point drive' may stick.

If the sensors are needed, connect the trigger out on the Crossing Boom Control board to the trigger in on the Level Crossing board. If they are not required, put links in place of the MEL-12 phototransistors and omit the trim pots.

A spare switch on the point drive can be used to switch off the second bell sound on the Crossing Sound unit when the boom gates close, as is often done in real life. Two shielded wires can be run from the point drive auxillary switch to the two terminals marked 'SW' on the Crossing Sound board. The shields should be earthed to the Crossing Sound board. See the diagram on page 44 for the wiring.



The Crossing Boom Control circuit is made of several smaller blocks. They are the delay, the relay driver, the pulse throttle and the track sensors.



Pinout of the MEL-12

Crossing Boom Control Parts List

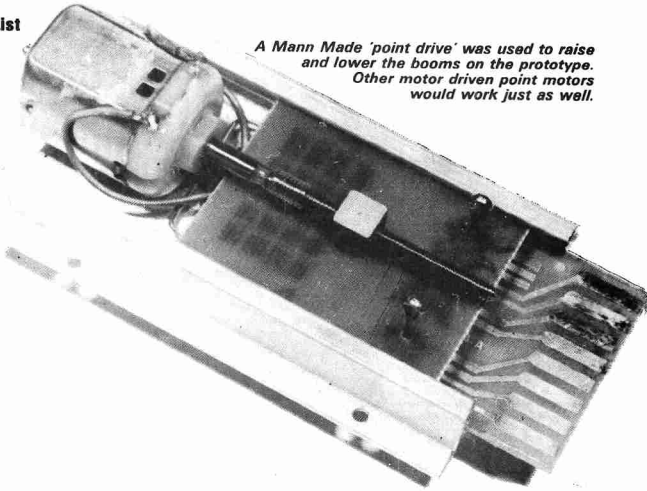
2 - 39R
1 - 1K
2 - 2K2
1 - 10K
1 - 220K

3 - 50k mini trim pot

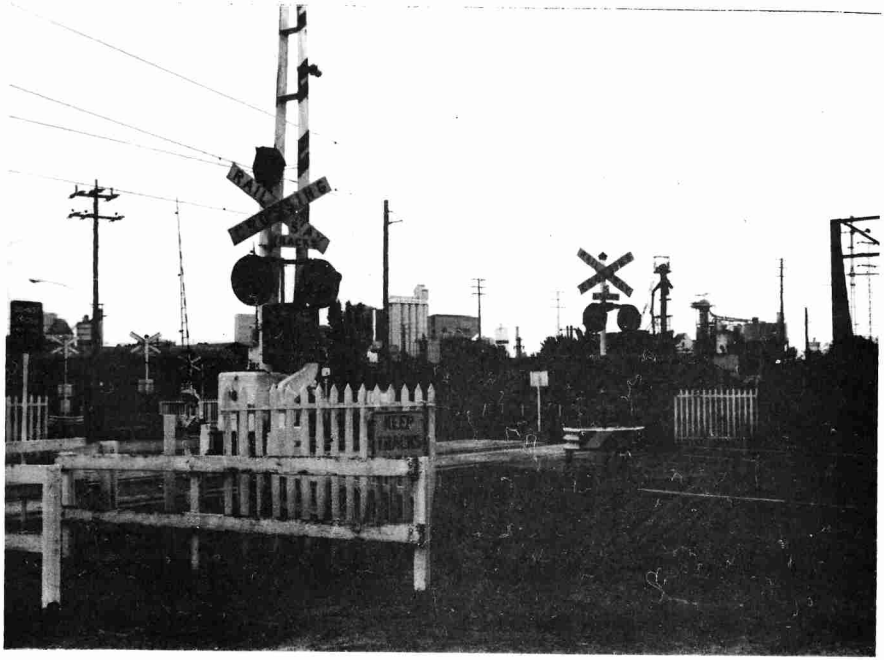
1 - 100n
1 - 1 mfd electro
1 - 10 mfd electro
1 - 100 mfd electro

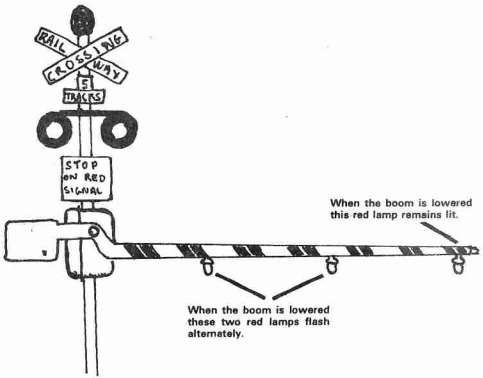
5 - 1N914 diodes
2 - 1N4002 diodes
2 - BC547 transistors
1 - 2N3055 power transistor
2 - MEL-12 phototransistors
1 - 74C14 chip

1 - 14 pin IC socket
2 - nuts & bolts
1 - DPDT 12v Mini relay
1 - Crossing Boom Control PCB

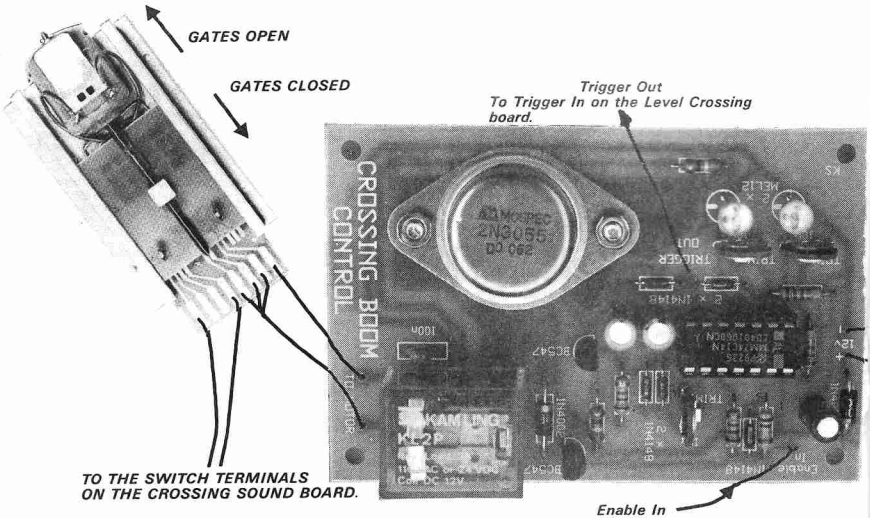


A Mann Made 'point drive' was used to raise and lower the booms on the prototype. Other motor driven point motors would work just as well.

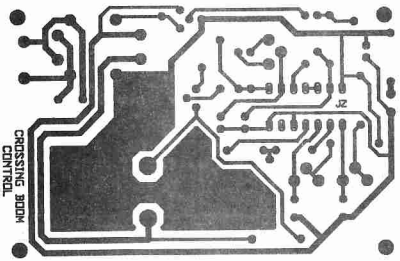


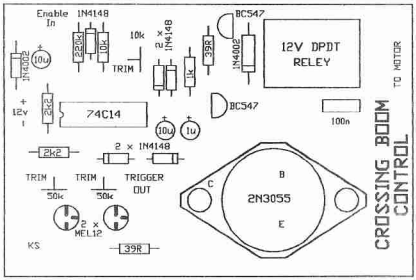


Some modellers may like to include the three lamps that are on the boom itself. These lamps can be mounted under or over the booms. I have seen one crossing on which one set was under and the other set was over. The photo on the previous page shows a set on which both sets are under the booms.

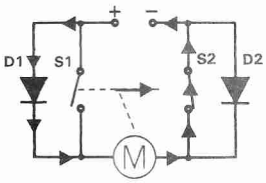


How to wire the point drive to the Crossing Boom Control board.

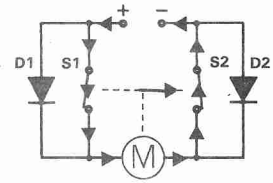




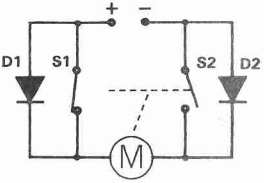
This series of drawings is to help you understand how the 'point drive' works. It should also help those who want to build their own from parts they have on hand.



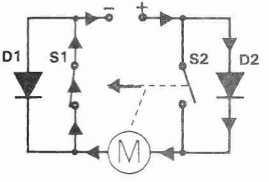
The 'point drive' consists of a motor, two diodes and a plate containing limit switches. The plate is pushed back and forth by the motor depending on the polarity connected to the point drive.
Power is always connected to the point drive and is switched by the limit switches.
Consider the polarity to the unit has just been reversed. This diagram shows how the power is connected now. Current flows through diode 1 and switch 2 allowing the motor to start. (In this explanation, conventional current is being used.)



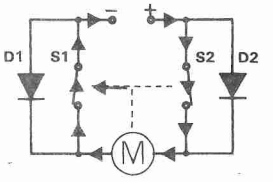
As the motor drives the plate across, switch 1 closes shorting out diode 1. The current is now flowing through both switches.



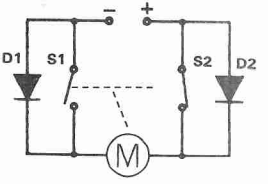
The plate reaches the other end of its travel and the motor stops. This is because limit switch 2 has just opened. Current cannot flow through diode 2 because it is reverse biased.



The polarity on the circuit is reversed. Current can now flow through diode 2 and the motor starts to drive the plate back in the other direction.
The motor used must reverse when the polarity to it is changed or the unit will not work. This means motors with field coils will not work. Care must also be taken to make sure the motor is connected the right way around.



As the plate moves switch 2 closes shorting diode 2.



The plate continues to move until limit switch 1 opens and the motor stops. This is because diode 1 is now reverse biased. If the polarity is reversed again the plate will start moving back in the opposite direction.