

AUTOMATIC REVERSING UNIT (ARU)

The Automatic Reversing Unit (ARU) is used to continually run a train from point to point without operator intervention. The ARU comes with two Infra-Red (IR) sensors used to detect a train at different locations around your layout. This can be expanded to four sensors as well as interfacing to the TC-8S so that turnouts can be controlled enabling more complex routes to be repeated. Two adjustable timers control the length of time that a train is stopped for at each IR sensor.

Operation

Each IR sensor has its own set of functions to perform when it detects a train, each one slightly different from the other. For example, if a train was detected by IR sensor 2, the ARU would stop the train for the length of time set by timer 1 (see Adjusting Timer Delays), switch any turnouts programmed to be controlled by IR Sensor 2 (see Controlling Turnouts), and reverse the direction of the train. Refer to the table below for each IR sensor functions.

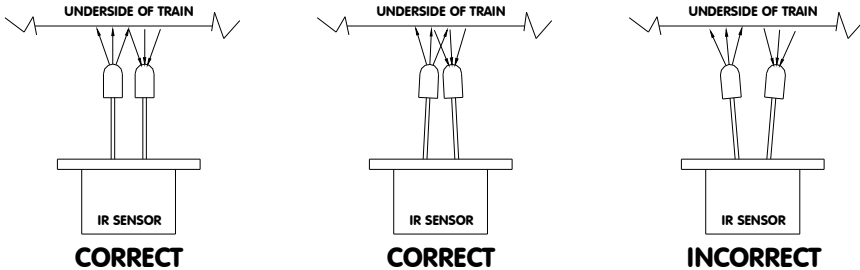
	TRAIN DIRECTION	TIMER
IR SENSOR 1	FORWARD	TIMER 1
IR SENSOR 2	REVERSE	TIMER 1
IR SENSOR 3	FORWARD	TIMER 2
IR SENSOR 4	REVERSE	TIMER 2

Any combination of IR sensors can be used, for example if you had a circular track with the train running in the same direction you could use IR sensor 1 and 3 to stop the train at two different stations along the track. You could have a single track with IR sensor 1 at one end and IR sensor 4 at the other and have the train run back and forth along the same track stopping for different lengths of time at each end.

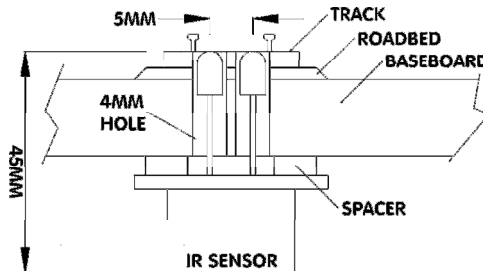
You will only require two IR sensors if you are not using turnouts and four when you are.

Installing IR Sensors

There is two parts to each IR sensor, a transmitter and a receiver. When mounting the IR sensor make sure that these two components are pointing directly up or slightly bent in towards each other. The train acts like a reflector when it passes over the IR sensor so if they are pointing away from each other the train may go undetected. Avoid installing IR sensors where they can be exposed to direct sunlight as it may cause false triggering.



It is recommended that the IR sensors are mounted under your layout and pushed up between the rails in your track. Drill two 4.0mm(5/32 inch) holes 5mm apart or make a 4.0mm x 9.0mm slot, being careful not to damage the track. Screw the IR sensor in place adding a spacer if necessary, so that top of it sits level with the top of your ballast or sleepers. Make sure nothing covers the top of the IR sensor.



Wiring IR Sensors to the ARU

The ARU can have up to four IR sensors connected to it, each one requiring three wires to operate. Pins 1, 2 and 3 on each sensor terminal block on the ARU must be wired to pins 1, 2 and 3 on the IR sensor board respectively.

Wiring the Track to the ARU

Connect two wires from the track output on your transformer to the terminals marked *TRACK IN* on the ARU. Now connect two wires from the *TRACK OUT* terminals on the ARU to the track. If the ARU is not turned on then you can manually operate your train as normal, so at this stage it is a good idea to place a train on the track and check that the speed and direction controls work correctly.

Wiring Power to the ARU

Connect two wires from the AC output on your transformer to the terminals marked *AC OR DC POWER IN* on the ARU. Input power can be 6 to 18 VAC or 8 to 25VDC.

Powering Up the ARU

When you power up the ARU, there is a preprogrammed delay before power is supplied to the track. This is to allow the TC-8S (if connected) to go through its initialisation process. If a train is not detected over any of the four IR sensors after the delay then it will set any connected turnouts to the straight position and start the train running in a forward direction. It is recommended that you always have the train parked over an IR sensor before powering up the ARU.

Calibrating the IR Sensors

Place a train over the IR sensor you want to calibrate and then hold down the calibration button. If the LED for the IR sensor you are calibrating is on or flashing then turn its sensor control in an anti-clockwise direction until the LED goes out. Now slowly wind the sensor control in a clockwise direction until the LED starts flashing again. Release the calibration button and you are done. At this stage the IR sensor is at its most sensitive point and in some circumstances maybe falsely triggered. If this occurs reduce the sensitivity by winding the sensor control in a clockwise direction until the correct setting is achieved. Once the IR sensors have been calibrated you should not have to do it again. Repeat this procedure for all IR sensors you wish to calibrate.

When the calibration button is released there is a preprogrammed delay before power is applied to the track as explained in the “Powering Up the ARU” section.

Controlling Train Speed and Direction

The ARU does not control the speed of the train, this is done by an external DC train speed controller connected to the *TRACK IN* terminals on the ARU. The direction of the train depends on which sensor last detected the train. sensors 1 and 3 will set the train in a forward direction while sensors 2 and 4 will set it in a reverse direction. On power up if a train is not detected over any of the four sensors it will start the train running in a forward direction.

The ARU is not designed to work with DCC.

Adjusting Timer Delays

The ARU has two separate timers which control the length of time the train is stopped for once it has been detected. Timer 1 is used when a train is detected at either IR sensor 1 or 2. Timer 2 is used when a train is detected at either IR sensor 3 or 4.

You can adjust Timer 1 by winding its control in an anti-clockwise direction to decrease the delay and in a clockwise direction to increase it. Likewise you can adjust Timer 2 by winding its control in an anti-clockwise direction to decrease the delay and in a clockwise direction to increase it. When either timer has been activated its associated LED will be illuminated. If you decrease the delay enough the train will not stop at all.

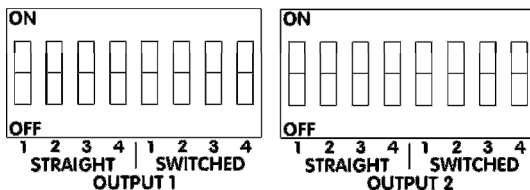
Wiring Turnouts

The ARU interfaces directly to the TC-8S which enables it to control up to two turnouts. The turnout motors are wired to the TC-8S exactly the same as if it was operating as a stand alone unit (refer to the Turnout Controller-8S User Manual). The only difference is that the turnouts you wish to be controlled by the ARU have their control pins on the TC-8S wired to the output connector on the ARU. The output connector on the ARU has 3 terminals, *COMMON*, *OUTPUT 1* and *OUTPUT 2*. *OUTPUT 1* is operated by the *OUTPUT 1* control switches and *OUTPUT 2* is operated by *OUTPUT 2* control switches. Connect a wire from the *COMMON* terminal on the ARU to the *GROUND* pin on the control panel connector which plugs into your TC-8S. Then wire from the *OUTPUT 1* terminal on the ARU to the control pin of the turnout you wish to operate (i.e. *T1 CNTL* for turnout 1). Wire the *OUTPUT 2* terminal on the ARU to the control pin of the second turnout you wish to operate (i.e. *T4 CNTL* for turnout 4). Two turnout control pins on the TC-8S can be connected to the one output terminal on the ARU if you wish to operate a crossover. See the TC-8S user manual for more information.

If you are controlling turnouts connected to different TC-8S's then make sure you connect the *COMMON* terminal on the ARU to the *GROUND* pin on both control panel connectors.

Controlling Turnouts

There are two banks of eight switches along the top of the ARU, one for each turnout. Each bank is divided into two. The first four switches are marked *OUTPUT 1 STRAIGHT* with the numbers 1 through 4 next to them.



These numbers represent the four IR sensors. If you moved switch 1 to the on position, then when a train is detected at IR sensor 1 then turnout 1 will be changed to the straight position. If you moved switch 2 to the on position then turnout 1 will be changed to the straight position when a train is detected at IR sensor 2 and so on. Likewise the next four switches are marked *OUTPUT 1 SWITCHED* with the numbers 1 through 4 next to them. Move the switch of the IR sensor you wish to change turnout 1 to the switched position to on. The second bank of switches is exactly the same as the first except it is used to operate turnout 2.

Specifications

Dimensions: 152mm (width) x 90mm (depth) x 30mm (height)
Maximum Train Current: 2A
Maximum Train Voltage: 30VDC

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