INSTRUCTION SHEET

The Atlas Master™ DCC Turnout Control Unit - Item #344

IMPORTANT PRECAUTIONS, PLEASE READ BEFORE USING YOUR NEW TCU!

The Atlas Master™ Turnout Control Unit (TCU) (Item #344) is an accessory for the Atlas Master™ DCC System (or any other NMRA-compliant DCC system) and underwent intensive testing before its release. Any use other than that described in this instruction sheet is not covered by the Atlas warranty.

Connect the TCU only to DCC systems that are designed for such use. This instruction sheet explains in detail how to connect the Atlas Master TCU to an AC transformer, to your DCC system, and to the switch machines used to operate your turnouts.

Do not, in any case, exceed the limits for voltage and power specified in this Instruction Sheet since doing so could damage the TCU and void its warranty.

Do not expose your TCU to dampness or to direct sunlight.

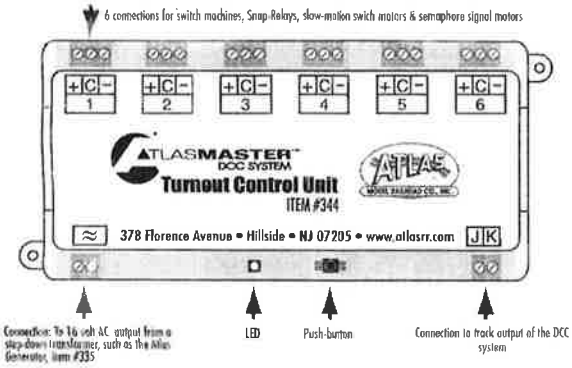
FUNCTION OF THE TCU

The TCU is an accessory (stationary) DCC decoder designed for use with the Atlas Master™ DCC System or with any other NMRA-compliant DCC system. Accessory decoders serve as the connecting link between your DCC system and various accessories (such as twin-coil switch machines, Atlas Snap Relays, slow-motion switch machines, semaphore signal motors, etc.) used on your model railroad layout.

The TCU was designed specifically for the connection of twin-coil switch machines and Atlas Snap Relays to a DCC system. These devices will operate very reliably when connected to one of the TCU outputs.

Slow-motion switch machines or the motors that are used to operate semaphore signals can also be connected to the TCU. This connection requires (depending on the particular device used) the addition of two silicon diodes of type 1N4003. These diodes are not supplied with the TCU but are available from most electronics parts suppliers.

TECHNICAL DATA



Range of addresses	1 - 1024
Maximum AC input voltage	16 volts rms
Maximum DCC system voltage	24 volts
Output voltage	Approximately one volt less than voltage applied to TCU AC input
Pulse duration of outputs	Settable from 0.1 to 10 seconds
Maximum power available from a TCU output:	
Up to 1-second pulse duration	3 Amps
More than 1-second pulse duration	1 Amp
Minimum power consumption of device(s) connected to a TCU output	10mA
Dimensions	4.72 x 2.36 x 0.78 in.

NUMBER OF TCU OUTPUTS

The TCU has six outputs, meaning that up to six devices such as switch machines and semaphore signal motors, etc. (or combinations of such devices connected in parallel to the same TCU output) can be connected to a TCU and can be controlled individually.

PULSE DURATION

After receiving (from the DCC system) a turnout control command for a particular output, the specified output on the TCU will be turned on. It will remain turned on for as long as the turnout control command is being sent from the DCC system to the TCU. In addition, the pulse duration of each TCU output can be set individually to any duration in the range from 0.1 to 10 seconds.

OVERLOAD PROTECTION

Each TCU output has a built-in mechanism to protect it against overloads (short circuits). If the maximum permissible power for an output is exceeded, the TCU will shut down the terminal ("+" or "-") of the output that has experienced a short-circuit. You can tell that an output has been turned off by the fact that the LED at the bottom of the TCU is not illuminated even though a DCC turnout control command for this output has been sent to the TCU. The opposite terminal of an output is not affected by this protection mechanism.

For example, if there is a short circuit on the "+" terminal of a particular TCU output, this "+" terminal will no longer function. However, the corresponding "-" terminal as well as the other five TCU outputs will function normally. A short-circuited output terminal can be reactivated only by momentarily disconnecting all AC power from the TCU by unplugging from its wall outlet the AC transformer used to supply power to the TCU.

OUTPUT VOLTAGE

An AC voltage is supplied to each active TCU output. AC output voltages are particularly advantageous for use with twin coil switch machines and Atlas Snap Relays.

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ATLASMASTER™ DCC SYSTEM

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Any device (or parallel combination of devices connected to the same TCU output) connected to a TCU output must have a minimum current consumption of at least 10mA. This minimum current consumption requirement will be satisfied with almost all of the devices that can be controlled by the TCU. However, if in doubt, please contact the manufacturer of your particular device.

AC POWER INPUT TO TCU

The TCU receives from its AC input terminals, which are labeled ≈, the AC power that it needs to operate. Use a suitable transformer; we recommend the Atlas Master™ Generator (Item #335) for this purpose.

WARNING: Use only a transformer that provides an AC output to power the TCU. Do not use power packs that deliver DC output voltages since doing so can damage or destroy the TCU.

CAUTION: The output power of the transformer used must not exceed 45VA in order to guarantee that the built-in TCU overload protection mechanism operates properly.

CONNECTING POWER AND CONTROL LEADS TO TCU

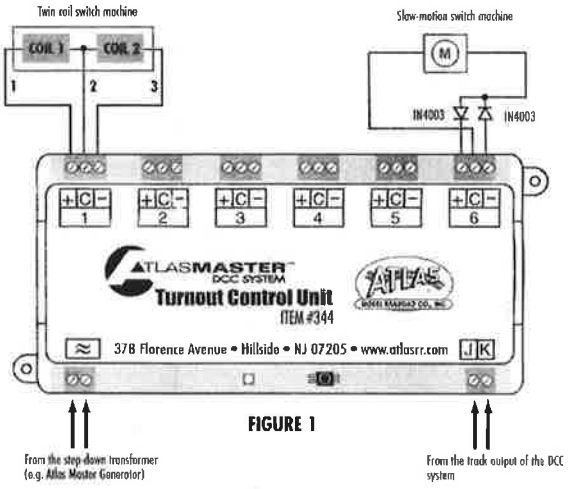


FIGURE 1

CONNECTION TO AC TRANSFORMER

Please refer to Figure 1: Connect the terminals on the TCU that are labeled (≈) to the output terminals of your AC transformer. Be sure the transformer you use does not exceed the maximum permissible transformer output voltage of 16 Vrms. Also, the maximum output power from this transformer must not exceed 45VA to guarantee properly functioning overload protection. We recommend using the Atlas Master™ Generator (Item #335).

CONNECTION TO THE DCC SYSTEM

Please refer to Figure 1: Connect the terminals on the TCU that are labeled J and K to the track power output of your DCC system. (Note that the DCC outputs to the track are also labeled J and K with an Atlas Master™ DCC system or with a Lenz Digital Plus DCC system.)

CONNECTING TURNOUTS TO TCU

Since model railroad turnouts can be operated remotely by using either twin-coil switch machines (such as those made by Atlas) or slow-motion switch machines, the TCU is designed so that each TCU output may be used to control either twin-coil switch machines (or Atlas Snap Relays) or slow-motion switch machines (or DC-operated semaphore signal motors). However, a single TCU output cannot be used to control both twin-coil switch machines and slow-motion switch machines. Also keep in mind that multiple (up to six) Atlas twin-coil switch machines (or six other devices that have the same or less power consumption as an Atlas twin-coil switch machine) can be connected in parallel to each TCU output. This latter capability of the TCU is very useful for controlling two or more turnouts that must always be thrown together, such as a crossover track between two main lines.

With either twin-coil switch machines or slow-motion switch machines, a switch machine can be wired to the TCU so that when the "+" terminal for a TCU output is activated by the DCC system the straight route is selected for the turnout controlled by this switch machine, and when the "-" terminal is activated the curved route is selected. If you connect a turnout to the TCU and get this type of operation, but you would like the turnout to perform in the reverse manner (When the "+" terminal for a TCU output is activated by the DCC system the curved route is selected and when the "-" terminal is activated the straight route is selected.), simply reverse the connections between your switch machine and TCU output terminals labeled "+" and "-".

TCU CONNECTIONS FOR TWIN-COIL SWITCH MACHINES (OR ATLAS SNAP RELAYS)

Please refer to the top left of Figure 1. The common connection to the two coils in a twin-coil switch machine (the wire labeled 2 in Figure 1) is connected to the terminal marked "C" on a TCU output. The remaining wire from coil 1 (labeled 1 in Figure 1) is connected to the TCU output terminal marked "+," and the remaining wire from coil 2 (labeled 3 in Figure 1) is connected to the TCU output terminal marked "-."

Table 2 contains the color codes on the wires that are attached to certain Atlas switch machines and relates these color codes to the numbering of the switch machine connections in Figure 1. (If you are not using Atlas switch machines, please refer to the instructions supplied with your particular switch machine to verify the proper connections for these switch machines.)

Terminal designations in Figure 1:	1	2	3
Wire colors on Atlas switch machine	red	black	green

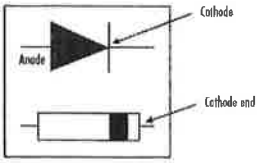
When using twin-coil switch machines without an automatic current shutoff (this includes all Atlas switch machines), extending the pulse duration (see the section entitled "Setting Addresses and Pulse Durations for TCU Outputs") beyond the factory-default setting is necessary ONLY if the switch machine does not move far enough despite its being installed and operating correctly. Keep in mind that extending output pulse durations can lead to significant overheating of twin-coil switch machines.

TCU CONNECTIONS FOR SLOW-MOTION SWITCH MACHINES

Please refer to the top right of Figure 1. Slow-motion switch machines require a DC voltage for operation. By reversing this DC voltage, the direction of rotation of the motor in the slow-motion switch machine is reversed, and the turnout or semaphore signal is moved to the opposite position.

To connect slow-motion switch machines to the TCU, you will need to purchase two 1N4003 (or similar) silicon diodes for each output of the TCU that is to control one (or more) slow motion switch machines. Connect your slow-motion switch machines as

shown in Figure 1. Note that a ring around the body of a silicon diode marks the end of the diode that corresponds to its cathode lead. The type of silicon diode required depends on the current consumption of your particular slow-motion switch machines, but normally type 1N4003 silicon diodes should have sufficient capacity.



IMPORTANT: When operating slow-motion switch machines from an Atlas Commander or HandCommand in the Atlas Master™ DCC system, you must hold down (for a long enough period of time to allow the points of your turnout to move completely from one position to the other) the function button (F0 or F1) that corresponds to the direction in which you wish the turnout to move. Holding down the function button is not necessary with some other DCC systems.

OPERATING TURNOUTS FROM YOUR DCC SYSTEM

To operate a turnout from your DCC system, it is necessary first to specify the address of this turnout. Then, and only then, can you press the button on your DCC system that causes this turnout to move to the desired position.

For example when using an Atlas Commander, the turnout menu may be accessed by first pressing the Forward and Reverse buttons at the same time and then releasing these two buttons, pressing the "+" or "-" buttons repeatedly until Sch is displayed on the screen of the Commander, and finally pressing the Enter button. Repeatedly press and release the "+" or "-" buttons until the address of the turnout that you wish to operate is displayed on the screen. Finally, press either F0 or F1 to operate the turnout (depending on which direction you wish the turnout to move).

If you are using another DCC system, consult the users manual for this system for the procedure to operate turnouts with your system.

CONNECTING AN ATLAS #56 SWITCH CONTROL BOX TO THE TCU (OPTIONAL)

As shown in Figure 2, if you are using a TCU output to control either a twin-coil switch machine or a Snap Relay, you may also connect an Atlas #56 Switch Control Box to the same TCU output to which you have connected the twin-coil switch machine or Snap Relay. By installing this #56 Switch Control Box, you now have the ability to control the switch machine or Snap Relay either from your DCC system or manually by using the #56 Switch Control Box. A typical Atlas twin-coil switch machine or Snap Relay is shown in Figure 2. As was discussed earlier, the common wire for the two coils in a twin coil switch machine is connected to the "C" terminal of a TCU output. The remaining wire from the first coil of the twin-coil switch machine or Snap Relay is connected to the "+" terminal of this same output, and the remaining wire of the second coil is connected to the "-" terminal of the TCU output.

The connections to the Atlas #56 Switch Control Box are also shown in Figure 2. When connecting the #56 Switch Control Box, make certain that the common connection (top center screw) from the Switch Control Box is connected to the right-hand AC input terminal, as shown in Figure 2. Otherwise, the #56 Switch Control Box will not function properly.

WARNING: The "C" terminals of two different TCUs must not be connected to one another.

Move the button on the #56 Switch Control Box to the left side, and then press this button briefly to activate coil 1. Similarly to activate coil 2, move the button on the #56 Switch Control Box to the right side and press it briefly.

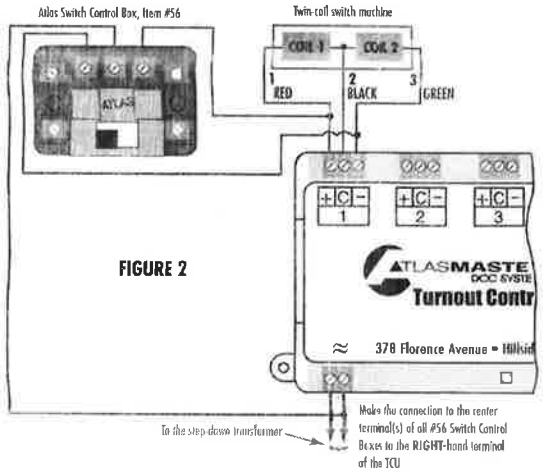


FIGURE 2

SENDING MULTIPLE DCC TURNOUT COMMANDS TO A TCU

Incoming switch commands from the DCC system are stored in the TCU until they can be processed. If the TCU receives several switch commands in a row that cannot be processed simultaneously, the corresponding TCU outputs will be activated in the order in which these commands were received by the TCU. This feature is ideal for use in selecting a route through multiple turnouts, such as a route through a yard switch ladder.

SETTING ADDRESSES AND PULSE DURATIONS FOR TCU OUTPUTS

The six outputs from the TCU decoder are set by factory default to turnout addresses 1 to 6. In addition, by factory default, the output pulse duration is set to 0.1 seconds (100ms) for all six TCU outputs.

The following two procedures may be used to set TCU outputs to different turnout addresses. Furthermore, with the second procedure, it is also possible to set the pulse duration of a TCU output to any desired value in the range from 0.1 to 10 seconds.

1. In the first procedure, output 1 can be set to any desired address. The remaining five TCU outputs will then be set automatically to the five addresses immediately following the address specified for output 1.
2. The second procedure can be used to set each of the six TCU outputs to individual addresses. Unlike the first procedure, the addresses of TCU outputs need not be sequential in this procedure. In addition, this second procedure allows specifying a different value for the pulse duration for each of the six TCU outputs.

If you are not already familiar with the steps used to control turnouts from your DCC system, before undertaking any of the following procedures, it is suggested that you first take the time to re-read carefully the sections in the user manual for your DCC system that deal with controlling turnouts and experiment with operating some turnouts that you have already connected to your TCU.

PROCEDURE FOR SETTING TCU OUTPUTS TO SEQUENTIAL ADDRESSES

This first procedure is used to set TCU output 1 to any desired address.

CAUTION: All turnout addresses must be in the range of 1 to 99 if you are using an Atlas Master Commander DCC system.

The remaining five TCU outputs will then be set automatically to the five addresses immediately following the address specified for output 1.

Connect the TCU to both the low voltage AC supply and to the track output of your DCC system as described in the Section entitled "Connecting Power and Control Leads to TCU." Then switch on the power to your DCC system and complete the following steps.

1. Choose the address to which you wish to set the first output of the TCU. Enter the address that you have just chosen into your DCC system in the same way that you would enter the address of a turnout that has the address that you have chosen for this first TCU output.
2. Press down the small push-button that is located at the bottom of the TCU and keep it depressed until the LED on the TCU lights continuously. It will take approximately three seconds for this LED to illuminate. Release the push button after you see this LED has become illuminated. The LED will remain illuminated, and the TCU now will change from its normal operating mode into its programming mode.
3. Press one of the two buttons on your DCC systems that are used to operate a turnout. It does not matter whether you choose the button for the straight or for the curved route. For example, when using an Atlas Commander, you may push either the F0 button or the F1 button.
4. The address received with the switch command is now sent to output 1 of the TCU. Outputs 2 to 6 will be set automatically to the five following addresses.

You can tell that this sequential TCU address setting has been done correctly if the LED at the bottom of the TCU turns off and the turnout command is carried out; i.e., the switch machine connected to the turnout with the address that you have specified for TCU output 1 (assuming that a switch machine has been connected to this turnout and wired to TCU output 1) moves. The TCU will now return to its normal operating mode.

PROCEDURE FOR SETTING ADDRESSES AND PULSE DURATIONS FOR TCU OUTPUTS

The second procedure is used to set individual TCU outputs to addresses that do not necessarily have to be sequential. Furthermore, it is also possible to set the pulse duration of an output to any desired value in the range from 0.1 to 10 seconds by using this procedure.

Connect the TCU both to the low voltage AC supply and to the track output of your DCC system, as described in the section entitled "Connecting Power and Control Leads to TCU." Then turn on the power to your DCC system and complete the following steps in order to set the address and pulse duration of each TCU output.

1. Press the small push-button at the bottom of the TCU and hold this button down until the LED at the bottom of the TCU is illuminated continuously. Note that it will take approximately three seconds for this LED to become illuminated. After the LED lights, release the push-button. The LED on the TCU will continue to be illuminated continuously.
2. Press the push-button on the TCU again momentarily. The LED will now start to flash with the following pattern: One flash followed by a pause indicating that output 1 has been selected. If you wish to set the address and/or pulse duration of TCU output 1, go now to Step 5.
3. If, however, you wish to select TCU output 2, press the push-button on the TCU once more. The LED on the TCU will again flash on and off in an evenly spaced pattern. Once you see this evenly spaced on/off-flashing pattern, press the push-button on the TCU again. The LED will now start to flash with a new pattern:
   - Two flashes followed by a pause indicating that output 2 has been selected.
   - If you wish to set the address and/or pulse duration of TCU output 2, go now to Step 5.
4. To select TCU output 3, 4, 5 or 6, repeat the procedure in step 3 as many times as are needed to reach the desired output.
5. Enter the address to which you wish to set the selected TCU output into your DCC system. (If you want to set only the pulse duration of this output, but not its address, press the push button on the TCU once more and go to Step 7.)
6. The LED on the TCU will start to flash on and off with an evenly spaced flashing pattern.
7. You can now set the pulse duration of the selected TCU output. (If you do not wish to set a pulse duration, press the TCU push-button again momentarily and go to Step 8.) Select a turnout address between 1 & 100 (1 & 99 if you are using an Atlas Commander) on your DCC system that corresponds to the TCU output pulse duration that you want to use in the following way: Address 1 stands for 0.1 second; address 100 for 10 seconds; and so forth.

For example, if you wish to extend the duration of the output pulse on a TCU output to 1.1 seconds, you would enter turnout address 11 into your DCC system.

WARNING: Extending the output pulse duration very much beyond its default value of 0.1 seconds can damage or destroy Atlas switch machines and Snap Relays. This damage is not covered by the Atlas warranty on these switch machines or Snap Relays.

The TCU will interpret, as the desired pulse duration, the number that you have entered into your DCC system.

8. The LED will start to flash on and off with the one of the irregular flashing patterns that were described in Steps 2, 3 and 4 above. You may now set the address and/or pulse duration for the TCU output that corresponds to the next TCU LED flashing pattern you observe. To do this, go back to Step 5 and continue with Steps 6 and 7.
9. Repeat the above procedure for all TCU outputs. If you wish to skip a certain output, simply press and hold the push-button on the TCU momentarily, and the TCU will proceed to the next output. This feature also makes it possible to set the address and/or pulse duration of a single TCU output separately.

CAUTION: If only the address of a TCU output is changed, any change in pulse duration that was previously made will remain in effect for this output.

10. To complete this process, press the push-button on the TCU once again until you see that the LED turns off.

RESETTING TCU TO FACTORY-DEFAULT SETTINGS

To reset the TCU to its factory-default settings, perform the following steps:

1. Interrupt the low voltage supply to the TCU by unplugging from the wall outlet the transformer that is used to supply AC voltage to the TCU.
2. Press the push-button at the bottom of the TCU and keep this button depressed.
3. Switch the AC voltage back on again by plugging your transformer back into the wall outlet.
4. Proceed as if you wish to switch turnout 1 with your DCC system by entering address 1 and pushing one of the two buttons on your DCC system that are used to throw a turnout (button F0 or F1 on an Atlas Commander). It does not matter which of the two buttons you press.
5. Release the push-button on the TCU.

At the completion of this procedure, the TCU has been reset back to its factory-default settings of output addresses 1 to 6 and to the shortest pulse duration (100ms) for all six outputs. The TCU will now perform a test during which each of its outputs is activated in sequence. If any switch machines have been connected to the TCU outputs, the turnouts controlled by these switch machines will be activated briefly one after the other during the course of this test.