SWITCH ACCESSORY	COMM	4 O	4 T	3 O	3 T	COMM	2 O	2 T	1 O	1 T	SWITCH ACCESSORY
		8	7	6	5		4	3	2	1	

LIONEL
CONTROL SYSTEM
LEGACY

LCS ASC2

LAYOUT CONTROL SYSTEM ™

6-81639

LCS PDI CABLES
use either connector

PROGRAM

AC Power
A U A U

PDI

PGM

Lionel Accessory Switch Controller 2 (ASC2) Owner's Manual

LIONEL
CONTROL SYSTEM
LEGACY

LCS

LAYOUT CONTROL SYSTEM

Thank You!

L ionel's Layout Control System, or "LCS", integrates full control of your layout into the palm of your hand! Use this system to control switches, accessories, and more using the Cab controller of your choosing!

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Controlling switches wired to the ASC2

Appendix

What is Lionel's Layout Control System?

LCS adds to your existing command control system! Control your layout from a Lionel Cab remote or from smart devices using the LCS App. Control locomotives, operate track switches, accessories, light, and more! Create automatic events to control passing locomotives and other layout accessories or switches.

LCS is a modular system, with each product offering unique features. No single LCS product will do everything and not every layout will require every type of LCS device. A fully realized LCS system will likely include the following:

- A Lionel Command Base such as the Base3
- LCS ASC2 to operate switches, lighting, and accessories
- LCS BPC2 for block power control
- LCS SensorTrack which adds a new level of interactivity with compatible Lionel Legacy and VISION locomotives
- LCS AMC2 for controlling accessory motors and incandescent lights
- LCS SER2 for computer control, use of existing serial devices like the TPC-300 and TPC-400

How it works!

Your Lionel Cab controller sends commands to your command base. In turn, the base controls your locomotives. LCS works in parallel with your command base, adding a wired network of control modules. Spread across your layout, these LCS modules operate switches, lighting, accessories, and track power blocks. LCS is bidirectional, meaning modules can send and receive commands.

Here's where it all comes together. Since LCS can also send commands back through the command base, LCS devices can operate your locomotives as well as your layout! For example, a module like SensorTrack can make a locomotive blow a grade-crossing signal as it passes.
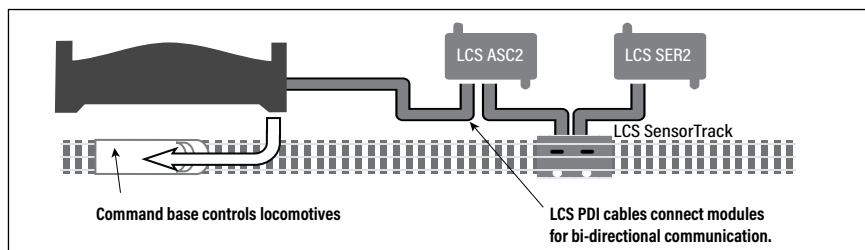
Figure 1. LCS adds to your Lionel Base3!

What is Lionel's Layout Control System?

LCS ASC2 Module

The ASC2 module is designed to be connected to track switches and accessories on your model railroad layout. Then you can control these connected switches and accessories from a Lionel hand-held remote or a smart device.

- When configured in switch mode, an ASC2 operates up to four remotely operated switches from Lionel and other manufacturers.
- The ASC2 has eight Normally Open relays, with four banks of two complementary outputs. One pair of relays will activate the "THRU" position with one set of contacts, and the other set of contacts will activate the "OUT" position.
- Each relay is rated at 20 amps.
- When configured in accessory mode, up to eight lights, uncoupling tracks or basic on/off accessories can be controlled.
- Accessory mode is configured as 8 normally open relays, split into two banks of four. Each of these two banks has a common terminal feed.

Figure 2. LCS ASC2 module

LCS Device Installation

Installing Your First LCS Device

The following section describes installation of a new LCS system. If you already have installed your first LCS component, skip ahead to the next section titled "Installing additional LCS devices."

When installing a new LCS system, the process depends on if you are installing using a Base3 command base or no command base at all.

Installing a new LCS system with a Base3

To install a new LCS system on a layout with a Base3:

1. Turn off power to your layout and Base3.
2. Connect a LCS PDI cable to one of the three LCS ports on the back of the Base3.
3. Connect the other end of the PDI cable to one of the two PDI ports on your new LCS module.
4. Restore power to your layout and Base3.

Note! The Base3 runs an initial systems' test before powering up the LCS system. When you power on the Base3, wait 15 seconds and then the LCS system will turn on as indicated by the LED lights.

Once connected and powered up, you can control Lionel locomotives and Layout Control System products using a Cab-1L, Cab2, or the Cab3 App.

If you have additional LCS devices to install, see "Installing additional LCS devices." If not, skip ahead to the next section of this manual, "Configuring your LCS Device."

Figure 3. Install a PDI cable into one of the three LCS ports on the back of the Base3

LCS Device Installation

Installing a new LCS system with NO Command Base

The Layout Control System can be used without a Lionel Command base. This would be appropriate for a layout which only uses "conventional" or "transformer-controlled" locomotives or a different type of locomotive control system such as DCC. An LCS WiFi is required, as are one other LCS module (such as ASC2 or BPC2).

To install a new LCS system on a layout that does NOT include Lionel Command Base:
1. Connect the DC wall-pack to the female cable-mount connector of the LCS DB-9 Cable.
2. Connect the LCS PDI cable end of the LCS DB-9 Cable to either connector on your LCS WiFi.
3. Set the Base/No Base switch to "NO BASE."
4. Leave the DB-9 connector of the LCS DB-9 Cable unconnected.
5. Plug in the LCS wall-pack power supply.

With this setup, you can control other Layout Control System products using compatible software on smart devices connected via WiFi or from a computer using a wired serial connection via an LCS SER2. Since this configuration does not include a command base, you will not be able to use Lionel Cab Remotes, command-controlled locomotives or wireless command controlled switches or accessories in conjunction with this LCS system.

If you have additional LCS devices to install, see "Installing additional LCS devices". If not, skip ahead to the next section of this manual, "Configuring your LCS Device."
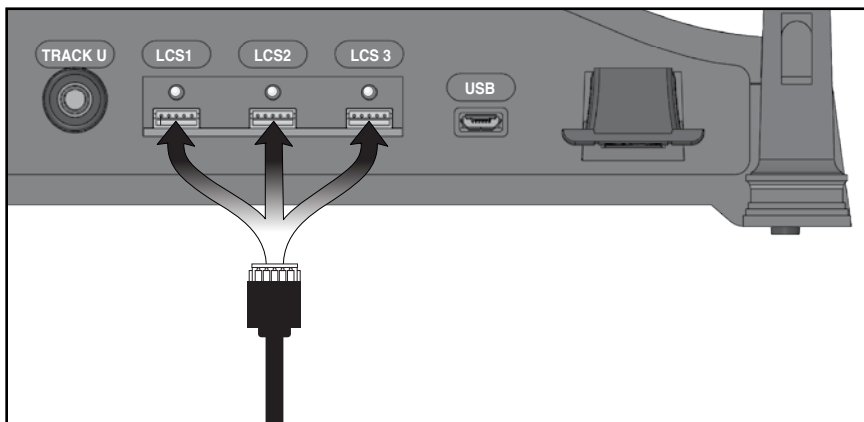
LCS Device Installation

This section describes adding a new device to an existing Layout Control System installation. If you are installing a brand new LCS system, please refer to the previous section of this document "Installing Your First LCS Device".

Adding additional LCS devices to an existing Layout Control System requires an additional cable for each new device. These "LCS PDI Cables" come in a variety of pre-made lengths. They are not included with LCS devices, and must be purchased separately. LCS PDI Cables are available in a variety of lengths:

6-81500 - LCS PDI 1ft Cable

6-81501 - LCS PDI 3ft Cable

6-81502 - LCS PDI 10ft Cable

6-81503 - LCS PDI 20ft Cable

Each new device is connected via LCS PDI cables in a "daisy-chain" fashion (one to the next, and so on). The order of devices in the "chain" is up to you.

To connect each additional LCS device:

1. Find the "last" LCS device in the chain. One if its two LCS PDI connectors will be in use, the other will be empty.

2. Using your chosen length LCS PDI Cable, connect one cable end to the unused LCS PDI connector of the last LCS device in the chain.

3. Connect the second cable end to either of the LCS PDI connectors on your new LCS device (see figure below). Your new LCS device is now the last one in the chain.
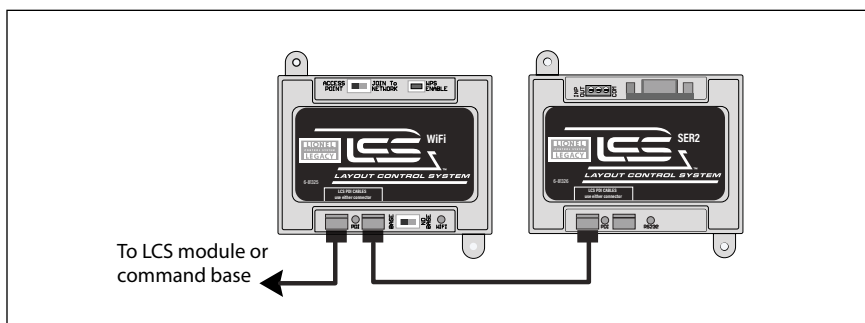
Figure 4. Installing additional LCS devices

Configuring Your ASC2

The illustration below shows the name and location of each switch, connector and indicator light on your LCS ASC2 module. The function of each is described on following pages.

A – **Switch/Accessory terminals should be connected to lights, switches and accessories.**

B – **Label for screw terminals in Switch or Accessory mode. Each ASC2 must be configured either for switch OR accessory operation.**

C – **LCS PDI cable inputs. Use either connector.**

D – **Red LCS PDI activity indicator.**

E – **Program switch used to set the ASC2's TMCC ID.**

F – **Relay Power terminals**

Figure 5. ASC2 callouts

There are three additional steps required to use your ASC2. They are:

1. Connect an accessory transformer to the Relay Power Terminals.

2. Set the ASC2's software configuration. In this step, you will choose switch vs. accessory mode, base address and the latching or momentary sub-mode.

3. Wire your accessories or switches to the ASC2.

Configuring Your ASC2

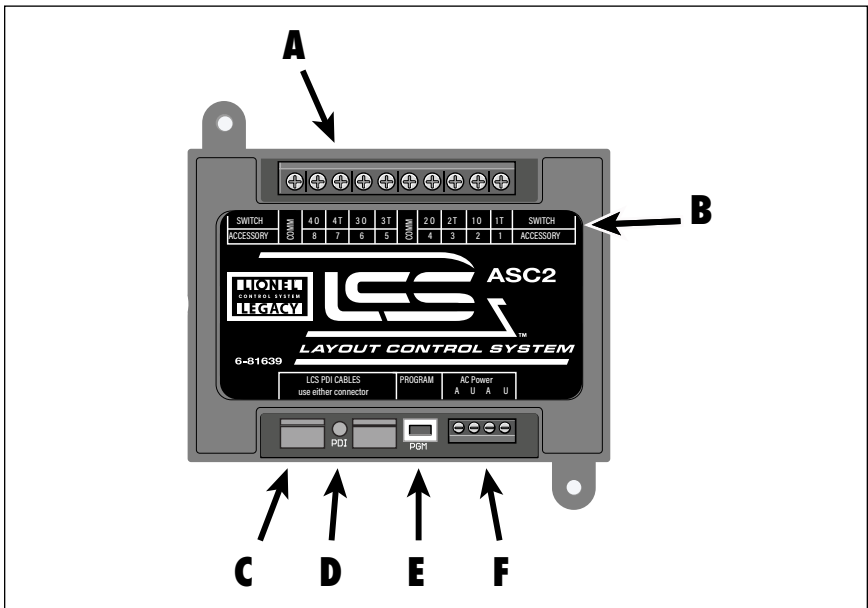## Installing a new LCS system with NO Command Base

Your ASC2 requires an external power source to operate its 8 internal relays. This must be supplied from a separate accessory transformer and is required for both Accessory or Switch configuration of your ASC2.

Connect an accessory transformer with an 12-14 VCA output to the ASC2's front screw terminal connections marked "A" and "U" as shown in Figure 9 below. If your installation includes more than one ASC2, they can share the same accessory transformer as long it the combined current draw of the relays does not exceed the capacity of the accessory transformer (See Specifications, Electrical at the end of this document).
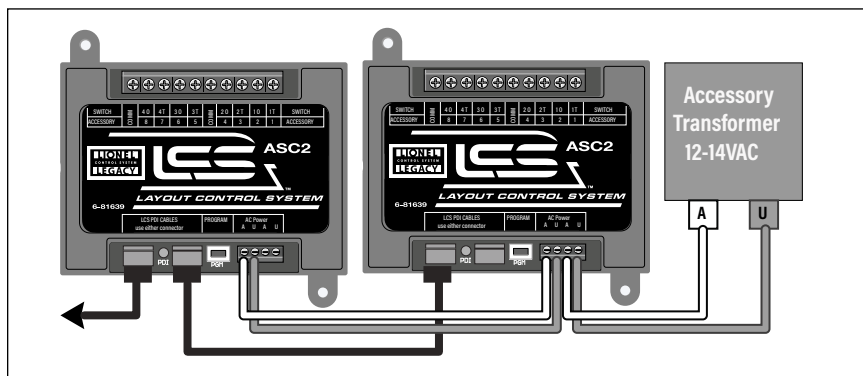
Figure 6. Connecting two ASC2 modules with LCS PDI cables and parallel external relay power

The ASC2 requires separate external power to operate its internal relays. Multiple ASC2 and/or BPC2 modules can be wired in a daisy-chain fashion as shown above.

When connected to switches, lighting or accessories, the ASC2 will switch on and off the power to these connected devices. However, the power to these external devices will simply be passing through the ASC2 relays. The ASC2 does NOT supply the operating power required by connected switches, lighting or accessories.

To connect the Relay Power Terminals on your ASC2:

1. Attach one wire to the Common/Ground/U terminal of your transformer and connect it to the POWER U terminal on the ASC2 unit. Do not connect this terminal to the outside rail.

2. Attach another wire to the Power/A terminal of your transformer and connect it to the POWER A terminal on the ASC2 unit.

3. If your layout includes additional ASC2 or BPC2 devices, you can use the spare A and U terminals on the first unit to jumper power to your next ASC2 device as shown in Figure 6.

Configuring Your ASC2

Understanding ASC2 Software Configuration

Your ASC2 software configuration is a single operation that sets three distinct features:

1. Switch mode vs. Accessory Mode

2. The base address/TMCC ID used to control connected accessories/switches

3. Sub-mode setting. For accessories, the sub-mode chooses between operating an assortment of accessories and/or lights vs. using an ASC2 exclusively to control up to 8 independent uncoupling tracks. For switches, the sub-mode chooses between quick-operating switches (like FasTrack) or slow-acting switches.
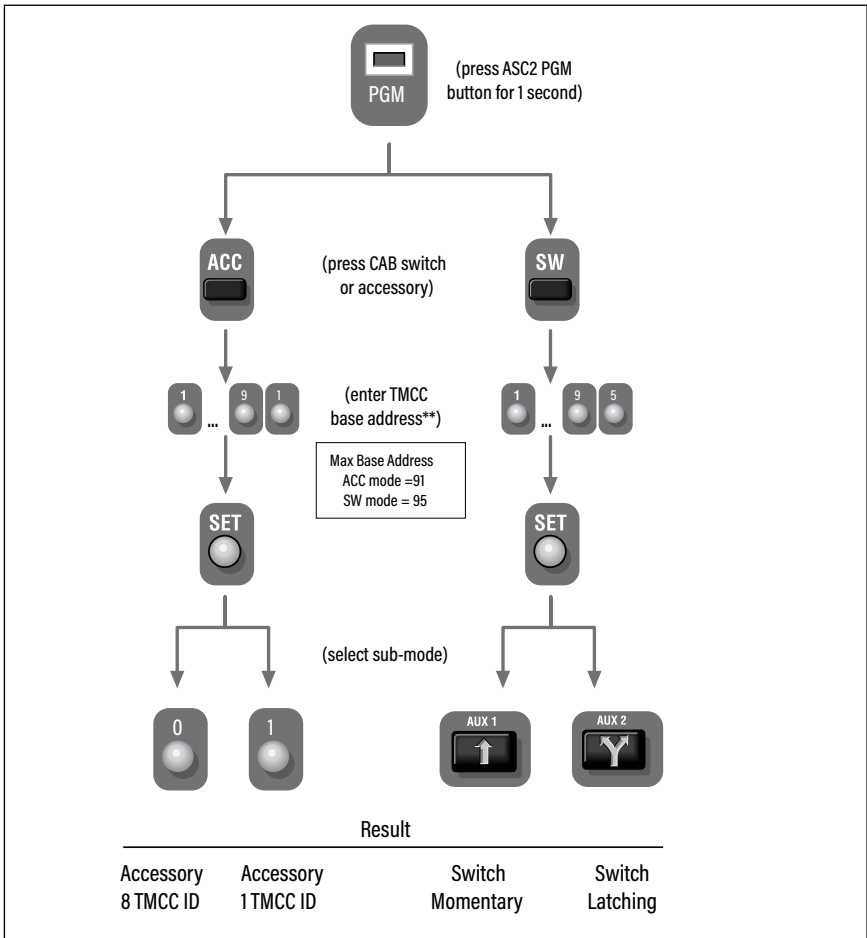

Figure 7. ASC2 configuration flowchart

Configuring Your ASC2

Switch vs. Accessory Mode

You cannot mix switch and accessory modes in a single ASC2.

In Accessory mode your ASC2 will respond to commands sent to "accessory IDs" from your remote. Up to 8 accessories are supported on a single ASC2.

In Switch mode, your ASC2 will respond to commands sent to "switch IDs" from your remote. Up to 4 switches are supported on a single ASC2.

Base Address/TMCC ID

Each ASC2 on your layout needs a unique numbered address (a.k.a. TMCC ID). You'll set this "base address." In switch mode, the ASC2 responds to four sequential IDs, starting with the base address. In "Eight ID" accessory mode, the ASC2 responds to eight sequential IDs, again starting with the base address.

Switch Sub-Mode: Momentary vs. Constant/Latching Operation

Lionel FasTrack and similar quick-throwing switches should use momentary operation. Tortoise-style, slow moving switches should use "constant power" or "latching" operation. You cannot mix latching and momentary switch operation in a single ASC2. Refer to the manual for your switch if you are unsure which mode to use. Choosing the wrong mode can prevent a switch from throwing, or permanently damage it.

Constant/Latching operation is also appropriate for signal controlled lighting where it is necessary for power to be on continuously.

Accessory Sub-Mode: Eight IDs

Eight ID sub-mode should be used when a combination of lights and accessories are connected to your ASC2. In this mode, each light or accessory will have its own TMCC ID. Relay terminal #1 will respond to the base address ID and each subsequent terminal responds to the next-higher ID number.

Eight ID sub-mode allows both momentary and latching relay operation. For momentary operation, pressing AUX1 turns on that relay terminal as long as you hold the key. Pressing AUX2 latches that relay on and it remains on after the AUX2 key is released. The next AUX2 key-press turns it off.

Accessory Sub-Mode: Single ID

Single ID sub-mode is designed specifically for connecting uncoupling tracks to a single ASC2. In this case, only one TMCC ID is used and relay operation is always momentary. You should choose Single ID sub-mode when ONLY uncoupling tracks are connected to your ASC2.

Configuring Your ASC2

Configuring & Using ASC2 in Accessory Mode

To configure your ASC2 for ACCESSORY Operation:

1. Turn power to your command base and LCS system on.
2. Press and hold the ASC2 PGM button for 1 seconds. The red LED will begin blinking slowly.
3. On your Lionel cab remote, press ACC to choose Accessory configuration.
4. Enter the 1 or 2 digit base address/TMCC ID.
5. Press SET. The red LED will blink quickly, then return to slow blinking.

   At this point, you've configured your ASC2 for Accessory operation and set the base TMCC ID. Now you need to set the accessory addressing mode—8 ID's or single-ID sub-mode.

6. Press AUX1, then 0 for Eight ID sub-mode OR AUX1, then 1 for Single ID sub-mode (see Accessory Mode sections on the previous page for more information). The red LED will stop blinking and the configuration process is complete.

To operate your ASC2 in ACCESSORY, 8 ID sub-mode:

1. Press the ACC button on your remote
2. Enter the ID number matching the address range set in the configuration step above. Hint: this will be the base address or one of the next seven numbers)
3. Press AUX1 to activate the associated accessory on a momentary basis, holding AUX1 as long as you desire to keep the accessory operating. (If you are close to your ASC2, listen for the sound of the relay clicking on and off.)
4. Press AUX2 to toggle the associated accessory on and off (like a light switch that you'd leave on indefinitely).

To operate your ASC2 in ACCESSORY, Single ID sub-mode:

1. Press the ACC button on your remote
2. Enter the ID number matching the base address set in the configuration step above.
3. Press AUX1, then numeric 1 to 8. The number entered will cause that relay terminal to operate momentarily, turning briefly on, then back off automatically, regardless of how long you hold the button.

   Single ID sub-mode is specifically designed for controlling multiple uncoupling tracks. See Appendix for additional ASC2 configuration examples.

Additional commands

   The ASC2 will identify by holding the numeric "0" (Legacy "R") command by turning on the RED PDI activity LED. This identifying mode will only work on the first ID in the 8 ID sub-mode of operation.

   The ASC2 will turn off all outputs if a numeric "0" (Legacy "R") command is received. The ASC2 will turn off all outputs if a "System Halt" command is received. Use the HALT button only in emergency situations.

Configuring Your ASC2

Configuring & Using ASC2 in Switch Mode

To configure your ASC2 for Switch (a.k.a. Turnout) Operation:

1. Turn power to your command base and LCS system on.
2. Press and hold the ASC2 PGM button for 1 seconds. The red LED will begin blinking slowly.
3. On your Lionel cab remote, press SW to choose Switch configuration.
4. Enter the 1 or 2 digit base address/TMCC ID.
5. Press SET. The red LED will blink quickly, then return to slow blinking.

   So far you've configured your ASC2 for Switch operation and set the base TMCC ID. Now you need to set the switch sub-mode—momentary or latching.

6. Press AUX1 for momentary OR press AUX2 for latching operation (see Switch Sub-Mode: Momentary vs. Constant/Latching Operation for more information). The red LED will stop blinking and the configuration process is complete.

Note! Lionel FasTrack and similar quick-throwing switches should use momentary operation. Tortoise slow moving switch machines should use "constant power" or "latching" operation. You cannot mix latching and momentary switch operation in a single ASC2. Refer to the manual for your switch if you are unsure which mode to use. Choosing the wrong sub-mode can prevent a switch from throwing, or permanently damage it.

To operate your ASC2 in SWITCH mode:

1. Press the SW button on your remote
2. Enter the ID number matching the address range set in the configuration step above. (Hint: this will be the base address or one of the next three numbers)
3. Press AUX1 to set the track switch/turnout to THRU (aka straight) position. Press AUX2 to set the track switch/turnout to OUT (aka turn) position.

Accessory examples

This section of the manual describes configuring the ASC2 for operation of up to 8 individual accessories.

Note! Your ASC2 must be configured either as a switch controller OR an accessory controller. It cannot control switches and accessories at the same time.

Basic on/off accessories and layout lighting can be connected to the Accessory/Switch terminals on the ASC2. In Accessory mode, up to 8 different devices can be connected. Refer to Figure 8, letter B. The row labeled "Accessory" shows which terminals correspond to accessory 1 through 8. Accessory 1 through 4 share one common connection and 5-8 share another.

Keep in mind that the ASC2 does not supply power to the accessories; this device simply acts as an ON/OFF switch. It is recommended that the ASC2 COMM connection be used for the "hot" leg of your external power.

To connect a basic on/off accessory or light to your ASC2:

1. Attach one wire to the Power/A terminal on your power supply and connect it to the COMM terminal of the ASC2.
2. Attach another wire to the Common/Ground/U terminal on the power supply and connect to an accessory power terminal.
3. Attach a final wire to the remaining accessory power terminal and connect it to a numbered terminal on the ASC2 (terminal 1 shown in the illustration).

Note! To operate your accessores in eight ID sub-mode, you will need to address each connected accessory by its individual TMCC ID. Accessory 1's ID is equal to the TMCC ID base address. Accessory 2's ID is equal to the base address plus one. See Appendix A for additional accessory configuration and operation examples.

Accessory examples

Wiring a single basic accessory

To connect a basic on/off accessory or light to your ASC2:

1. Attach one wire to the Power/A terminal on your power supply and connect it to the COMM terminal of the ASC2.

2. Attach another wire to the Common/Ground/U terminal on the power supply and connect to an accessory power terminal.

3. Attach a final wire to the remaining accessory power terminal and connect it to a numbered terminal on the ASC2 (terminal 1 shown in the illustration).

Note! Each of the two "COMM" terminals on the ASC2 is the common connection for four relays. "COMM" does not mean "ground." The illustrations in this manual show switching of the HOT or "A" connected to the shared COMM terminal.
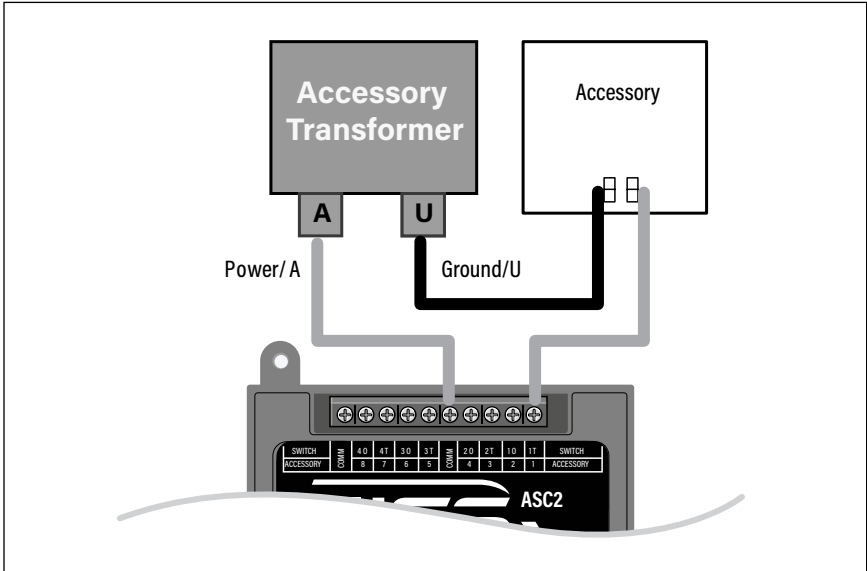

Figure 8. An accessory wired to the #1 terminal. The external Power Supply provides operating power for the accessory; the ASC2's internal relay acts as an on/off switch to control the accessory action.

Accessory examples

Wiring and operating the Floodlight Tower

Refer to the illustration below to wire a Floodlight Tower (available separately) to Accessory Terminal number 3.
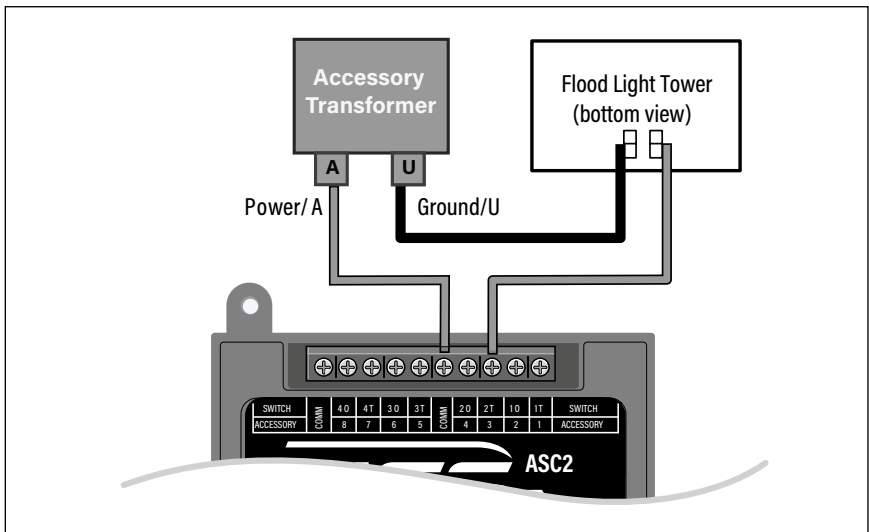

Figure 9. Floodlight Tower wiring example

To operate the Floodlight Tower.

1. Press ACC on the CAB remote controller.
2. Enter the TMCC ID associated with the accessory connected to terminal #3. (This would be the ASC2's TMCC ID base address +2).
3. Press AUX2 to turn on the lamps.
4. Press AUX2 again to turn them off

Accessory examples

Wiring multiple motors or lights on the same accessory

It is possible to use the ASC2 unit to operate more than one function on a single accessory. For example, you could operate a motor and a light independently of each other. Follow these steps and refer to the figure below.
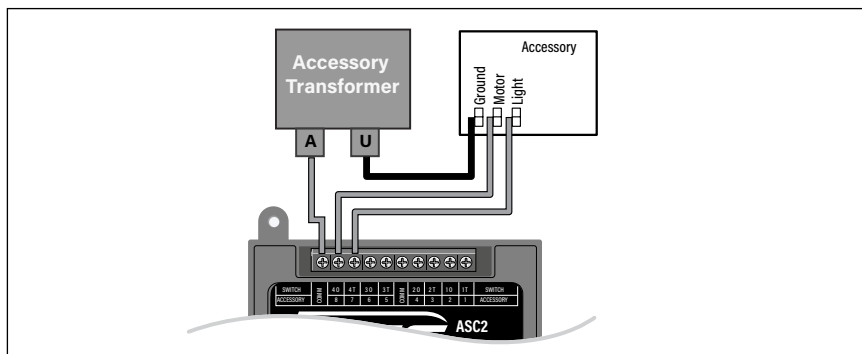

Figure 10. Here, an ASC2 is connected to control two features of a single accessory. In this example, accessory terminal 7 controls a light and 8 operates a motor.

Note! The ASC2 will control accessory motors that operate in one direction only.

To connect an accessory with two motors or lights:
1. Attach one wire to the first motor and connect it to a numbered accessory terminal.
2. Attach another wire to the second motor (or light) and connect it to a numbered accessory terminal.
3. Connect the remaining accessory wire to the Common/Ground/U terminal of the transformer.
4. Attach a final wire to the Power/A terminal of the transformer and connect it to the COMM terminal on the ASC2 unit.

To operate the Accessory light:
1. Press ACC on the CAB remote controller.
2. Enter the TMCC ID associated with terminal #7. (This would be the ASC2's TMCC ID base address +6).
3. Press AUX2 to turn on and off the lights.

To operate the Accessory motor:
1. Press ACC on the CAB remote controller.
2. Enter the TMCC ID associated with terminal #8. (This would be the ASC2's TMCC ID base address +7).
3. Press and hold AUX1 to run the motor.

Accessory examples

Wiring and operating the Sawmill

Refer to the figure below to wire a Sawmill (available separately) to accessory terminal #2.
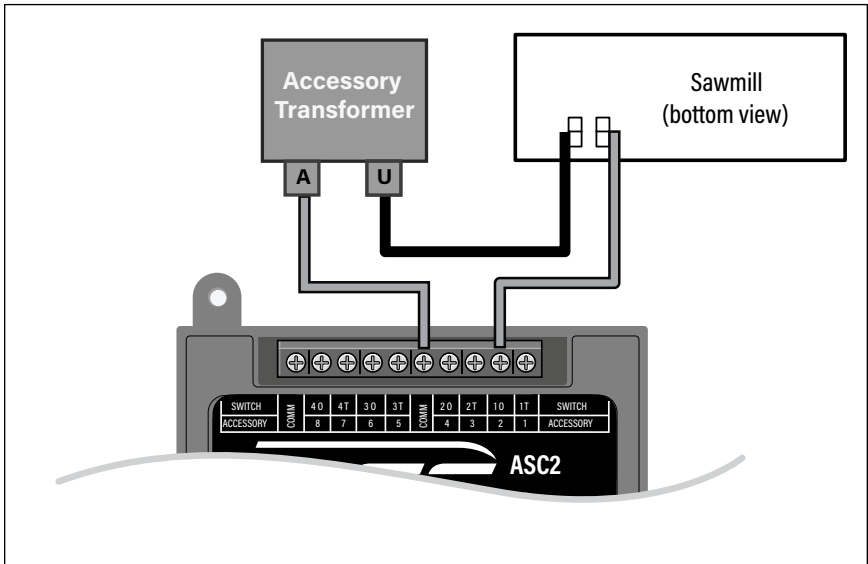

Figure 11. Sawmill wiring diagram

Follow these steps to operate the Sawmill.

1. Press ACC on the CAB remote controller.
2. Using your CAB remote controller, enter the TMCC ID associated with the accessory. In this case, that would be the base address +1 (for terminal #2).
3. Press and hold AUX1 on the CAB-1 to turn on the Sawmill. Release the button to turn off the sawmill.

Accessory examples

Wiring and operating the Diesel Fueling Station

The Diesel Fueling Station requires two ASC2 outputs and accessory ID#s. Refer to the figure below to wire the Diesel Fueling Station (available separately) to output numbers 7 and 8.
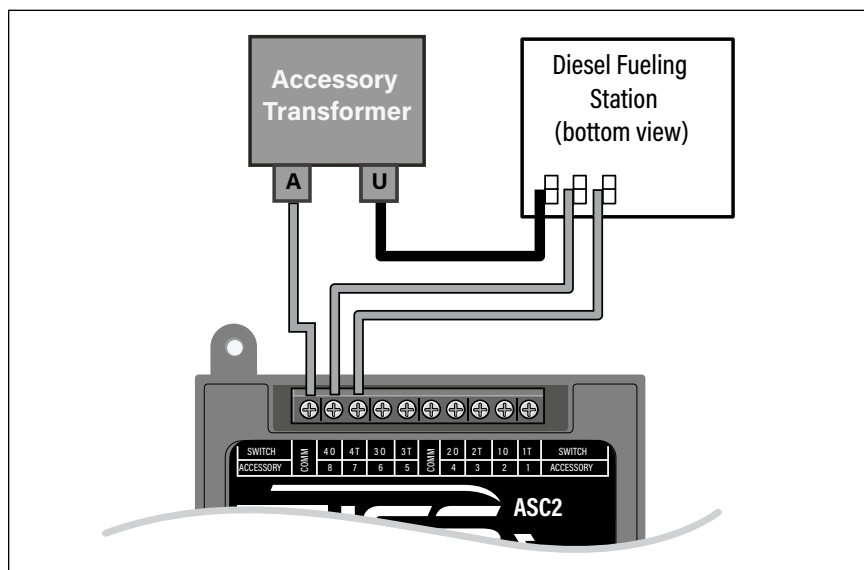
Figure 12. Diesel Fueling Station wiring diagram. Operation uses two TMCC ID numbers

Follow these steps to operate the Diesel Fueling Station.

1. Press ACC on the CAB-1L remote controller.
2. Press 7 on the CAB-1L remote controller to address the accessory.
3. Press AUX2 to turn on the lamps.
4. Press AUX2 again to turn them off.
5. Press ACC on the CAB-1L.
6. Press 8 on the CAB-1L.
7. Press and hold AUX1 and the attendant will come out for as long as you hold the button down.

Accessory examples

Wiring and operating the Uncoupling Tracks (ASC2 single-address mode)

Refer to the figure below to wire an Uncoupling Track section (available separately, part no. 6-65530). To avoid the possibility of damage to your uncoupling tracks, your ASC2 should be set to Single ID addressing mode (see page 17).

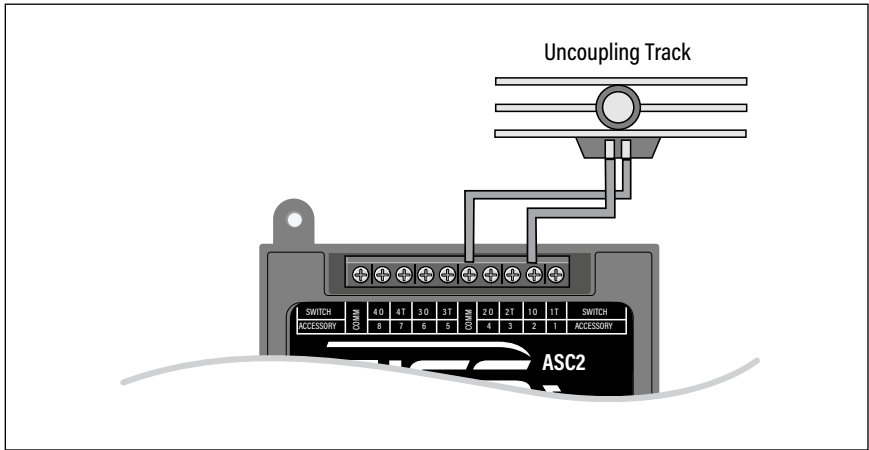Figure 13. Uncoupling track wiring diagram

Follow these steps to operate the Uncoupling Track section.

1. Press ACC on the CAB remote controller.
2. Using your CAB remote controller, Enter the ASC2's TMCC ID base address.
3. Press the numbered key matching the terminal connected to your track (2, in this example). The magnetic uncoupling disk will be briefly activated, then automatically turn off.

Connecting switches to the ASC2

The Accessory Switch Controller is capable of controlling up to four remote switches at a time. Compatible Switches and Switch Controllers include Lionel FasTrack & O27 models, Atlas, Tortoise Switch machines and Z-Stuff switch machines. Note that the ASC2 unit does not supply power to the switches; it simply opens or closes them. The ASC2 provides two variations of switch operation: momentary, in which the switch power is activated for less than a second and constant, or "latching" operation.

Be sure to select the proper sub-mode; Tortoise switch controllers won't work with momentary operation. FasTrack and other quick-acting switches will be permanently damaged by continuous/latching power. See page 14 for switch sub-mode configuration.

Each switch requires three connections: THROUGH, OUT, and COMMON. The switch terminals at the top of the ASC2 will accommodate each of these connections. The first switch is connected to the terminals labeled 1 T (THROUGH), 1 O (OUT), and COMM; the second switch is connected to the terminals labeled 2 T (THROUGH), 2 O (OUT), COMM; and so on. Switches 1 & 2 will share the first COMM terminal on your ASC2, switches 2 & 3 share the second.

Once switches are wired to your ASC2, you can operate them using your CAB remote or other control device. On a CAB remote, AUX1 (THROUGH) indicates that the train will travel straight. AUX2 (OUT) indicates that the train will follow the curved section in the switch.

If you want to use both command control as well as a physical switch controller, such as those provided with FasTrack remote switches, you can wire these in parallel to your ASC2 connections. See the following section for details.

Connecting switches to the ASC2

Connecting Lionel FasTrack Remote Switches

The ASC2 can operate all models of Lionel's remote controlled FasTrack switches. An ASC2 should not be connected to a Lionel Remote/Command FasTrack switch, as these switches are already command-control enabled.

To connect a FasTrack switch to an ASC2 switch position #1:

1. Attach a wire to the THROUGH (straight path) terminal on the first FasTrack switch and connect it to the 1 T terminal on the ASC2 unit.
2. Attach another wire to the OUT (curved path) terminal on the first switch and connect it to the 1 O terminal on the ASC2 unit.
3. Attach the final wire to the GND terminal on the first switch and connect it to the COMM terminal to the right of the 1 T and 1 O terminals on the ASC2 unit.
4. Repeat this process for any additional switches, filling the empty switch terminals on the ASC2 in the same way.
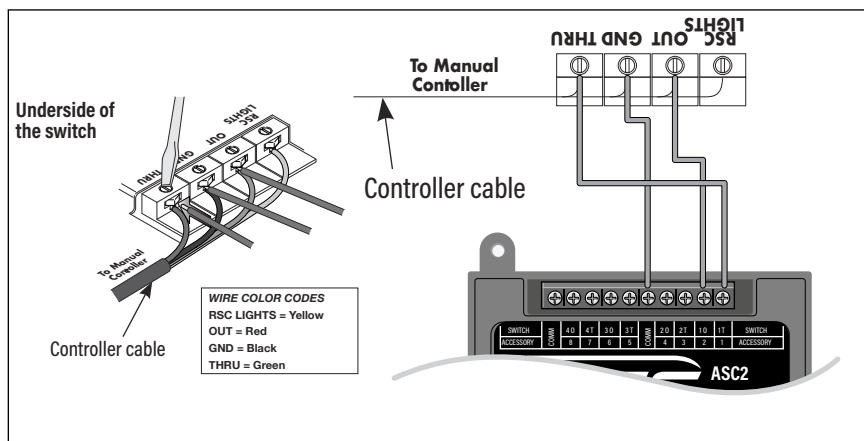

Figure 14. FasTrack Remote Switch wiring with manual controller lever wired in parallel

Note! Refer to page 14 and set the ASC2 to the momentary power sub-mode. Constant power will damage the switch.

Connecting switches to the ASC2

Connecting Lionel Tubular Remote Switches

The ASC2 can operate a variety of Lionel tubular track switches.

1. Attach a wire to the THROUGH (straight path) terminal on the first switch and connect it to the 1 T terminal on the ASC2 unit.
2. Attach another wire to the OUT (curved path) terminal on the first switch and connect it to the 1 O terminal on the ASC2 unit.
3. Attach the final wire to the COMMON terminal on the first switch and connect it to the COMM terminal to the right of the #1 and #2 terminals on the ASC2 unit. Refer to the bullet items below when locating the common terminals:

   - LTI O gauge switches #3010 and #3011: #2 terminal on the side
   - Postwar O22 and MPC O gauge #5132 and #5133: center terminal
   - Super O switches: single post closest to the motor
   - O-27 and O42 #1122, #1122e, #5121, and #5122: terminal closest to the motor

4. Repeat this process for any additional switches, filling the empty switch terminals on the ASC2 in the same way.

Refer to page 14 and set the ASC2 switch sub-mode to supply momentary power. Constant/latching power will damage the switches.
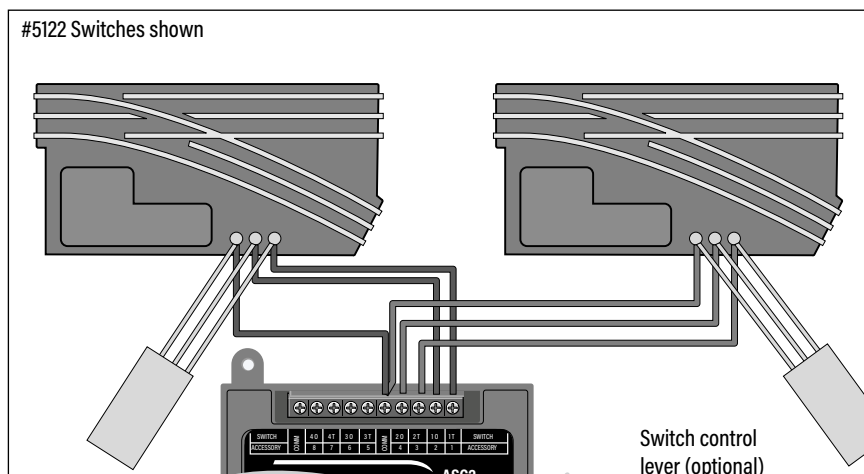

Figure 15. Other Lionel switch wiring. Here, two switches are connected to the ASC2's switch #1 and switch #2 terminals.

Connecting switches to the ASC2

Modifying Lionel O-27 switches for fixed voltage operation

O -27 type switches receive their power from variable track voltage. Therefore, track power must be ON in order to operate O-27 switches. If you prefer to operate this type of switch with a fixed voltage power sources (independent of your track power), you need to make the following modifications:

First, take the top cover off of the switch by removing the screw. This will expose the double coils. Next, find the two wires that are located at the center of the two coils. These wires are contained inside one piece of insulation. Gently pull on the insulation to expose the wires.

Now, clip the two wires about 1/2″ from the coils. Using electrical tape, wrap the wire ends that come up from the bottom of the switch. Use the heat from your soldering iron to remove 1/4″ of the varnish insulation from the remaining wires then twist the wires together. Using your soldering iron, put a small amount of solder on the ends of these wires and solder a jumper wire to them.

Wrap this connection with electrical tape to keep it from coming in contact with the coil housing. Before you replace the switch cover, you may need to cut a notch (using a hobby knife) for the wire to come through. You may also route the wire through the holes used to vent any heat generated by the coils on top of the cover.

Replace the cover on the switch then, attach the jumper wire to a fixed voltage power source. You will need to attach a ground wire from this separate power source to the outside rail of your track, or you can attach this ground wire to the "U" post on the power supply. Connect the switch as discussed in the previous section.

Note! In all cases, O-27 switches should be used with ASC2 momentary operation. Using the ASC2's constant/latching sub-mode may damage your O-27 switch.
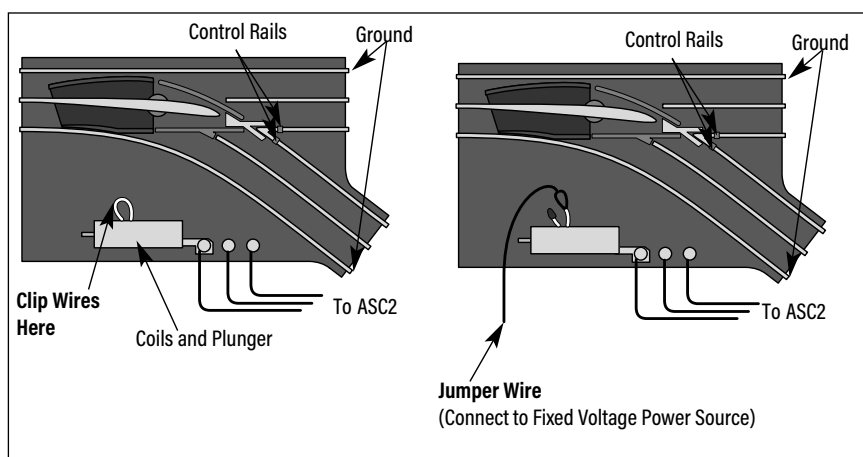
Figure 16. Modifying O-27 switches for constant voltage operation

Connecting switches to the ASC2

Connecting Atlas Switches

The ASC2 is able to control Atlas switches. Simply connect both switch machine outputs to the ASC2 as illustrated the figure below. This example shows the Atlas connected to switch #3 of the ASC2. Note that the outside terminals are the: THROUGH and OUT terminals. The COMM terminal is the middle terminal.

Note! Refer to page 14 and set the ASC2 to the momentary power sub-mode. Constant power will damage the switch.
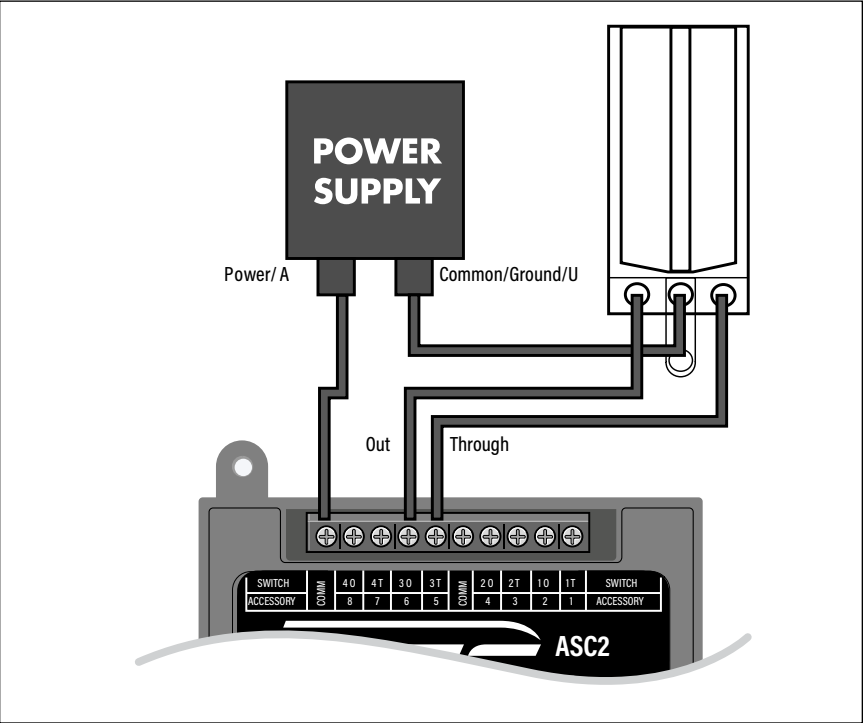
Figure 17. Atlas switch wiring

Connecting switches to the ASC2

Connecting Circuitron Tortoise Switch Machines

The ASC2 can operate Tortoise Switch Machines. Because this type of switch is powered by DC voltage, you must control the direction of the motor by using two general-purpose diodes such as 1N4004.

Refer to the figure below as you wire Tortoise Switch Machines. This example shows the Tortoise connected to switch #1 of the ASC2. Refer to page 18 and set the ASC2 to the latching/constant power sub-mode. If the switch operates in the opposite direction, simply reverse the 1 O and 1 T wires at the ASC2.
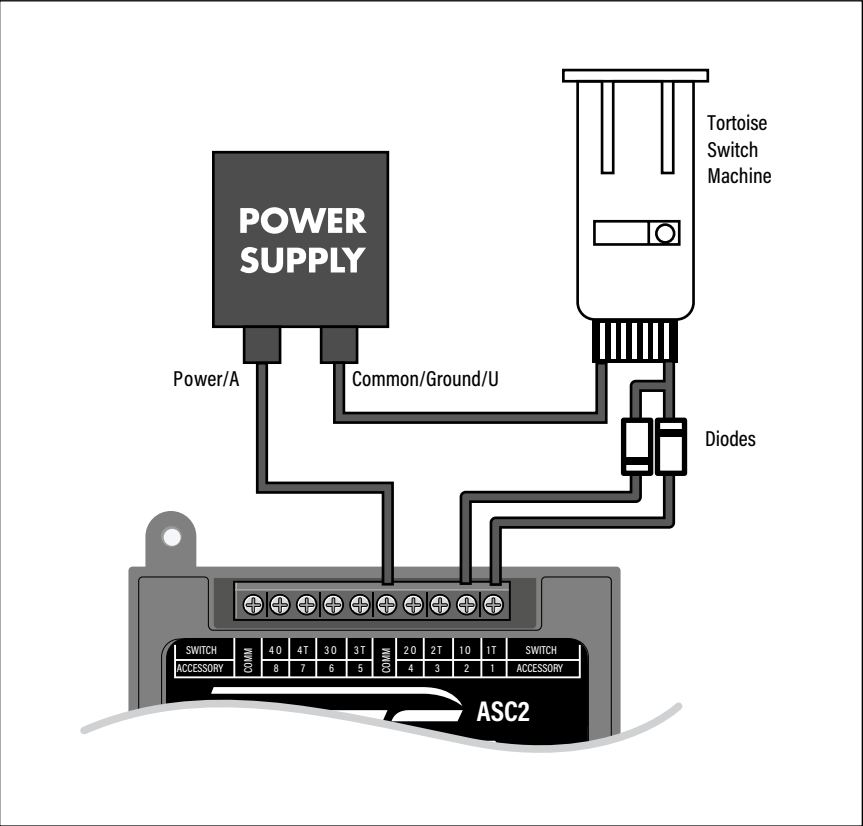
Figure 18. Tortoise switch machine wiring

Connecting switches to the ASC2

Connecting Z-Stuff DZ-1000 Switch Machines

The ASC2 can operate Z-Stuff DZ-1000 switch machines. Refer to the figure below as you wire the DZ-1000. This example shows the DZ-1000 connected to switch #4 of the ASC2.

Refer to page 18 and set the ASC2 to the momentary power sub-mode. Latching/constant power will damage the switch. If the switch operates in the opposite direction, simply reverse the 4 O and 4 T wires at the ASC2.
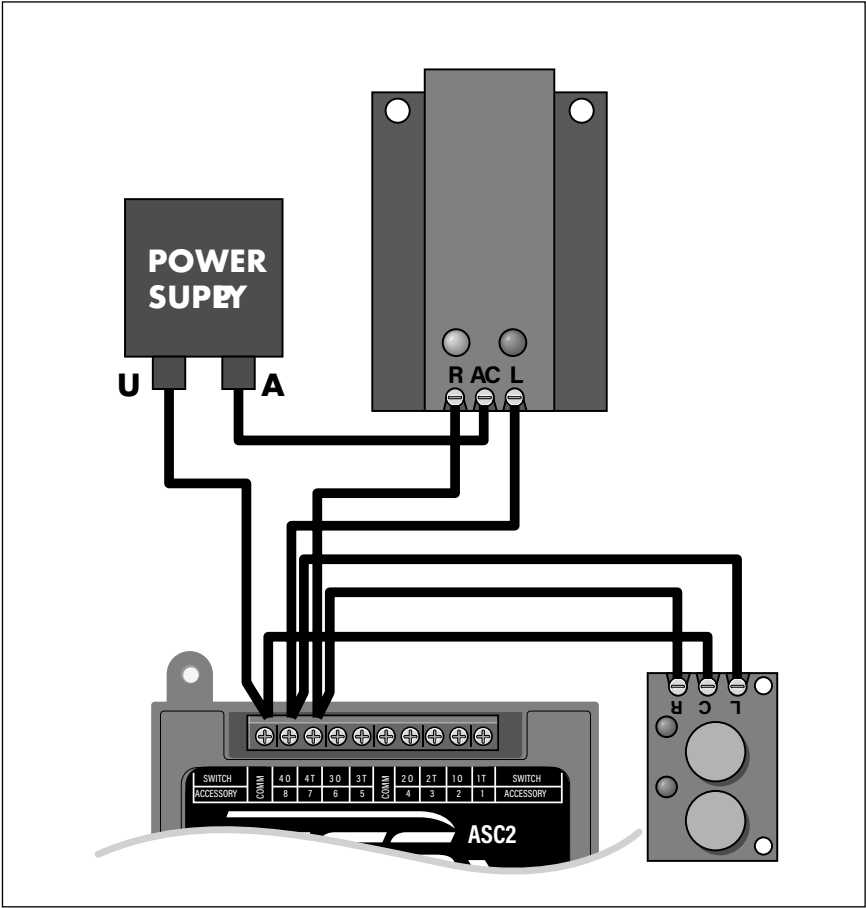

Figure 19. DZ-1000 switch machine wiring

Connecting switches to the ASC2

To address your switch, press SW and the TMCC ID# of the switch on the CAB remote controller. Be sure to enter the specific ID# corresponding to the ASC2 terminals to which the switch is wired (see Appendix A for additional examples).

Once you've addressed a switch, it can be operated using the AUX1 and AUX2 keys on your remote.

To set the switch to allow the train to continue on the straight path:
Press the THROUGH, or AUX1, button on your CAB remote controller.

To set the switch to allow the train to turn on the curved path:
Press the OUT, or AUX2, button on your CAB remote controller.

Finding the correct ID for each of the ASC2's switches.

If the switch does not operate as expected, it may be that you have not addressed it by the right TMCC ID#. Recall that each ASC2 has a base address that you must assign (see page 14). Use the base address to determine the specific TMCC ID# of each of up to four connected switches. Switch 1's ID is the same as the base address. Switch 2's ID is the base address plus 1.

For example, assume your ASC2 has a TMCC base address of "1." If you would like to operate the switch wired to the third group of terminals of an ASC2 unit (3T, 3O, and COMM), you need to press SW, 3 on your CAB remote controller. Then operate that switch using AUX1 or AUX2.

If your ASC2 had a different base address, for example "17," then the address of the third switch would be "19." In this case, you'd press SW, 19 on your CAB remote controller. Then operate that switch using AUX1 or AUX2.

Note! The ASC2's LED illuminates for one half of a second to indicate that it has received a command.

Connecting switches to the ASC2

Routes and the ASC2

It is sometimes useful to develop set paths for your trains to travel on. For example, on many layouts, trains will travel over a series of switches when passing through a switching yard. A group of switches assigned to a route can be controlled at the press of a button. Activate a certain route, and all of the switches will be thrown automatically.

Both the CAB-1L and CAB2 remotes can work with routes, but there are a couple of important differences to note.

CAB-1L can build and operate routes numbered from 0-9. When a route is built with a CAB-1 or CAB-1L remote, the route assignments for the four connected switches are stored locally within your ASC2. Note that changing modes (such as re-configuring an ASC2 module from switch to accessory operation) will erase any locally-saved route information from your ASC2. Route information stored in other ASC2s, if present, won't be affected.

The LEGACY CAB2 can build and operate routes numbers from 0-99. Routes created using the CAB2 are stored within the LEGACY command base. Changing modes on your ASC2 has no effect on routes stored in the LEGACY command base.

Building Routes with a CAB-1L remote

Clearing routes

You must clear all of the switches that were assigned to an old route ID# before building a new one with the same ID#.

1. Press RTE on the CAB-1L remote controller.
2. Enter the old route ID# (0-9) that you need to clear.
3. Press the SET button on the CAB-1L remote controller. The LED on the ASC2 unit will blink for one second. At this point, the old route has been cleared.

Building a route

When you build a route, you are defining which switches are in the route and how they are set. Switches can be set to allow the trains to go THROUGH (continue on a straight path) or to go OUT (turn onto the curve). Before you begin to assign switches to your route, we recommend that you list each switch, indicating whether it is a THROUGH or OUT switch.

1. Press RTE on the CAB-1L remote controller.
2. Select an ID# (0-9) and enter it with the numeric keys on the CAB remote controller. Allow two seconds for the route to fire completely.
3. Enter the ID# of the first switch, then press AUX1 for THROUGH or AUX2 for OUT.
4. Press SET on the CAB-1L remote controller. The LED on the ASC2 unit will flash for one second.
5. Repeat steps 1-4 to add switches to the route, addressing an additional switch each time you perform step 3.

Connecting switches to the ASC2

Firing routes from a CAB-1L

Activating a route will cause your track switches to switch to the appropriate positions, allowing your trains to travel straight or to follow the right or left curve.

To activate a route from a CAB-1L:

1. Press the RTE button
2. Enter the ID# (0-9)

Building Routes with a LEGACY CAB2 remote

Refer to your LEGACY Control System's Owners Manual for information on building routes on the CAB2 remote.

Firing routes from a LEGACY CAB2

Activating a route will cause your track switches to switch to the appropriate positions, allowing your trains to travel straight or to follow the right or left curve.

To activate a route from a CAB2:

1. Press the RTE button
2. Enter the ID# (one or two digits)
3. Press the Fire button to throw the switches.

Building and Firing Routes with the Cab3 App

Refer to control.lionel.com for information on building routes with the Cab3 App.

Appendix

Operation of the LEDs

On power up, the Red LED on your ASC2 will turn on for 1 second. If it remains on continuously, this indicates a problem with the LCS PDI cabling or your command base. During operation, the Red LED flickers when commands are passing through the LCS PDI bus.

Specifications of the LCS ASC2

Mechanical
- Size: 3.7" x 2.7" x 1.2"
- Mounting: Two #4 pan head sheet metal screws

Electrical
- Input PDI supply current: 50 mA

External Relay Power/Accessory Transformer
- Input relay voltage: 12-14 VAC
- Input relay current: ~60 mA x8 (~500 mA max)

Relay Contact Specifications
- Maximum relay contact voltage: 24 volts (AC or DC)
- Maximum relay contact current: 20 amps

Appendix

4. Press AUX2 to set the switch to Out position

Accessory Configuration Examples

To program your ASC2 for operating up to eight lights and/or accessories on IDs 9-16:
1. Turn power to your command base and LCS system on.
2. Press and hold the ASC2 PGM button for 1 seconds. The red LED will begin blinking slowly.
3. On your Lionel cab remote, press ACC to choose Accessory configuration.
4. Press the 9 key (this will be the base address/TMCC ID).
5. Press SET. The red LED will blink quickly, then return to slow blinking.
6. Press AUX1.
7. Press the 0 key. This sets Eight ID sub-mode.

To operate the second connected accessory:
1. On your Lionel cab remote, press ACC to address an Accessory.
2. Press the numeric keys 1, then 0. (the TMCC ID of the second accessory, base address plus 1).
3. Press AUX1 to turn the accessory on for as long as the button is held, OR
4. Press and release AUX2 to turn the accessory on and again to turn it off.

To program your ASC2 for operating up to eight uncoupling tracks, all responding to TMCC ID 17:
1. Turn power to your command base and LCS system on.
2. Press and hold the ASC2 PGM button for 1 seconds. The red LED will begin blinking slowly.
3. On your Lionel cab remote, press ACC to choose Accessory configuration.
4. Press the numeric keys 1, then 7 (this will be the base address/TMCC ID).
5. Press SET. The red LED will blink quickly, then return to slow blinking.
6. Press AUX1.
7. Press the 1 key. This sets Single ID sub-mode.

To operate the fifth connected uncoupling track:
1. On your Lionel cab remote, press ACC to address an Accessory.
2. Press the 1, then 7 key (the TMCC ID base address).
3. Press the 5 key to operate the fifth connected track piece.

Appendix

Switch Configuration Examples

To program your ASC2 for FasTrack Switch operation on IDs 3, 4, 5 and 6:

1. Turn power to your command base and LCS system on.
2. Press and hold the ASC2 PGM button for 1 seconds. The red LED will begin blinking slowly.
3. On your Lionel cab remote, press SW to choose Switch configuration.
4. Press the 3 key (this will be base address/TMCC ID).
5. Press SET. The red LED will blink quickly, then return to slow blinking.
6. Press AUX1 for momentary relay operation (the right choice for FasTrack switches).

To operate the third connected switch:

1. On your Lionel cab remote, press SW to address a switch.
2. Press the 5 key (the TMCC ID of the third switch when base address=3).
3. Press AUX1 to set the switch to Through position.
4. Press AUX2 to set the switch to Out position.

To program your ASC2 for Tortoise Switch operation on IDs 9, 10, 11 and 12:

1. Turn power to your command base and LCS system on.
2. Press and hold the ASC2 PGM button for 1 seconds. The red LED will begin blinking slowly.
3. On your Lionel cab remote, press SW to choose Switch configuration.
4. Press the 9 key (this will be the base address/TMCC ID).
5. Press SET. The red LED will blink quickly, then return to slow blinking.
6. Press AUX2 for latching relay operation (the right choice for slow-moving switches).

To operate the third connected switch:

1. On your Lionel cab remote, press SW to address a switch.
2. Press the 1 key twice (11 is the TMCC ID of the third switch when base address=9).
3. Press AUX1 to set the switch to Through position.

Notes

Lionel Limited Warranty Policy & Service

This Lionel product, including all mechanical and electrical components, moving parts, motors and structural components, with the exception of **TRACTION TIRES** are warranted to the original owner-purchaser for a period of **one year from the original date of purchase** against original defects in materials or workmanship when purchased through a **Lionel Authorized Retailer***.

This warranty does **NOT** cover the following:

• Normal wear and tear

• Defects appearing in the course of commercial use

• Damage resulting from abuse/misuse of the product

• Damage resulting from consumer or unauthorized attempted repair or modification

Transfer of this product by the original owner-purchaser to another person voids this warranty in its entirety. Modification of this product in any way; visually, mechanically or electronically, voids the warranty in its entirety.

Any warranted product which is defective in original materials or workmanship and is delivered by the **original owner-purchaser** (this warranty is non-transferrable) to Lionel LLC **MUST** be accompanied by the original receipt for purchase (or copy) from an **Authorized Lionel Retailer***, will at the discretion of Lionel LLC, be repaired or replaced, without charge for parts or labor. In the event the defective product cannot be repaired, and a suitable replacement is not available, Lionel will offer to replace the product with a comparable model (**determined by Lionel LLC**), if available. In the event a comparable model is not available the customer will be refunded the original purchase price (requires proof of purchase from the **Authorized Lionel Retailer*** it was originally purchased). Any products on which warranty service is sought must be sent with prior Return Authorization # from Lionel freight or postage prepaid (Lionel will refuse any package when postage is due). Lionel is not responsible for any unauthorized contents of the package or shipping packaging or materials or any package sent with-out prior authorization. **Transportation and shipping charges are not covered as part of this warranty for international shipments.**

NOTE: Products that require service that do not have a receipt will not be serviced by Lionel. Any product sent to Lionel under a Return Authorization and not accompanied by a receipt; the return shipping costs will be the responsibility of the customer.

In no event shall Lionel LLC be held liable for incidental or consequential damages.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

Instructions for Obtaining Service

If service for this Lionel LLC product is required you must FIRST call 1-800-4LIONEL (1-800-454-6635), Email Talktous@lionel.com, or write to Lionel Customer Service, 6301 Performance Drive, Concord, NC 28027. Please have the Lionel product number and original receipt showing the date, location of original purchase, and description of problem. You will receive a return authorization (RA) number to ensure your merchandise will be properly tracked and handled upon receipt at Lionel LLC.

Once you have your Return Authorization (RA) number, make sure the item is well packed to protect during shipping. (The original packaging was designed to protect product during transit).

Please make sure you have followed all of the above instructions carefully before returning any merchandise for service.

Warranty Information

Products that are more than 3 years old, from date of manufacture, are not applicable for warranty coverage, even if they have never been sold prior to this date. (Under no circumstance shall any components or labor be provided free of charge.)