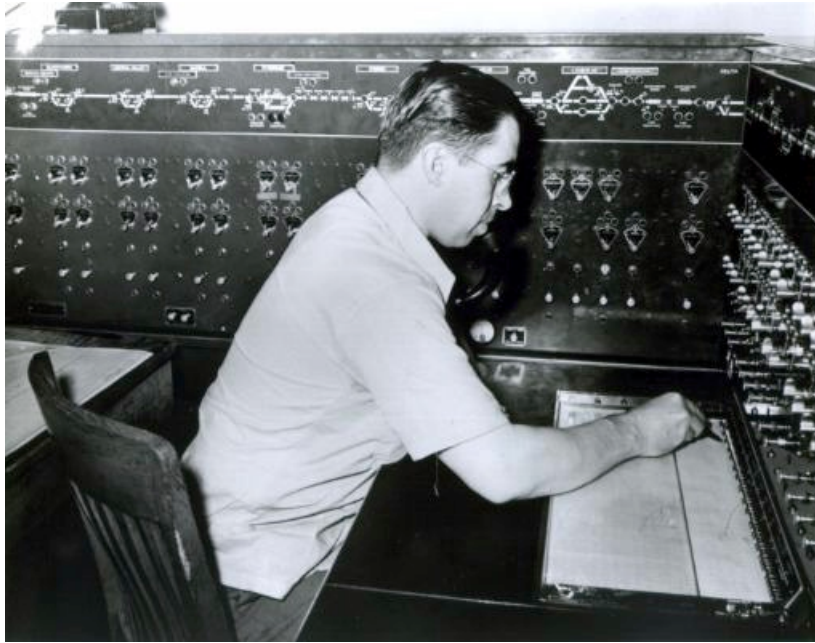


The Canyon Dispatcher's CTC Machine

We're working to replicate the prototype USS CTC machine that was used by the Canyon dispatcher on the Shasta Route in the early 1950's.



Although the project is only partially complete, CTC dispatching is now part of Shasta Route operating sessions.



The machine is structured in the usual way. There's a route schematic on the top that shows dispatcher-controlled track and occupancy indicators. Below the schematic, working from the top down, there is a row of switch control levers and indicators, then a row of signal control levers and indicators, then maintainer call switches, code buttons and lamps, and finally turnout unlock switches. The dispatcher also has telephone and radio sets.



Basic Operation

This section describes the basic operation of the CTC machine, telephone and radio communications.

CTC Machine Operations

The lamps on the track schematic indicate that the corresponding track circuit is occupied. Red lamps indicate control sections, i.e. switches, and yellow lamps indicate general track, e.g. the main and sidings. Track sections not under the dispatcher's control, shown by finer lines, do not have occupancy lamps. When a lamp for a control section goes on or off, a bell strikes to draw your attention to the change.

The dispatcher directly controls the position of the main and siding turnouts using the switch levers and indicators. Generally, the "Normal" position is set for the mainline and the "Reversed" position is set for the siding or to cross over, but note some special cases in the Layout Tour section below. The lamps above the lever show the current position of the turnout. To change the position, set the lever as desired, and press the code button until the code lamp comes on. Your changes will be sent to the layout, and the code light will go out. Once the turnout has moved on the layout, the indicators will show the new position.

The default aspect for dispatcher-controlled signals is "stop" in both directions, corresponding to the center indicator lamp. The dispatcher can "clear" a signal in a particular direction, allowing it to show "approach" (yellow) or "proceed" (green) aspects, using the signal levers. To allow trains to travel west (leftward) at a particular point, for example, set the signal lever to the "L" (left) position, and press the code button until the code lamp comes on. If you're changing a turnout at the same time, the turnout will move first. Once the associated turnout is set, the signal(s) will be cleared and the indicator lamp will change. Note that the actual signals by the track will only move to yellow or green if it's safe to do so. A train may still be seeing a red signal, even though the dispatcher has cleared the signal, if e.g. a turnout is set against the train or another train is too close ahead. When a train passes the signal, the signal returns to red on the railroad, and shortly after the center indicator lamp is lit to tell you that. (This machine has no "fleeting" option to keep a signal cleared)

There's a lamp over the dispatcher's desk which can be turned on and off with a switch just to the left of the lamp. The light switches for the room are on the wall behind you, to the right of the doorway.

The clock at the top left of the panel is a fast clock. It's controlled from the upstairs office, and generally runs at 3-1.

Telephone and Radio Communications

There are two main telephone lines on the railroad: The "Canyon Dispatch" line, and the "Shasta Dispatch" line.

The Canyon Dispatch line is yours for communicating with the Redding operator, the Dunsmuir yard hostler, and trains on your section of the railroad. They can call you by picking up a phone, pressing the talk button, and talking. The speaker on the top left of the CTC machine is always listening across the Canyon Dispatch line. You talk by using the foot switch, which partially mutes the speaker, preventing feedback but allowing a station to break in an emergency. To get the attention of Redding operator, Dunsmuir yard hostler or a train on the railroad, raise the corresponding maintainer call switch (see tour below) and press the code button on the corresponding section. This will light a flashing lamp on a phone booth in the corresponding location, and in the case of the Redding operator (under 6) and the Dunsmuir yard (under 18) will sound a buzzer. Once you've contacted them, lower the maintainer call switch and press the code button to turn the lamp off and stop the buzzer.

A separate telephone is provided for the "Shasta Dispatch" line. The Shasta Dispatcher (from Black Butte east under T&TO) uses this line to talk to operators on his section of the railroad. You can use this to talk to the Shasta dispatcher to coordinate passing trains back and forth at Black Butte. To listen on this line, pick up the phone, wait until no one is talking and announce yourself as "Canyon Dispatch" to the Shasta Dispatcher.

The radio console on the left side of the desk is to talk to the superintendent. Press to talk.

The intercom box on the left side of the desk is for calling crews from the crew lounge (living room). This also sounds in the Shasta Dispatcher's office, and you might hear them calling crews. You can use it to get Shasta Dispatch's attention if they've gone off the common telephone line.

Features and Foibles

Because some compression has been used in building the Shasta Route, particularly in the number of people available for operator and clerk jobs, there are some idiosyncrasies and non-prototypical features at present.

Because one person is serving as both Redding (left end) and Klamath Falls (right end) operator, he has to switch back and forth between the two phone lines. If he doesn't answer on the Canyon Dispatch line, you can either try to raise him on the Shasta Dispatch line or wait for him to return.

CTC machines have locks that prevent you from changing signals and turnouts in a dangerous way. For example, once you set a signal to allow a train to take a particular route, you can't set a conflicting route or change a switch until you've set the signals back to stop and then waited for a timer to expire. Our current implementation doesn't include these time locks, so you can change switch and signal settings at any time. Be careful out there!

The toggle switches in the bottom row of the CTC machine will eventually lock and unlock the fully manual turnouts on the main line, but are currently not used. An example of this is the turnout for the Shasta Spring siding. The SP did not install the

electrical throw motor needed to allow the dispatcher to throw it. It could only be thrown by a train crew. It is a mainline turnout, however, and to prevent accidents the Canyon dispatcher needed to release an electric lock on the turnout before the crew could move it. This was done via toggle switch on the lower row of the CTC machine: Raise that toggle, press the code button, and the electric lock would be released. We'll eventually have that in place, but right now each of those turnouts is permanently unlocked. You only need to give train crews verbal permission, you don't have to do anything on the panel before they can throw local switches.

Usually, only the CTC dispatcher changes mainline turnouts. In some cases, however, you'll want to turn over local control to a train crew or yard worker in the field. Our SP prototype had mechanical locks in the field. The crew would pull the train up to the turnout, talk to the dispatcher over the phone, use their key to unlock the turnout, and then would have manual control. Returning control to the dispatcher was similar. The crew would return the switch to the normal position, lock the mechanical lock, then inform the dispatcher. Instead of actual locks, we've put key-operated covers on the fascia controls for the mainline turnouts. When the crew moves the turnout using the local control, you'll see the turnout indicator on the panel change to reflect the new position.

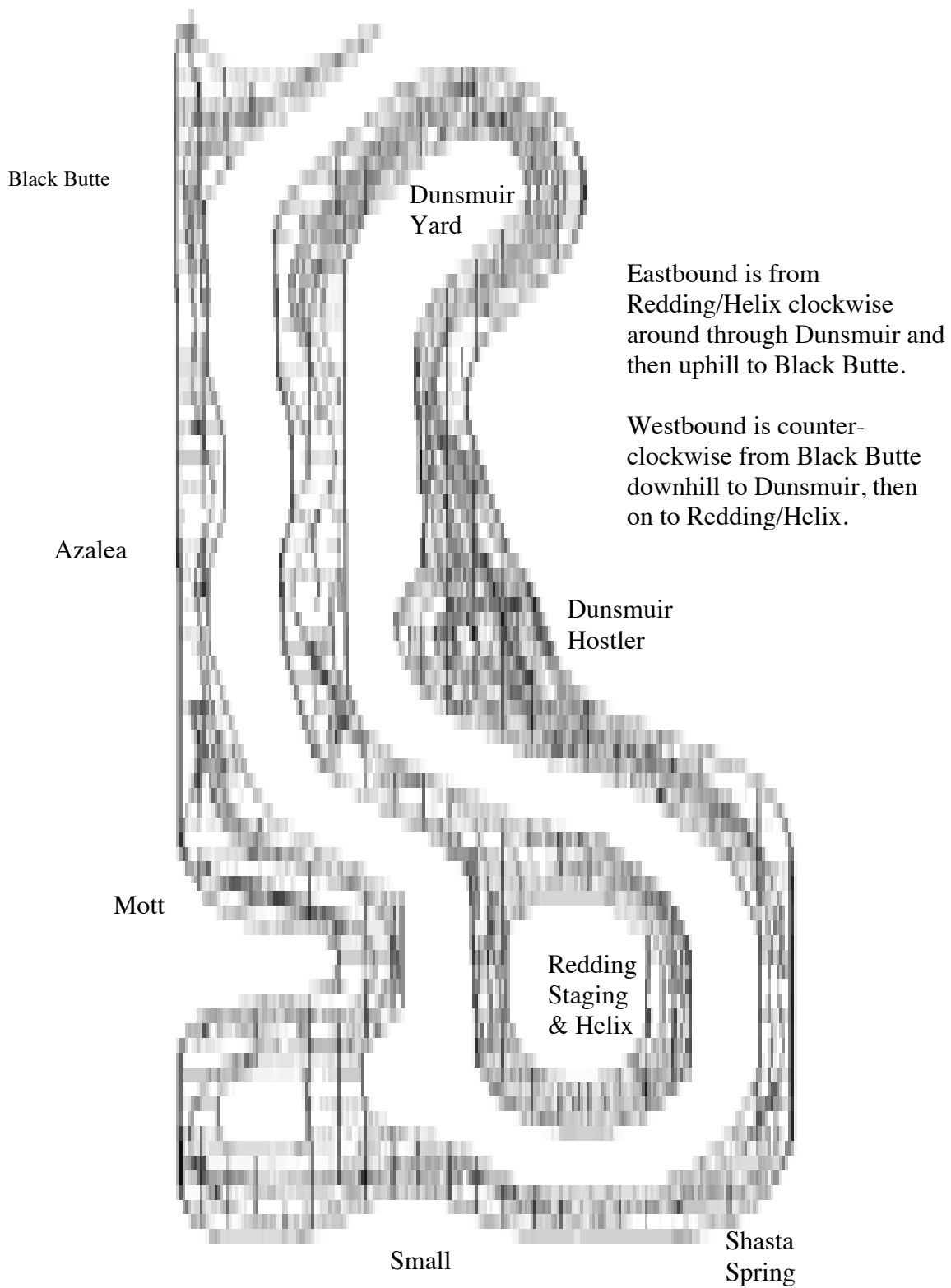
At present, you need to press the Code button for about a quarter second before it's sure to have latched. You'll certainly be OK if you press and hold it until the corresponding lamp comes on.

The CTC bell is rung whenever a train arrives at or leaves a control section (controlled switch). If this gets to be too much, there's a "Bell Cutout" switch on the lower right panel. When pulled out, the bell will only ring for trains coming onto or leaving your territory.

The machine has internal locks to prevent changing turnouts when occupied, or when signals would allow traffic over them. If you try to move a locked turnout, it won't be aligned until you change the lock condition. Signals have corresponding locks. They will "run time" if you change them from a cleared position. This ensures that any trains have time to stop before the signal is cleared again. (Time doesn't have to be run in the usual case of conditions on the railroad, e.g. a train arriving, clearing the signal.) During that time, you can't change the signal(s) or associated turnout(s).

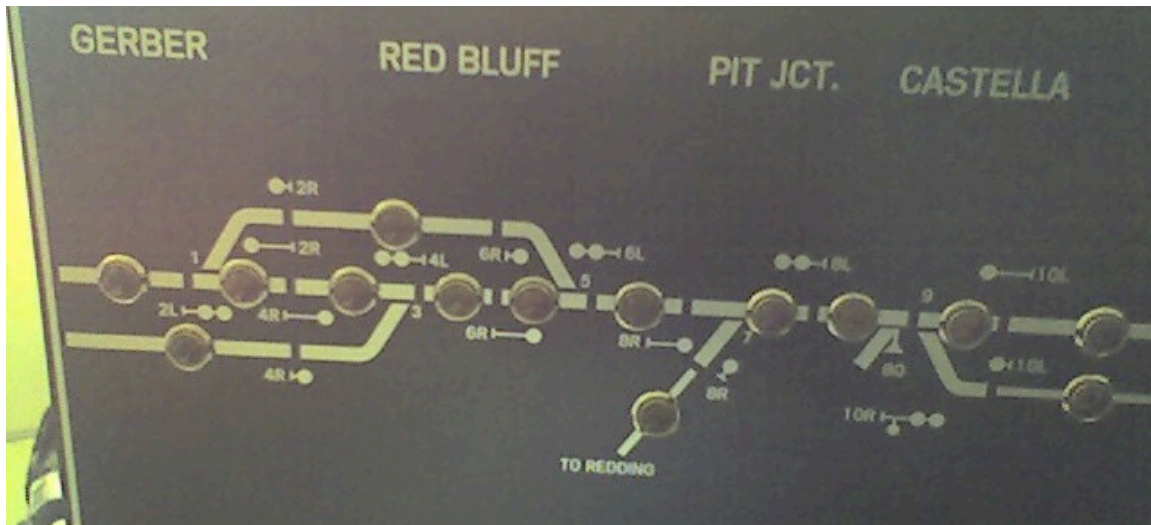
Layout Tour

It's 1952, and the CTC dispatcher controls from Redding to Black Butte. This corresponds to the lower level of the layout.



In this section, we make a left-to-right tour of the machine to describe a few things that the dispatcher might find useful to know. Only the west (left) half of the railroad was using CTC dispatching in our prototype year, so we're only using the left panel and left half of the center panel, up to the entrance to Black Butte

We use blue tape to mark temporary changes on the CTC machine and to remind you of some of the things we're discussing in this section. Generally, a lamp, lever or switch with blue tape should just be ignored. White and black tape is used, as the prototype did, for updates to the machine.



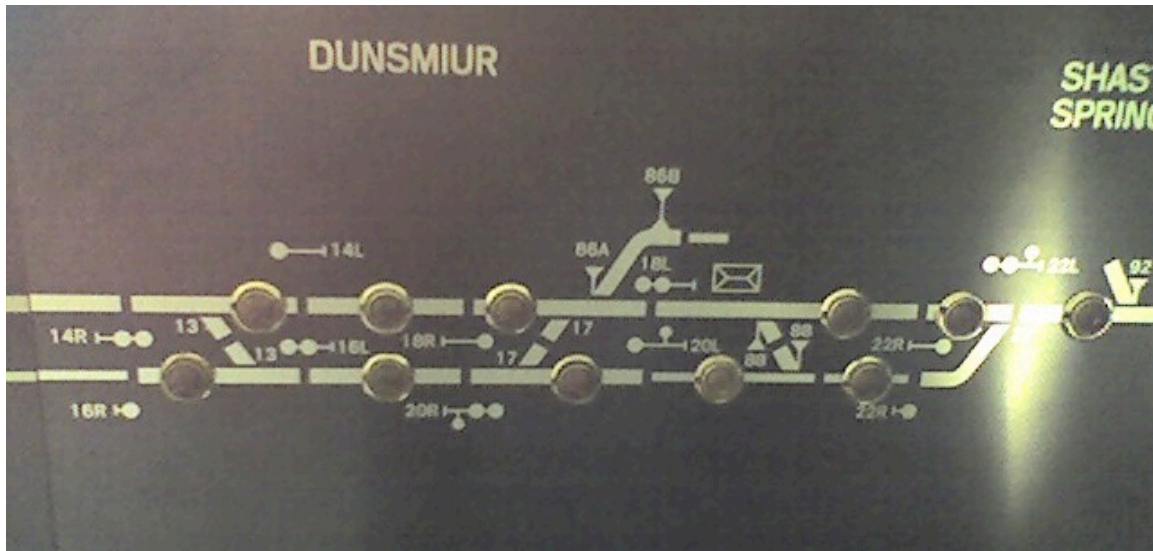
The left-most three sections, switches 1, 3 & 5 and signals 2, 4 and 6 for Gerber and Red Bluff, control the lower half of the helix. During operating sessions, the helix is only used for staging a few trains. The Redding operator is located inside the helix. He usually controls the turnouts when bringing trains in and out of the helix. You won't normally have to work with these sections of the CTC machine. To call the Redding operator, use the maintainer call switch under Signal Lever 6.

Most trains that start or end at the west end of the railroad do so on a Redding (staging yard) track. The Redding operator selects the track and works with the train crew to bring the train in or out of staging. The turnout that selects between the Redding staging entrance and exit switch, and its protective signals, are not on CTC machine. Those are automatic (ABS) signals, and indicate that the turnout is properly set for entrance to or exit from the Redding staging loops under the helix. Usually, trains talk to Redding or Dunsmuir about red signals there, but if they contact you via phone, have them set the fascia switch to properly route their train.

Redding traffic joins the main line at switch 7, coming up the track that shows as diagonal line running down and to the left at Pit Junction. Switch 7 usually stays Reversed, because most traffic comes and goes via Redding staging. The Normal position is used for traffic to and from the helix.

Between the Redding joining turnout (section 7) and the entrance to Dunsmuir (section 9), there's a locally controlled turnout labeled "80" and "Castella" on your schematic. Local tradition calls it "Lamoine", however. There is currently no electric lock; the local from Dunsmuir operates it manually.

Dunsmuir yard extends along the lower (south) side of the Dunsmuir siding from switches 9 through 23.



(West switch 9 was shown in the previous figure)

There are three crossovers in Dunsmuir between the main and siding. From left to right these are:

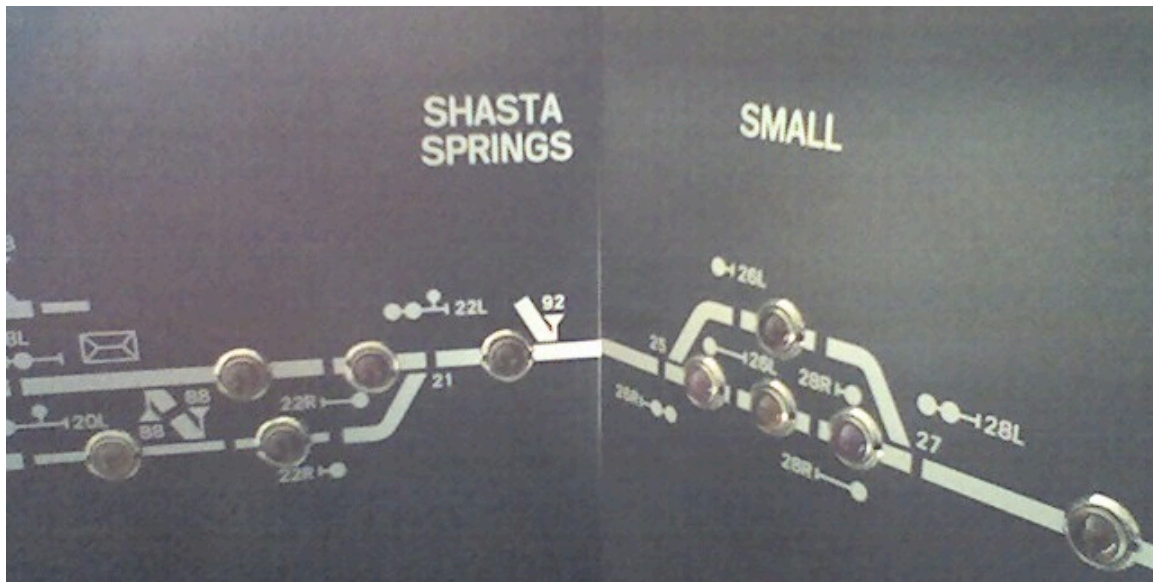
“Lower Crossover 13” – This is protected by signals 14 and 16. The eastbound (rightward) signals are on a signal bridge that some train crews can't directly see but there's also a fascia repeater that's visible.

“Team Crossover 17” – The yard crew uses this to add helpers to eastbound (rightward) trains. They like to be given control over it. Note that the 18L and 20L signals are not yet installed, so they have been locked out on the CTC machine. 18R and 20R are present. The maintainer call switch here alerts the Dunsmuir hostler.

“Upper Crossover 88” – This crossover has only local control, and is usually left under control of the yard crew for adding power to trains on the main. Trains arriving from the right on the main encounter an ABS (automatic) signal on a bridge just before this crossover. You have no control over this signal, it only protects against trains attempting to proceed with the crossover set against them. If a westbound crew calls to report they're stuck on the main at a red signal inside

Dunsmuir yard, they're probably at this signal and should just use the fascia switch to set the crossover properly.

There are three connections between the yard and the siding: At the left end near switch 9; in the center near where the Lower Crossover 13 connects (this is also called the "Engine Crossover", though it's really just a connection to the siding); and at the right near signal 22R. These are always under the control of the yard crew and are not interlocked with the signals. Trains that take the siding therefore proceed under "yard limits" rules at a slow speed. If the yard sets one of these away from the siding, you'll see an occupancy indication lit in the corresponding track section.



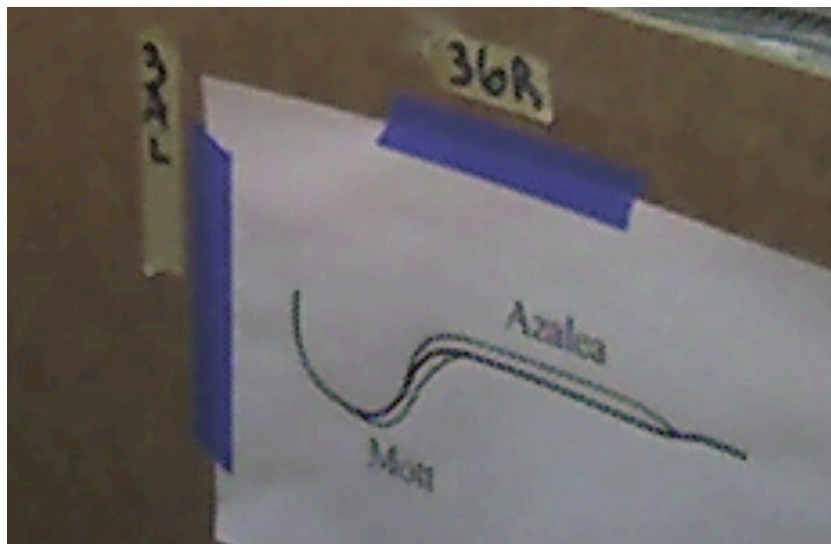
The Shasta Spring spur turnout, 92 on your panel, is permanently under local control.

Small siding is, well, *small*, and full size trains cannot pass here. It's mostly useful for returning helpers. There is one phone booth at the siding that's lit by both Small maintainer call switches so that you can contact a train crew.

The 28L signal entering Small from the Cantera Loop and the 30R signal entering Mott from Cantera Loop not visible from the aisle on the layout, but fascia repeaters are provided. If an engineers calls and says he can't see the signals, have him look at the repeater.



The Mott and Azalea sidings are arranged in a “lap” configuration. When switch 31 is set to normal, they form a central main track with two sidings. When the switches are set to reversed, it’s effectively a single long siding. Note that the track work on the layout makes the Mott/Azalea switches look like a crossover. Train crews will occasionally talk about “crossing” from one track to another there, but that’s actually following the main through the center. You must route passenger trains via the main at Mott due to clearance requirements!



(Better image needed! Replace with picture of trackwork?)

There is no room on the mainline between the two Switch 31 turnouts, not even enough room to stuff a helper engine, because of the way the switch frogs are constructed.



The Canyon dispatcher's territory ends at the Black Butte west (left) switches. The CTC limits at Black Butte are before (left of) the west (left) switches for eastbound (rightward) trains leaving the CTC section, and before (right of) the west switches for westbound (leftward) trains. Basically, trains coming onto your territory stop at the last signals before entering your territory through the Black Butte west turnouts, and you route trains leaving your territory onto the appropriate track in the Shasta dispatchers territory. You'll need to coordinate which track, etc, with him. Note that you can't generally see occupancy indications on your schematic for trains that are past the west switches at Black Butte; they're off your railroad, and you need to talk to Shasta dispatch to learn about what's coming.

Orders and clearances for trains moving between CTC and T&TO territories at Black Butte have been handled several ways in the past. We recommend you work out specific procedures with your T&TO counterpart at the start of the shift. Generally, trains coming east through Canyon territory are routed onto the main at Black Butte if they are proceeding toward Mount Shasta. Eastbound trains doing local work at Black Butte are routed to the siding after discussions with the Shasta dispatcher. Trains coming onto Canyon territory are routed to the siding at Black Butte by their train orders, as their authority ends there. (They sometimes forget and take the main, which can cause quite a tie-up.) Westbound conductors/engineers should call Canyon dispatch on the phone to give you their information and get clearance to enter CTC territory.

Because of the track configuration, the main at Mt. Shasta can be reached from either the main or siding at Black Butte, but the siding at Mt. Shasta can only be reached from the main at Black Butte. It's not possible to go directly from the siding at Mt. Shasta to the siding at Black Butte. This will effect how the Shasta dispatcher routes trains to you.

At Black Butte, to send traffic to and from the Black Butte main, set TO 39 to Normal. To send traffic to and from the Black Butte siding, set Switch 39 to Reversed and Switch 41 to Normal. The track to Siskyou line and Weed (staging) is connected to the industry track, the thin line at the top of the Black Butte track schematic. To send traffic to and from Weed, set Switch 39 and Switch 41 to Reversed.

Black Butte switching considerations

Although not prototypical, trains working local tracks at west end of Black Butte will often need to use the main track out toward the Azalea east (right) turnout. To do this, they need to work past the west Black Butte and east (right) Azalea signals, and they'll generally want local control of the Switch 41. To prevent trains working west Black Butte from completely blocking mainline traffic, a bypass track has been built. On the track diagram it looks like another siding, below the main between Azalea and Black Butte and labeled "bypass". This bypass track is much shorter than the usual sidings, however, and must not be used as a siding for meets.

To route trains across the bypass and allow local use of the main:

- Confirm that the switches are unoccupied
- Set Signal 38 to Stop (center)
- Set Signal 40 to Stop (center)
- Set Switch 35 to Reversed
- Set Switch 39 to Reversed
- Code 36 and 40, and wait for them to complete
- Raise the Call On lever under the Signal 38 lever
- Code 36
- Raise the Call On lever under the Signal 40 lever
- Code 40

Note that the signal lights for 38 and 40 are extinguished. This indicates that the signals in the field are in "call on" mode, showing a flashing-red "Restricting" aspect that allows the train to operate past the signal at restricted speed without having to contact you for each move. While in this mode, coding section 40 will not change turnout 41; it is locked to local control.

While the switching proceeds, use signals 36 and 42 to route trains across the bypass between the CTC main and the Black Butte main track.

When local switching is complete and the train has cleared up:

- Confirm that the switches are unoccupied
- Confirm that the Signal 38 lever is still set to Stop (center)
- Lower the Call On switch under the Signal 38 lever
- Code 36
- Confirm that the Signal 40 lever is still set to Stop (center)
- Lower the Call On lever under the Signal 40 lever
- Code 40

This restores normal operation. The center indicator lamps on signal levers 38 and 40 should light once the machine has cycled with the field stations.

Start of Day

This section describes preparing the Canyon dispatcher's station for an operating day. This will be done before visiting dispatchers arrive, so this section is only of passing interest to them.

The dispatcher needs:

- A blank train sheet taped to the desk, along with the filled-out one from the previous day's operations for reference
- Timetable(s) and will-run list
- "Rights of Trains"
- Sharpened pencils, yellow stickies and blue tape

Set up the communications:

- The telephone volume should generally start at about 75%.
- The radio should generally be set to "10-30" with the volume up about halfway. There's a "privacy" button that sets the "-30" subchannel.
- The intercom should be on channel B.

Resetting the CTC Machine

At the start of the day, or if the computer's program is restarted, pull out and then push in the "Remote Station Disconnect" button in the lower right. This sets CTC mode.

Next, center all the signal levers and press all the code buttons in sequence. This initializes all the signals to be under CTC control, instead of free running in "maintenance session" mode.

While you're doing this, you can check that you have control of all the mainline turnouts by changing them. If the lamps follow your commands, everything is OK. If the lamps don't follow, or go out, check the position of the corresponding layout fascia switch. Move it back to the mainline position if needed.

Out-of-Service Controls

The following controls are not implemented. They should be blue taped:

- The maintainer calls at 2, 4, 8, 10, 14, 22 which have nothing on the layout.
- Signals 2, 4, 6 in the helix and Dunsmuir 18L and 20L (also on track plan)

Resetting the Black Butte Operator Machine

At the start of the day:

- Hide (not close) most of the JMRI windows, leaving just the track schematics (perhaps artfully arranged)
- Use the three icons on the bottom of the computer screen to open up windows from the three video cameras. If you're asked for login credentials, just accept the default, or if needed enter "admin" for the account and "admin" for the password.
- Confirm that both boards at all three stations will go up and down, and then center the levers to leave them at up.