

System One Cab04 Radio Turn on Fix

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Problem Symptoms

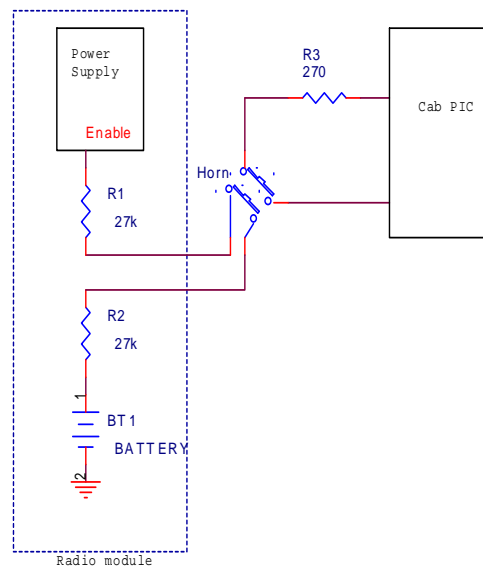
Some old System One Cab04's may sometimes have a problem where the keyboard becomes non-responsive to key presses. Normally the LED on the front blinks each time a key is depressed.

When the cab hangs up the following symptoms will be seen:

- The LED on front will not blink when any of the keys are pressed.
- None of the keys will work and you cannot change the direction of the locomotive.
- The LED on front will not light when "Select Loco" is pressed.
- The speed control still works normally and can control a locomotive.
- The radio activity LED on the top of the Cab04 will be blinking normally.
- The problem only occurs when the Cab04 is running on radio.
- The problem may appear to come and go, with the cab working normally sometimes.
- If the cab is off and then plugged into the cab bus the Cab04 will work normally.

Affected Cabs

Early System One Cab04's that later had radios installed in them. The part number on the internal circuit board in these cabs is 10006-9001 Rev A. These cabs use a DIP switch to set the cab address. See the photo of the cab below:



Problem Cause

The problem can occur due to the way the power turn on switch is implemented. On a radio cab the Horn button serves a dual purpose; it acts as the turn on switch, and it acts as the horn button. In order to serve this dual function there are four sets of contacts under the horn button. Two of these contacts go to the radio power up circuit, and the other two contacts trigger the horn function. A simplified schematic of the horn button is shown above:

When the horn button is depressed all four of the contacts may be connected together depending on how you press the key down. Some System One Cab04's will hang up when all four contacts are connected together when the cab is turned on. After the cab has powered up it is not an issue, but if all four contacts are connected together at turn on the processor in the cab may not start up correctly and the keyboard will not be scanned.

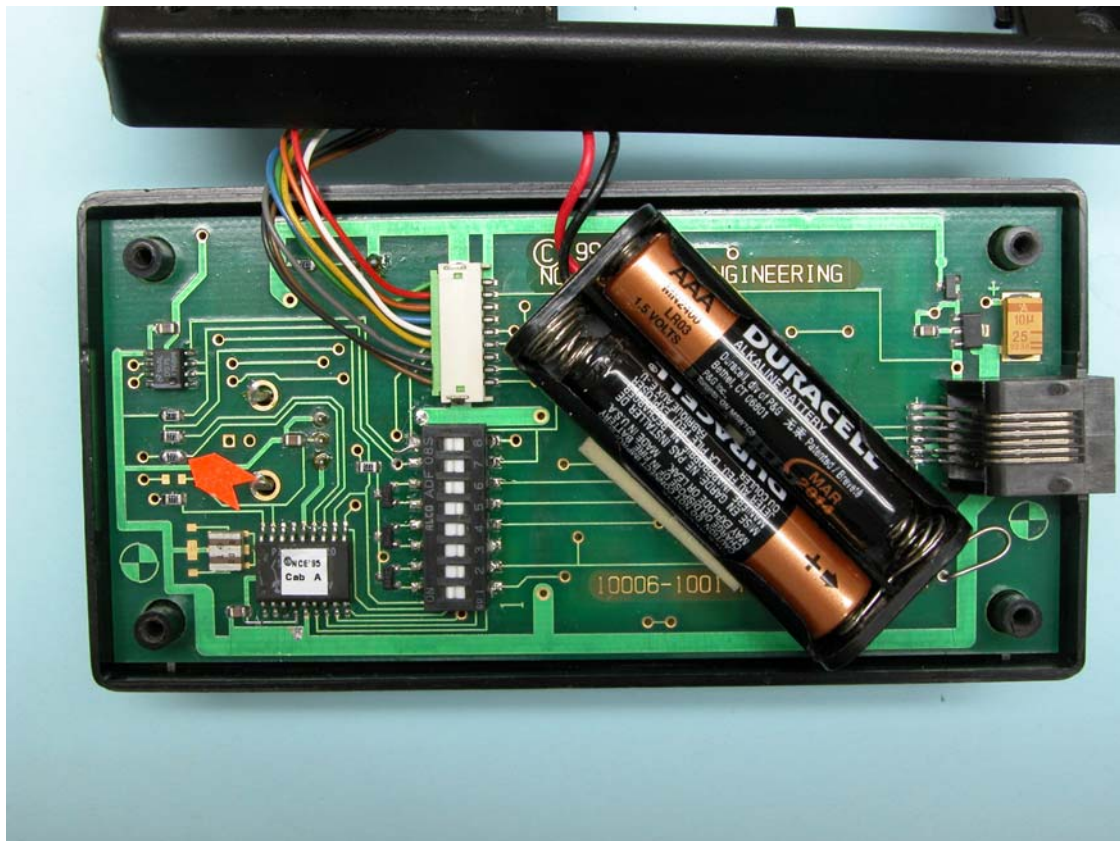
Most of the time the cab will work fine as one tends to rock the horn button and only some of the contacts get connected together. In order for the problem to occur you need to press straight down on the horn button so that all 4 contacts are connected.

Once the problem occurs the keyboard will remain non-responsive until the power is cycled on the cab. This can be done by removing the batteries to turn off the cab, or plugging it into the cab bus and then unplugging to turn the cab off.

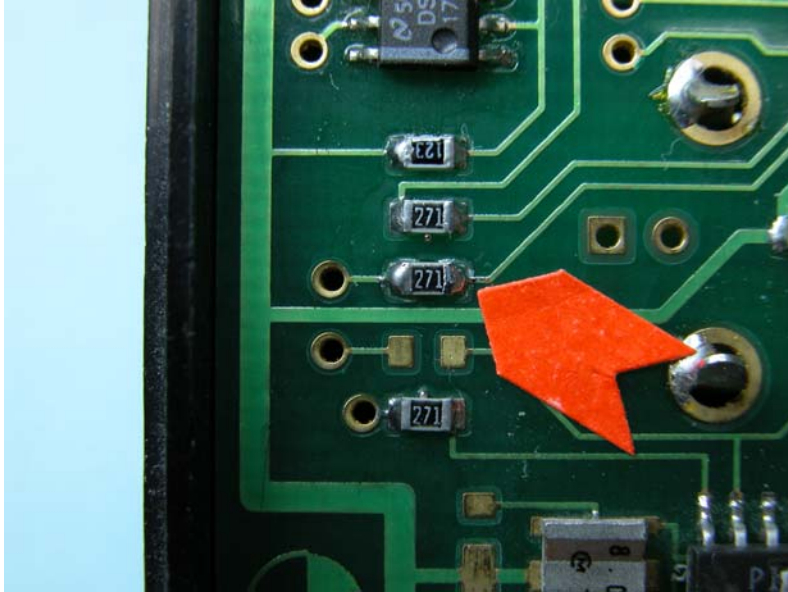
Problem Fix

The problem is that the processor latches up when it sees the battery voltage applied to both of the horn contacts at startup. To fix this problem the 270 ohm resistor that is in series with the horn contacts can be increased to 1k ohms (1000 ohms). Increasing the value of the resistor prevents the latch up from occurring and the cab will always start normally regardless of how the horn button is pressed.

The general location of the resistor is shown at the orange arrow in the photo below:



The photo below shows a close up of the 270 ohm (271 marking) resistor that needs to be changed:

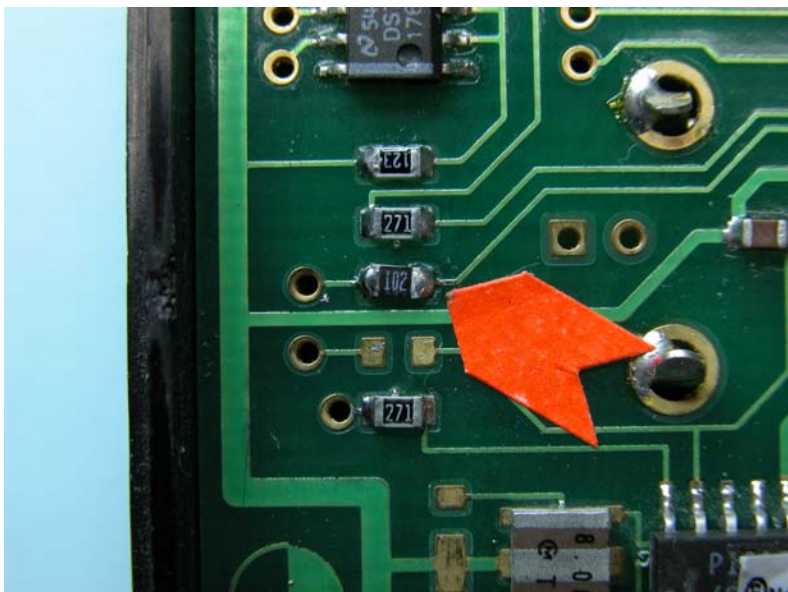


Replace the resistor with a 1k ohm, 5%, 0805 package surface mount chip resistor. The resistor can be obtained in small quantities from Digikey or Mouser from any number of suppliers.

Here are a few Digikey part numbers that will work:

P1.0KACT-ND	Panasonic
RMCF0805JT1K00CT-ND	Stackpole
RHM1.0KARCT-ND	Rohm
311-1.0KARCT-ND	Yageo

Here is another picture with the replacement 1k resistor (102 marking) installed.



Conclusion

The non-responsive keyboard issue with old System One Cab04's is due to the way the horn button is used to turn on the radio cabs. If all the contacts under the horn button are shorted together at the time the cab is turned on the keyboard may wake up non-responsive.

The problem can be fixed by changing the value of the series resistor that is in line with the horn button. Changing this resistor from 270 ohms to 1k ohms will allow the cab to start up normally regardless of how the horn button is depressed.