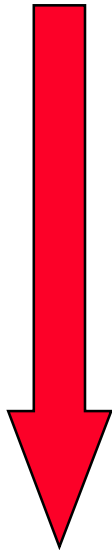


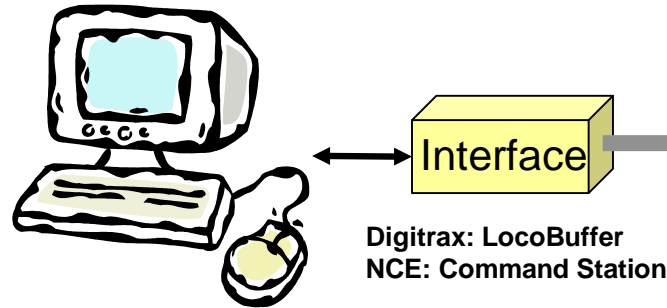
# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

### Figure 1, Route Control System (RCS) Overview

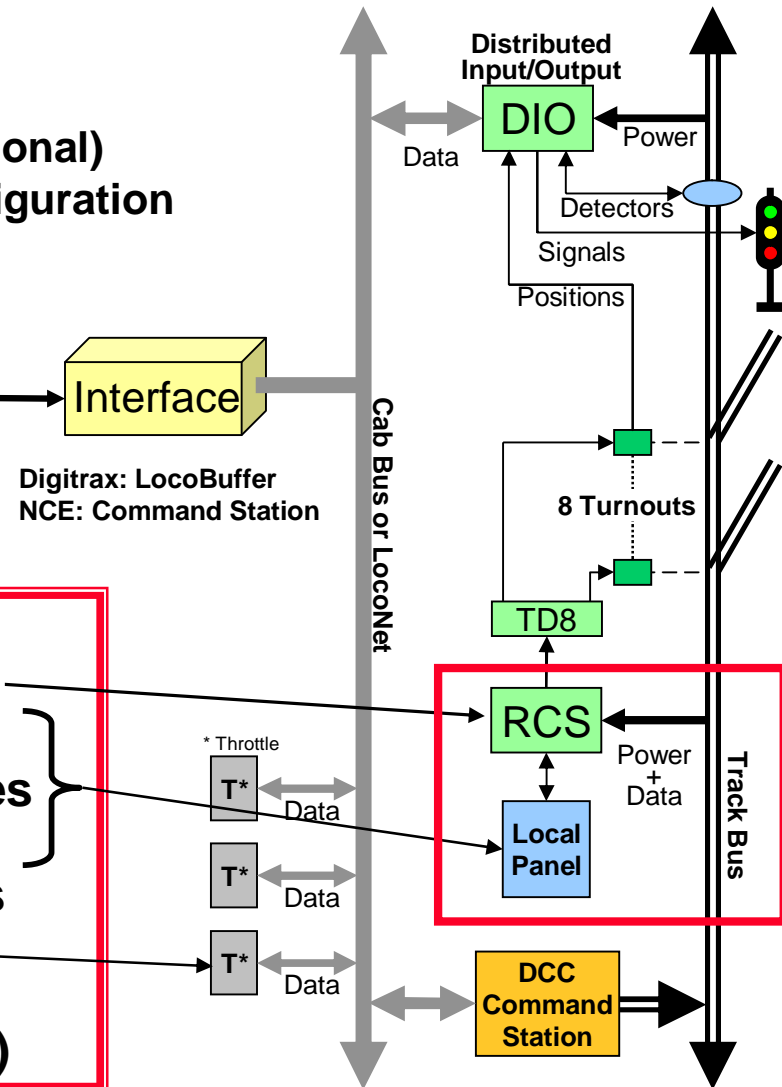


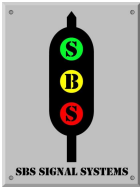
### SBS (Optional) System Configuration



### RCS Provides The Following Features:

- 8 Accessory Decoders on One Board
- Local Panel Control
- Pushbutton Route Control – 16 Routes
- Local Panel Lockout by Dispatcher
- User “Programs” Decoder Addresses & CV’s with DCC Throttle
- Integrates with SBS or... Standalone (No Computer Necessary)

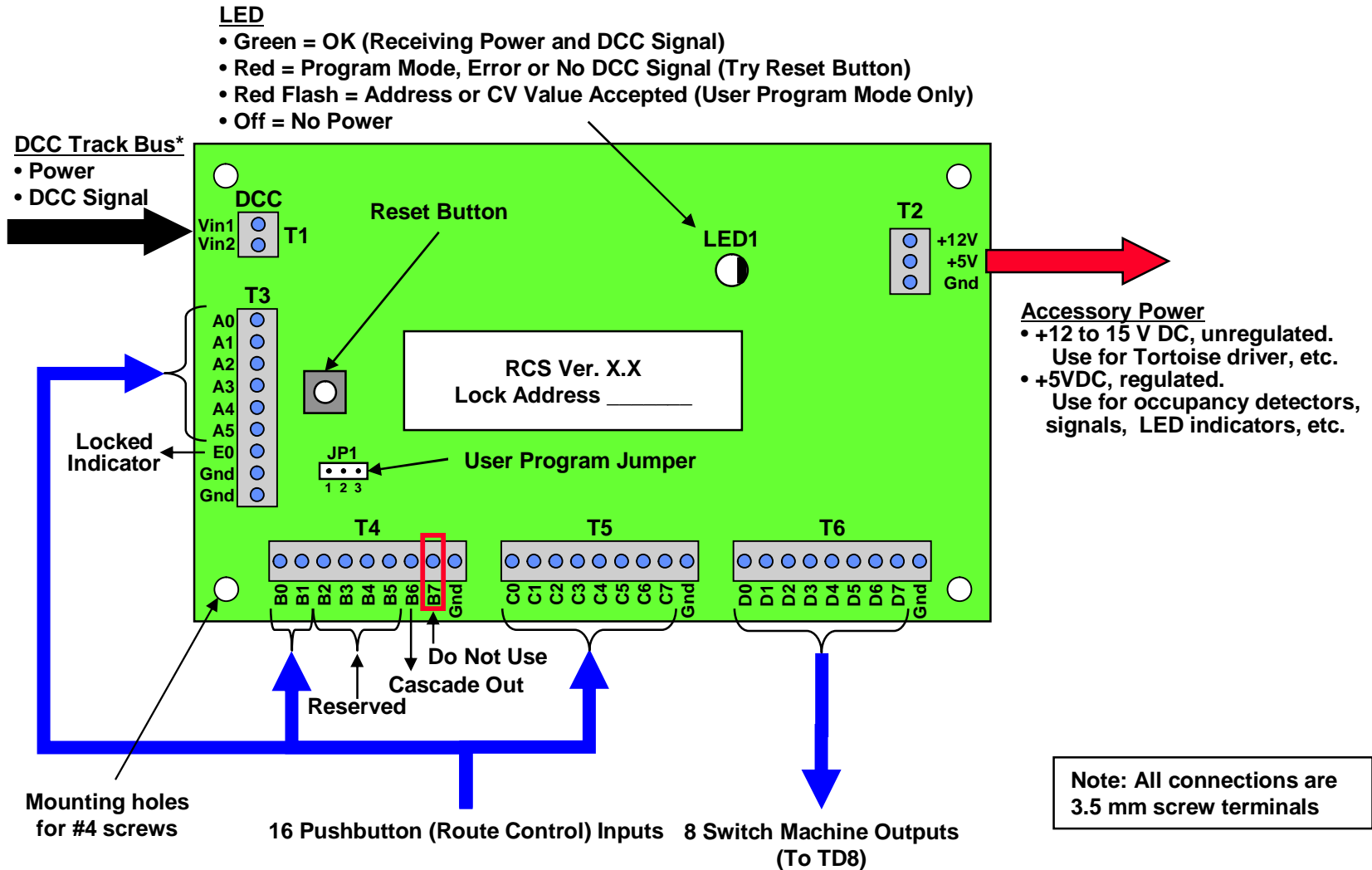


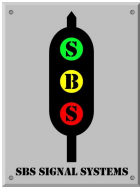


# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

## Figure 2, Route Control System (RCS) Board



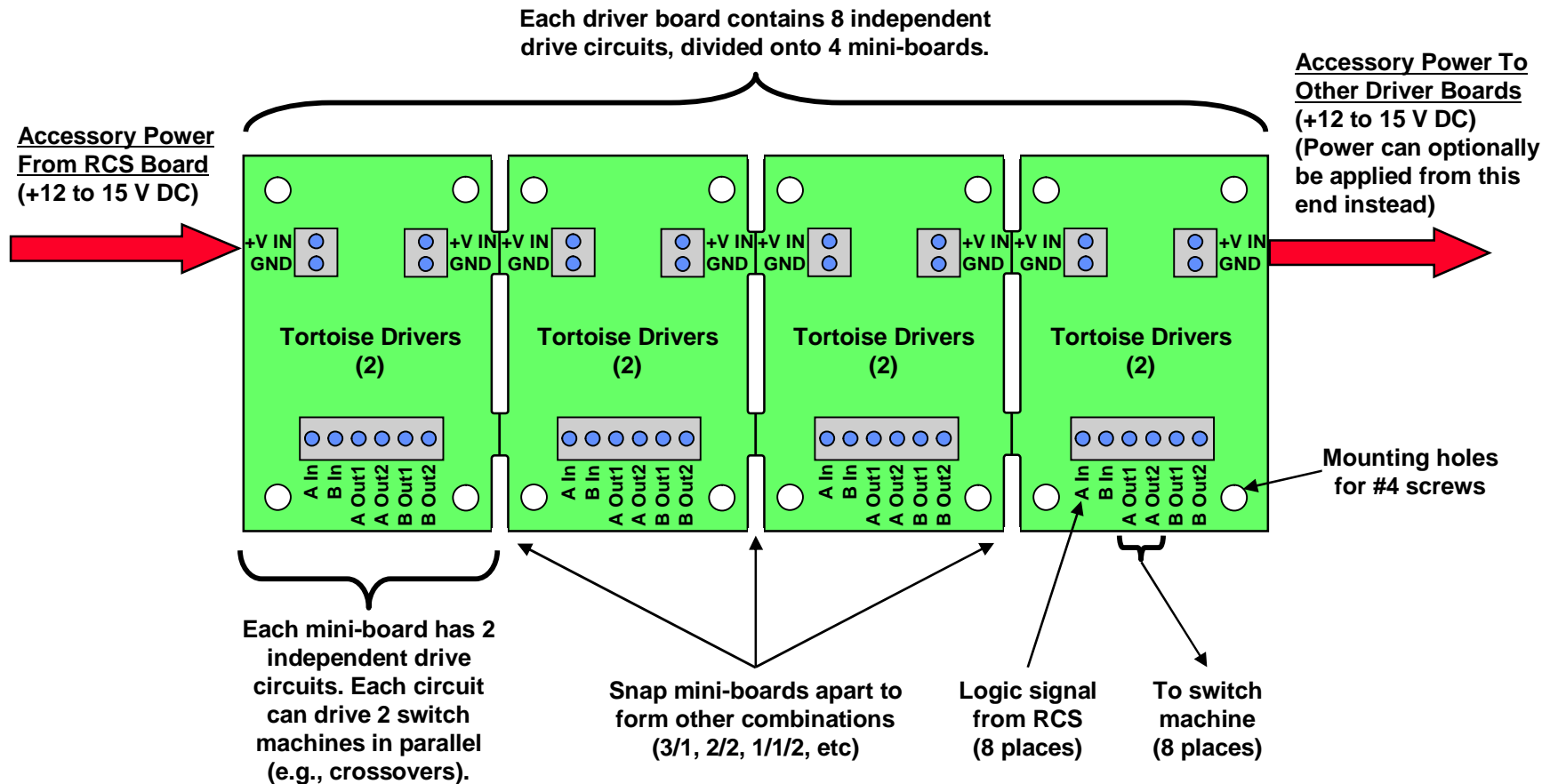


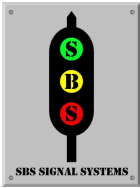
# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

## Figure 3, Tortoise<sup>®</sup> Driver Board (TD8)

Note: All connections are 3.5 mm screw terminals

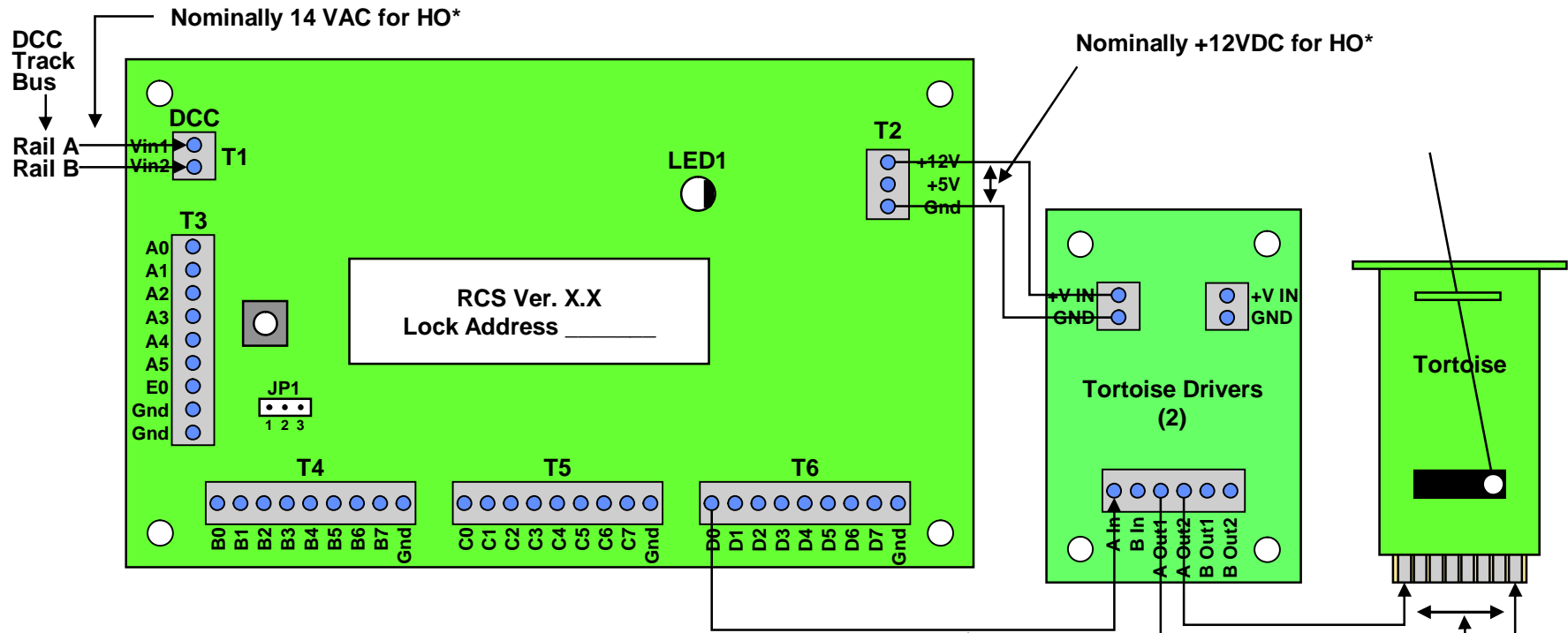




# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

**Figure 4, Tortoise® Wiring Schematic**



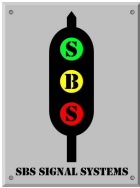
- Test Tortoise direction using DCC switch (accessory) commands NORMAL (Closed) and REVERSE (Thrown). See note.
- Program routes using RCS CV Worksheet (see Figure 15, Worksheet Example).

0VDC or +5VDC  
(measured to GND)  
depending on state.

Nominally  
+/- 10VDC  
for HO\*

Note: If Tortoise does not throw in the desired direction, transpose the Out1 and Out2 connections.

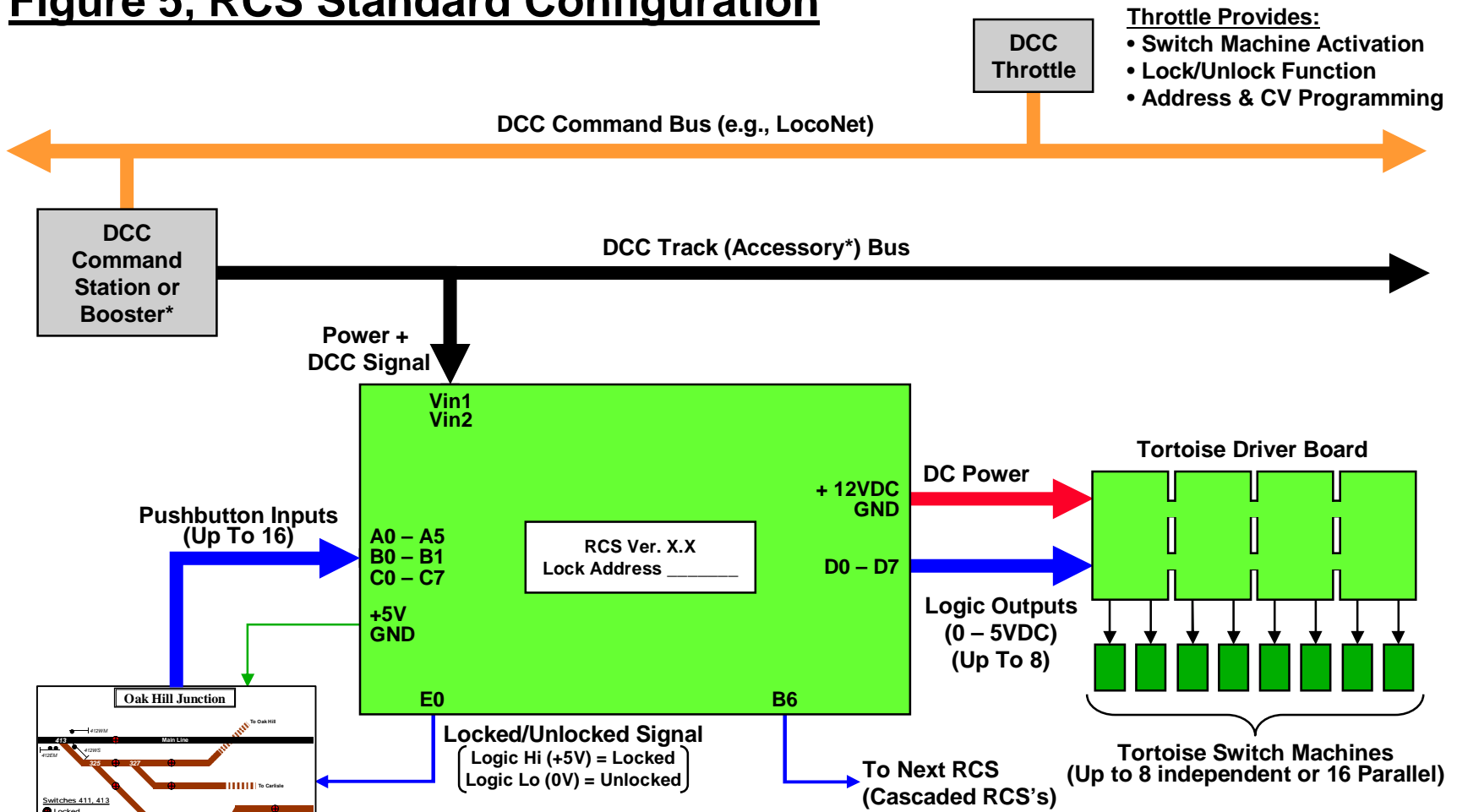
\*Voltages may vary depending on DCC booster setting of N/HO/O.



# Signals By Spreadsheet (SBS)

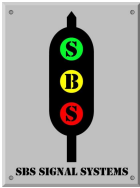
# Route Control System (RCS)

## Figure 5, RCS Standard Configuration



- Throttle Provides:**
- Switch Machine Activation
  - Lock/Unlock Function
  - Address & CV Programming

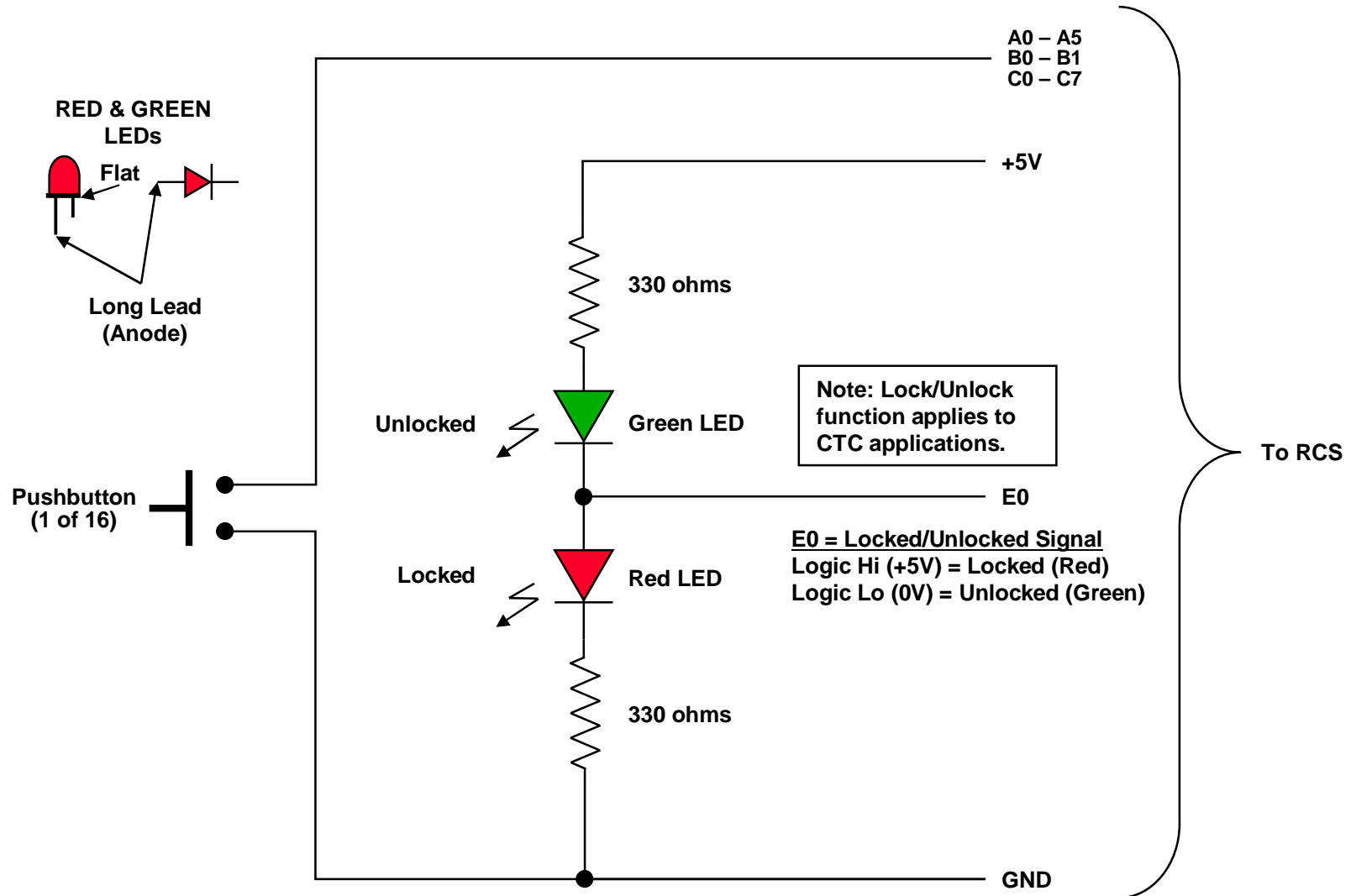
- Up to 8 independent switches (more with cascaded RCS's)
- Up to 16 independent routes (more with cascaded RCS's)
- Any or all switch machines may be locked (usually by the dispatcher)

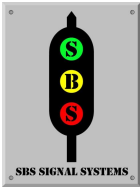


# Signals By Spreadsheet (SBS)

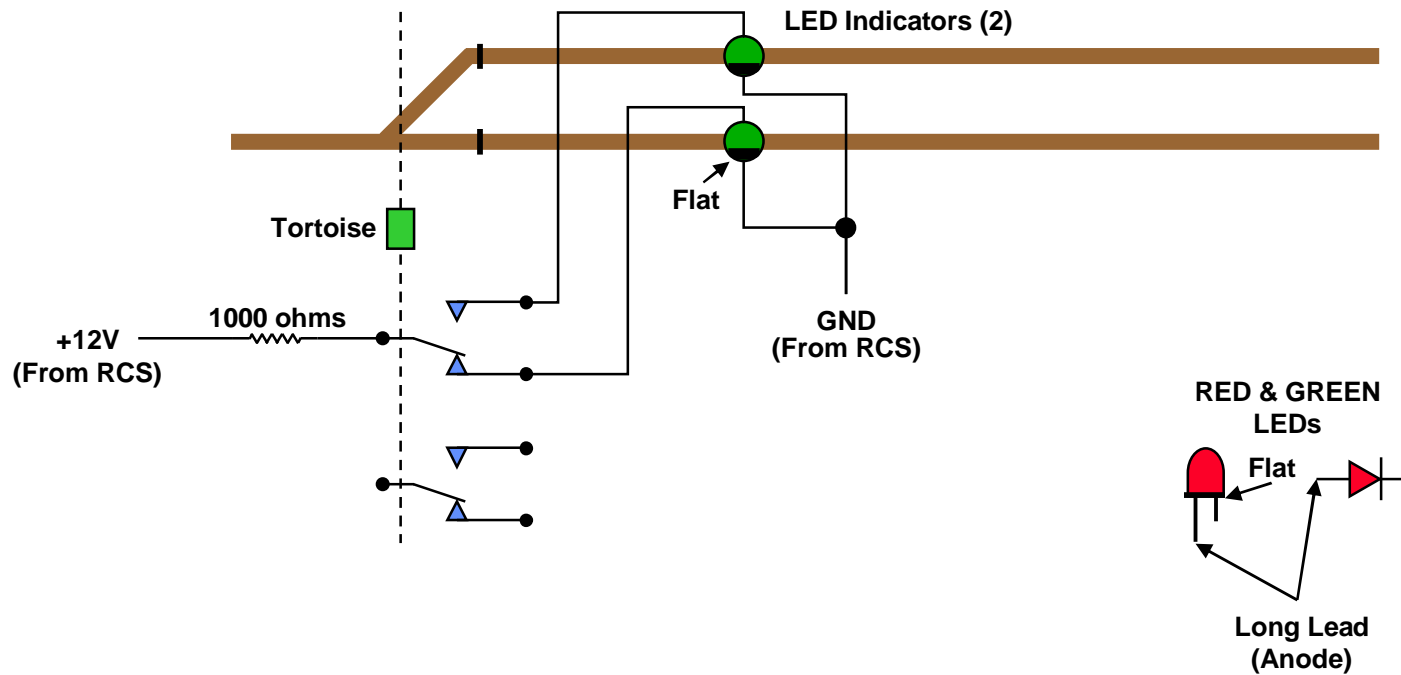
# Route Control System (RCS)

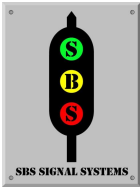
## Figure 6, Local Control Panel Schematic





## Figure 7, LED Switch Position Indicators (Optional)

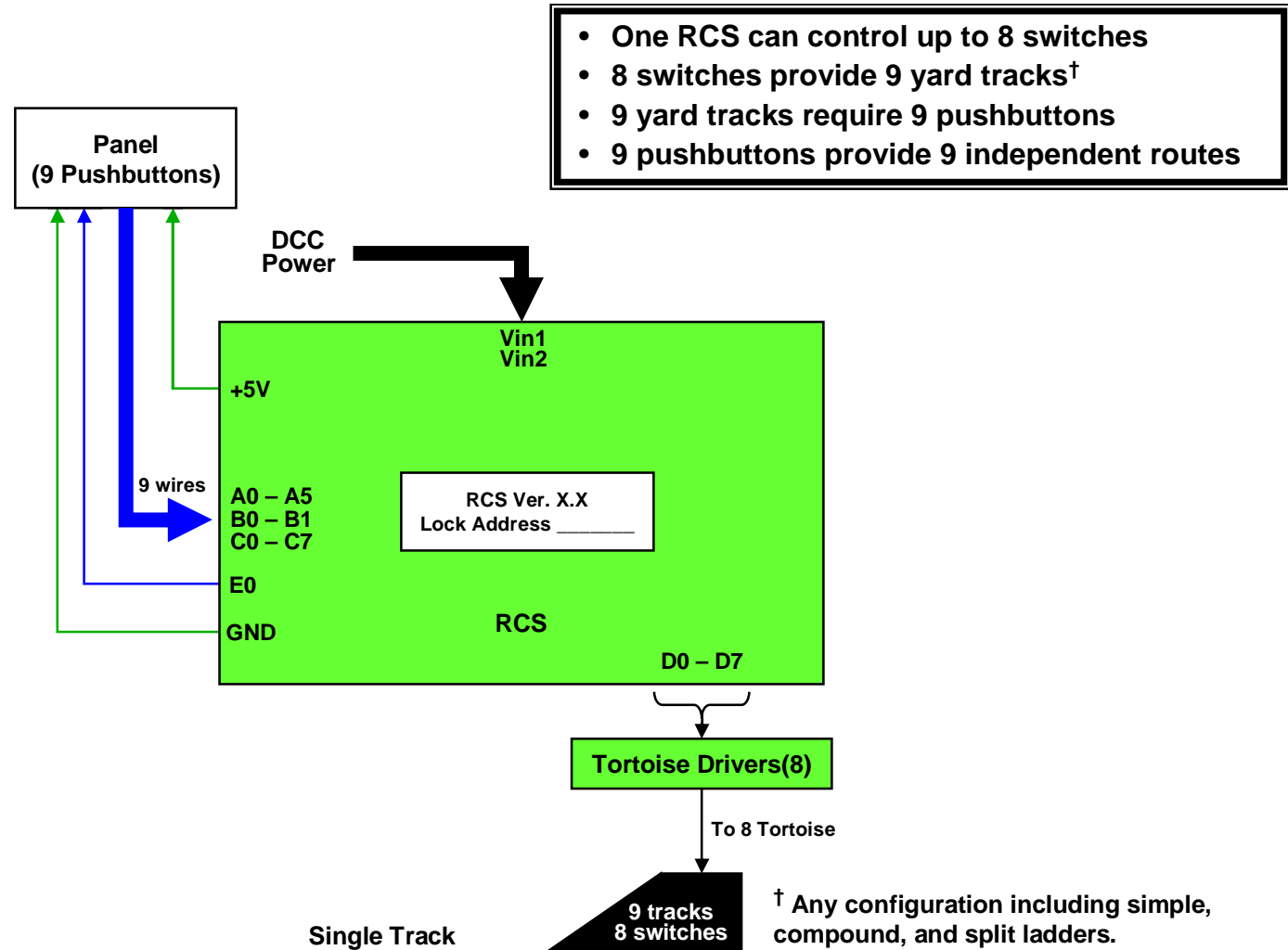


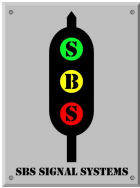


# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

## Figure 8, Example: Yard Control (Up to 9 tracks)

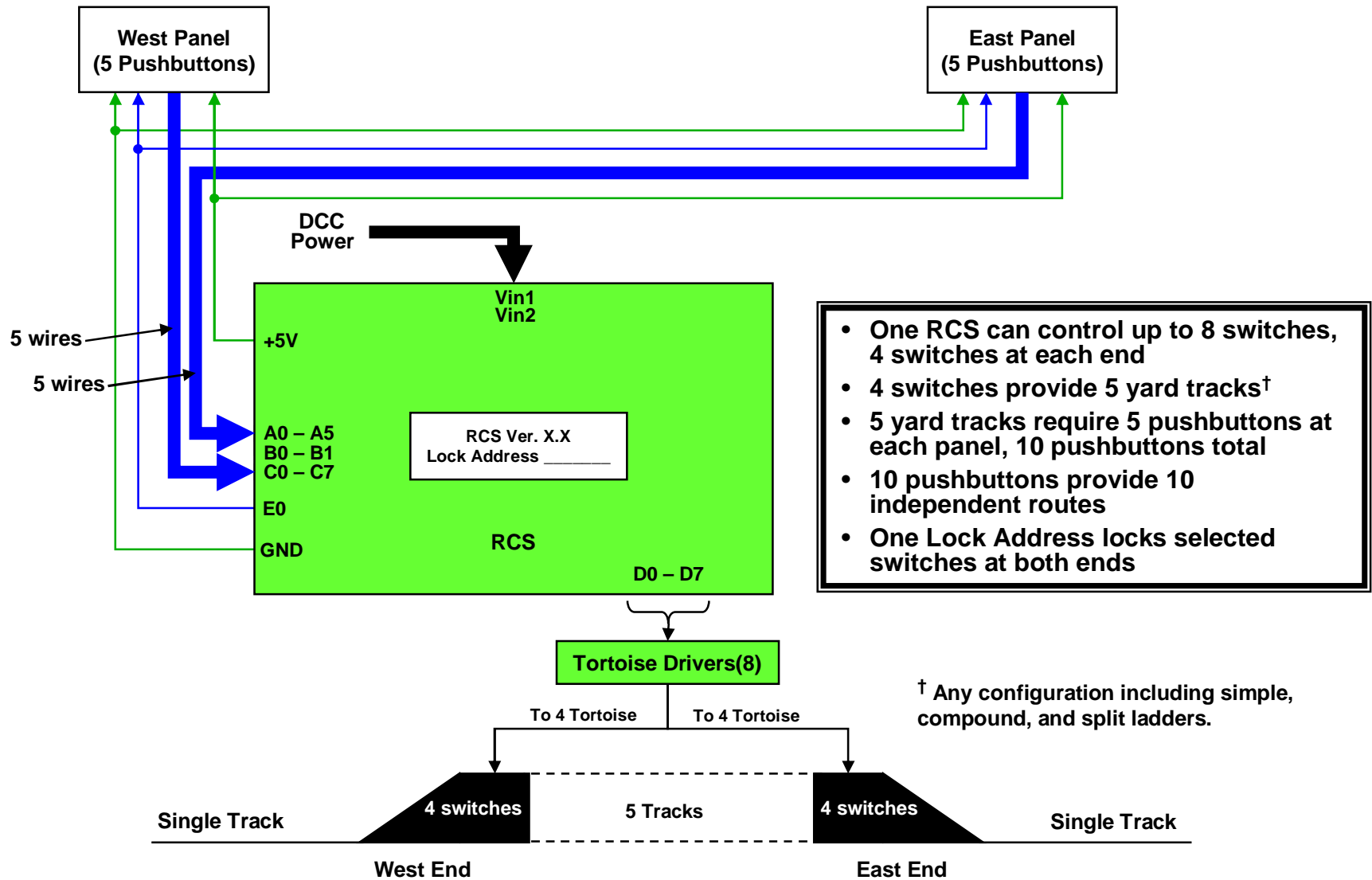


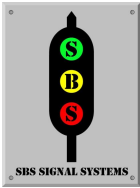


# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

## Figure 9, Example: Double Ended Yard Control

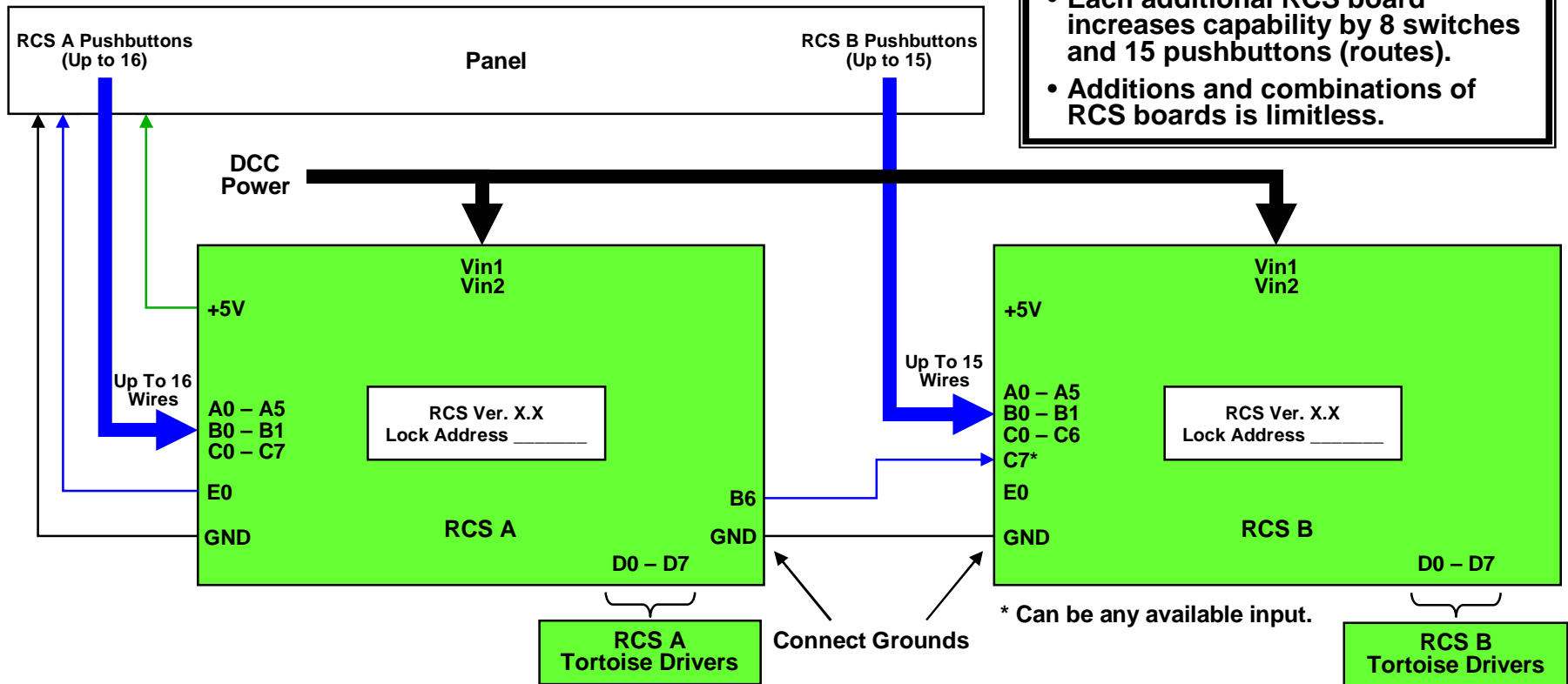




# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

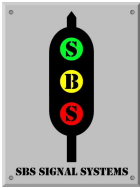
**Figure 10, Cascaded RCS Boards**



- Cascading is useful for large yards, multi-track loops, etc.
- Each additional RCS board increases capability by 8 switches and 15 pushbuttons (routes).
- Additions and combinations of RCS boards is limitless.

**Functionality**

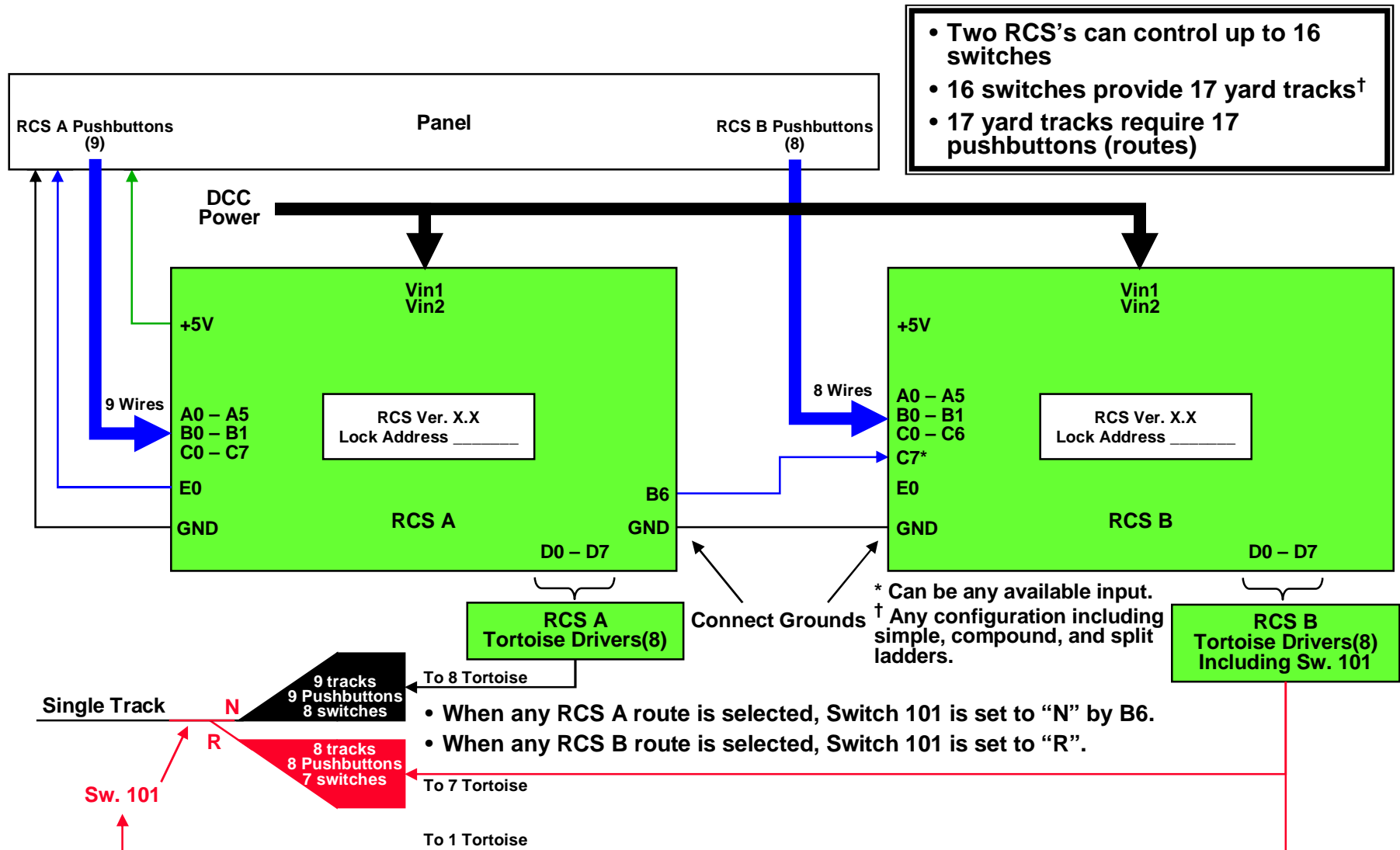
- RCS A Output B6 can be connected to any route input on RCS B (e.g., C7). B6 acts like a pushbutton, indicating that an RCS A route was just selected.
- RCS B's Worksheet must include the input from B6 at C7\*.
- When RCS B, C7\* is "pressed" by B6, RCS B switches are aligned as programmed.
- When any RCS B pushbutton is pressed, RCS A switches are not affected.
- RCS A and RCS B can be assigned the same or different Lock Addresses.



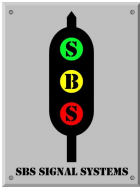
# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

**Figure 11, Example: Yard Control (Up To 17 Tracks)**



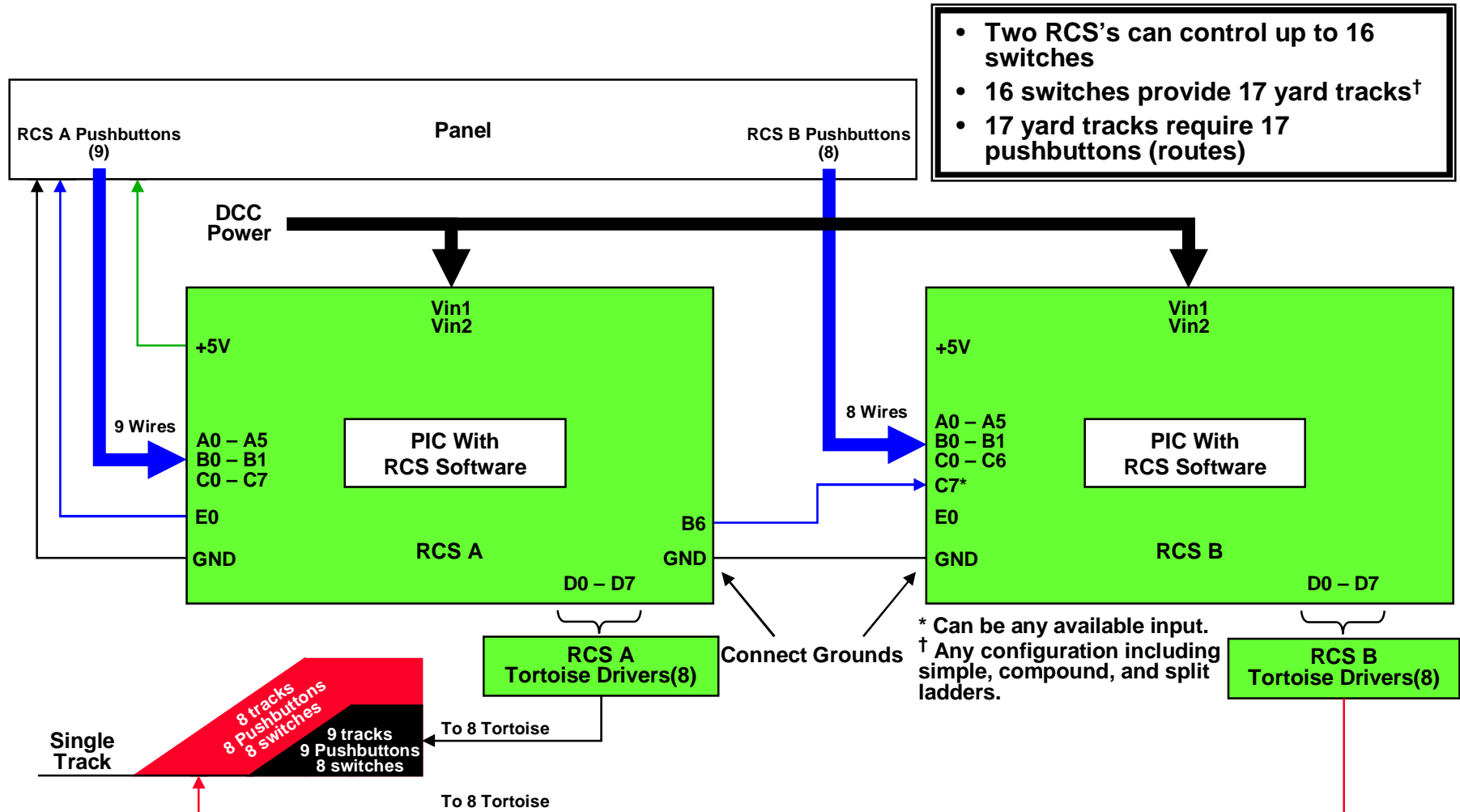
- Two RCS's can control up to 16 switches
- 16 switches provide 17 yard tracks†
- 17 yard tracks require 17 pushbuttons (routes)



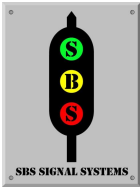
# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

**Figure 12, Example: Ladder Control**



- When any RCS A route is selected, all RCS B switches are set to “N” by B6.
- When any RCS B route is selected, RCS A switches are unaffected.

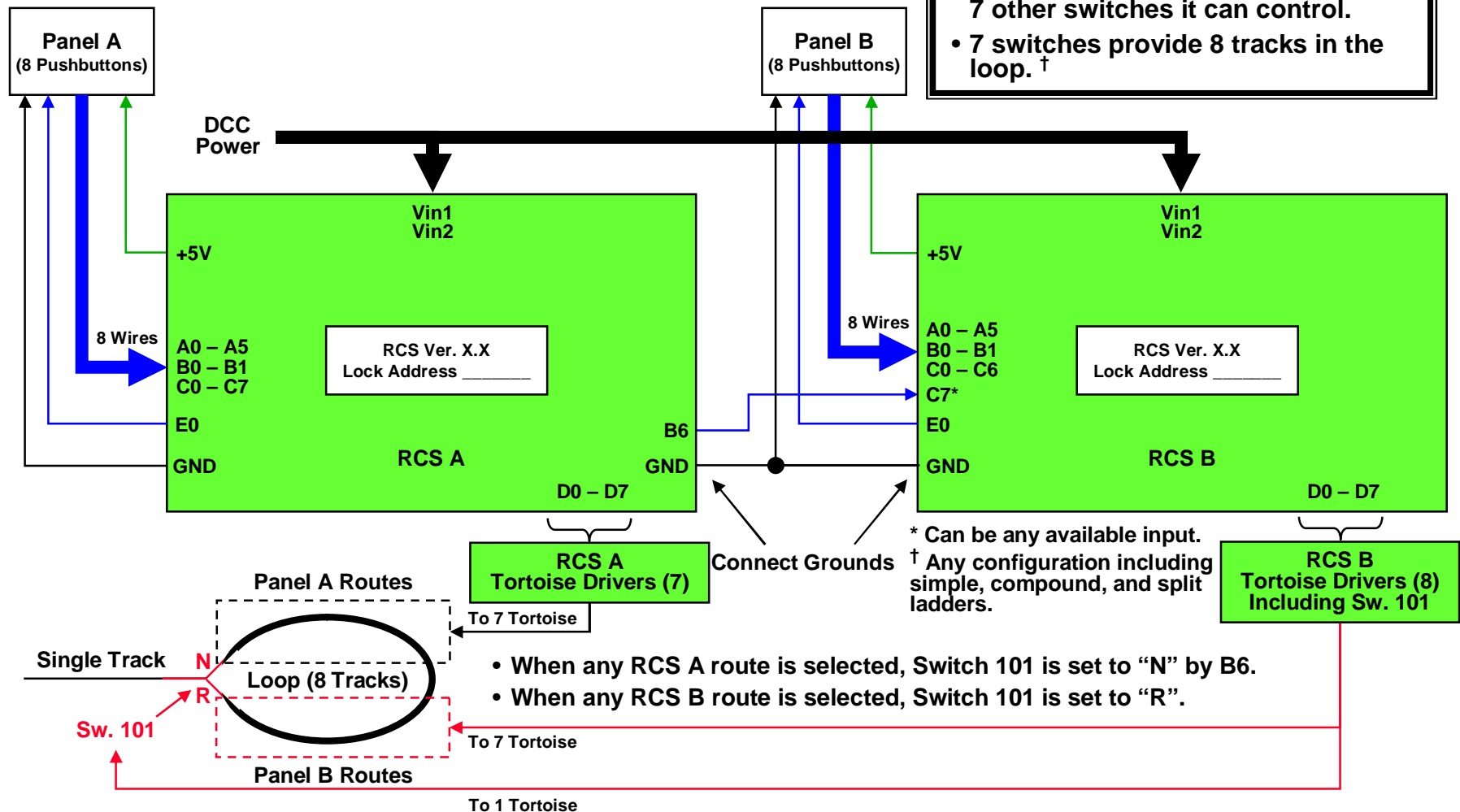


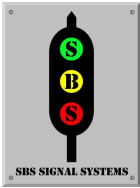
# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

**Figure 13, Example: Loop Control**

- Each RCS controls one end of the loop.
- RCS B controls Switch 101, leaving 7 other switches it can control.
- 7 switches provide 8 tracks in the loop. †



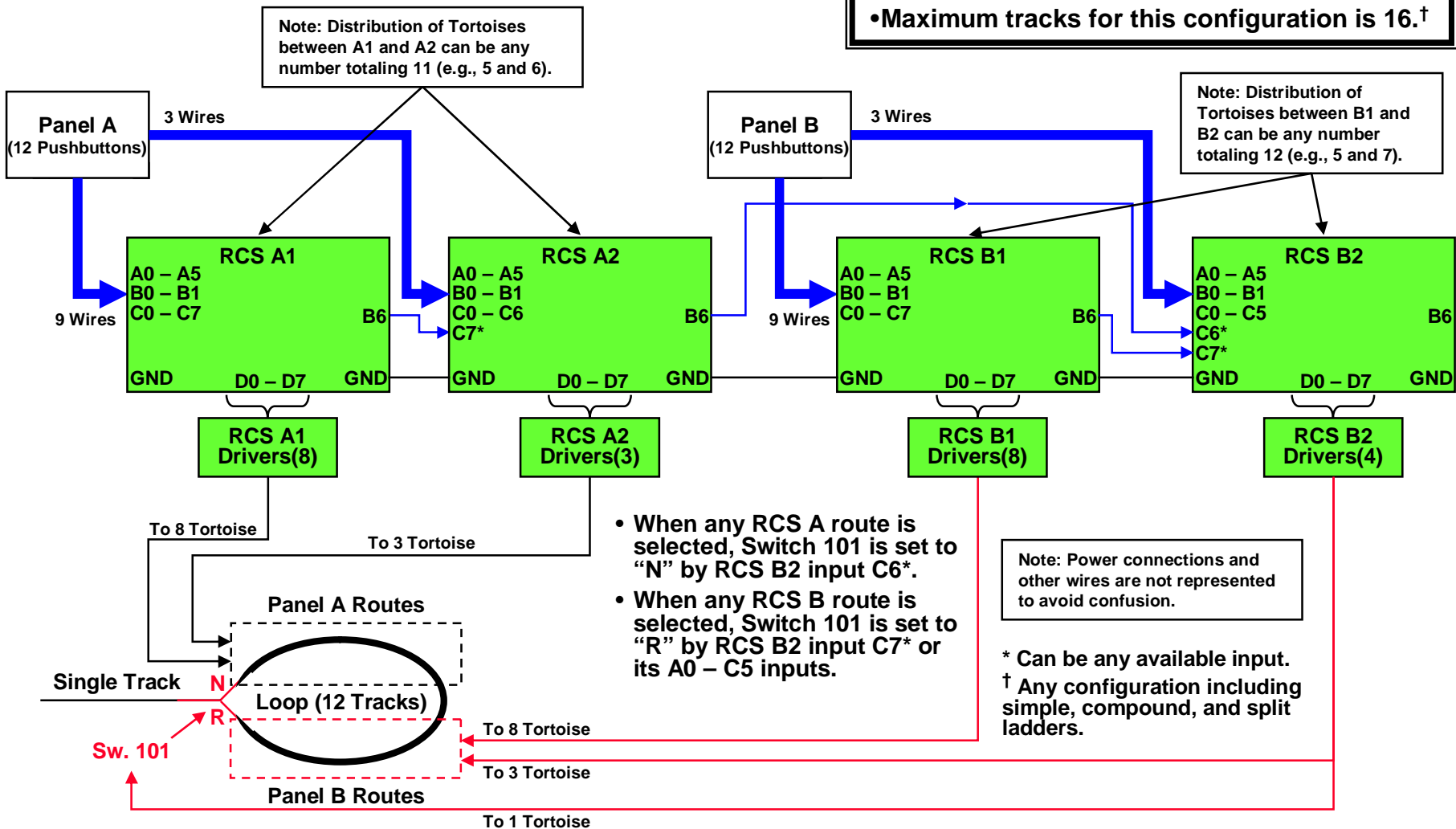


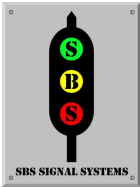
# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

**Figure 14**  
**Example: Expanded Loop Control (12 tracks)**

- 12 tracks require 11 Tortoise on each end.
- Switch 101 connects the two ends together and is controlled from RCS B2.
- Maximum tracks for this configuration is 16.†

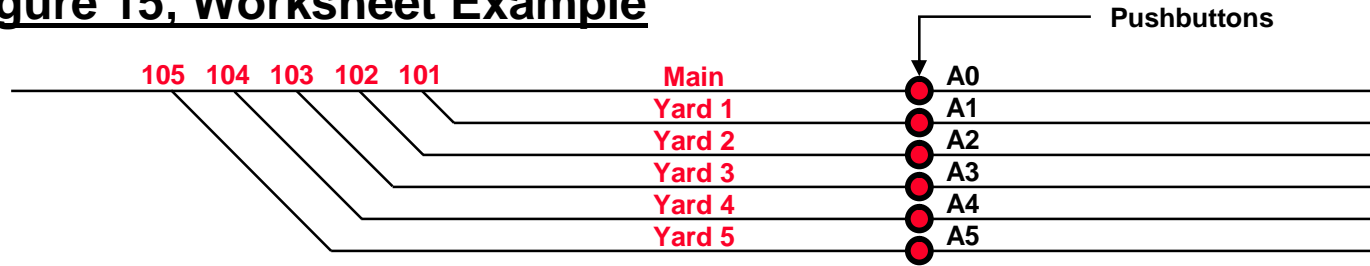




# Signals By Spreadsheet (SBS)

# Route Control System (RCS)

Figure 15, Worksheet Example



Note: User entries in worksheet are in **RED**.

Example with 6 Routes, 5 Switches, Lock Address=100:

Switch #	RCS Input	Route CV#	Route Value	Switch Position (N or R)					Don't Move CV Value	Don't Move CV									
				SW8	SW7	SW6	SW5	SW4			SW3	SW2	SW1						
105	104	103	102	101															
Teal	Blue	Green	Yellow	Purple															
D7	D6	D5	D4	D3	D2	D1	D0												
128	64	32	16	8	4	2	1												
Main	White	A0	81	31															
Yard 1	Pink	A1	82	30															
Yard 2	Brown	A2	83	28															
Yard 3	Grey	A3	84	24															
Yard 4	Chartruse	A4	85	16															
Yard 5	Orange	A5	86	0															
		B0	87																
		B1	88																
		C0	89																
		C1	90																
		C2	91																
		C3	92																
		C4	93																
		C5	94																
		C6	95																
		C7	96																
Lock (L/U)	Beige	E0 out	97	1															
	Red/Black	+5/GND																	

**Legend:**  
 N = Normal  
 R = Reverse  
 X = Don't Move  
 L = Locked  
 U = Unlocked

A blank RCS Worksheet can be downloaded from the SBS website: [www.SignalsBySpreadsheet.com](http://www.SignalsBySpreadsheet.com)

- Instructions:**
1. Enter on Worksheet header the Yard or Headblock Name and Lock Address. (Yard/Headblock Name is an optional entry.) Lock Address and Switch # address range is 0-2047.
  2. Enter on Worksheet the Switch #s, Track Names, and Wire Colors. Leave unused switches and tracks blank. (Track Names and Wire Colors are optional entries.)
  3. Enter on Worksheet the required Switch Position (N, R, or X) for each Track. (Ask yourself: when A0 is pressed, what position should SW1 go to? SW2? SW3? Etc.)
  4. Enter on Worksheet an "L" in the Lock row for each switch you want the dispatcher to be able to lock (that is, disable local control). Enter a "U" otherwise. (See Note 2)
  5. Calculate the CV values by adding the CV Weight (1,2,4,8,etc.) for each entry of N's and L's in the left CV Value column, for X's in the right CV Value column.
  6. Place the Jumper on the RCS board in "Program" position. (Jumper 1-2)
  7. Program the Lock and Switch #s using your throttle in "Switch Mode" in the following order: Lock, SW1, SW2, ... (Select address, press either N or R to program)
  8. Program the CV#s and their corresponding CV Values with your throttle in "Ops Mode". Use a non-existent locomotive address number - but not zero.
  9. Replace the Jumper on the RCS board to "Default" position. (Jumper 2-3)
- Note:**
1. The Lock Address and Switch #s should be unique on the layout. Exceptions may exist when multiple activations for the same address are desired.
  2. The Lock Address and Switch #s must always be entered in order (Lock, SW1, SW2, etc.). CV Values may be entered in any order.
  3. Outputs D0 to D7 are switch outputs (N=Hi=1, R=Lo=0); E0 Out is a lock indicator output (Locked=Hi=1, Unlocked=Lo=0)
  4. Inputs A0 to C7 are pushbutton inputs and must be pulled low for local operation. Lock Address locks switches indicated by "L" in CV97 (N-->Locks, R-->Unlocks)
  5. For some DCC systems: N(Normal)=C(Closed), R(Reverse)=T(Thrown), "Switch Mode"="Select Acc", "Ops Mode"="Program On The Main"
  6. "Power LED will flash from GREEN to RED then back to GREEN when a program operation is accepted.