Remote Signal Repeater

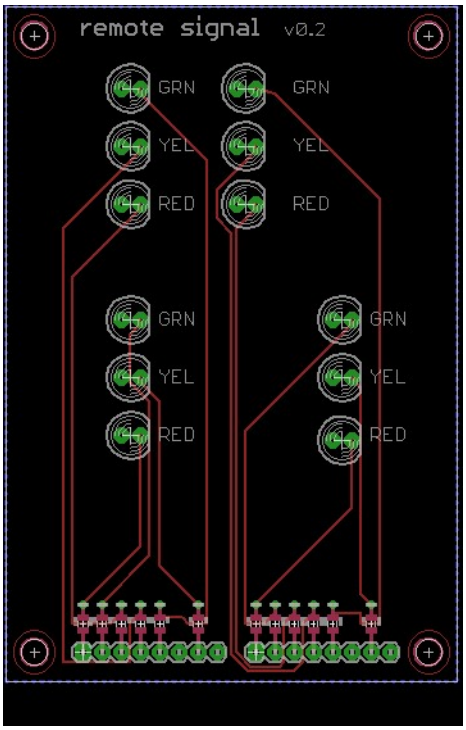

Figure 1- Remote Signal Repeater

What is a signal repeater and why would you want one? They are extra signals that are mounted above the backdrop or on the fascia so they can be seen even if:

- The primary signal is on hidden track
- The primary signal points in a direction that cannot easily be seen by the operator
- Another operator is standing your line of sight
- These are color light signals (stop light or "Type D" signals,) so color blind operators can follow them (unlike searchlights – US&S H2 etc) by seeing what position is lit.

These signals do not look like the prototype, they are schematics for faceplates with LEDs. They can be mounted in styrene boxes (not offered by MRCS) or in 3D printed or laser cut enclosures (again, we don't make them, but these technologies are widely available).

A friend (whose employment contract prohibits him from doing commercial work for others) designed these for me before I was familiar with circuit board CAD tools.

Note that the board is reversible so that by flipping it over and stuffing from the back it can handle either end of a siding. The "Entering Signal" (figure 1, left side) has two "heads" and the "main track leaving signal" (center) and the "siding leaving signal" (right) have one head each. All the LEDs are not necessarily implemented: for example many railroads assume that if you are heading into a

siding, you are going to stop at the leaving signal so there is no need for a GREEN (clear) signal, if the signal is protecting a switch that is heading into dark territory, than the most favorable indication you could receive is FLASHING RED (restricting) [note this board does not have any logic, the flashing must be provided by whatever circuit you're using to control the signal].

Assembly

[ ] add the limiting resistors, The Remote Signal Repeater is designed for 0805 Chip resistors, available at electronics supply houses such as Jameco, Digikey, Mouser and marketplaces such as AliExpress. Resistor pads are provided for each LED position so you can set the brightness of each LED individually. You may need to do some testing with your crew as 1) the commodity 5mm LEDs (see below) may not be equally bright at a given current (set by the resistor value) and 2) 20% of males have some degree of color vision impairment. Using the "Type D" (inverted traffic light) scheme provides a backup but it's better if you can set the colors so your guys can see! If you are limiting LED current elsewhere (on your signal driver for example) you can just bridge the pads with a small piece of wire.

Starting from the left in figure 1 above on the Left Connector (with the silk screen)

1	LOWER RED	Entering Signal	Left Connector
2	LOWER GREEN	Entering Signal	Left Connector
3	UPPER RED	Entering Signal	Left Connector
4	UPPER YELLOW	Entering Signal	Left Connector
5	UPPER GREEN	Entering Signal	Left Connector
6	+ Voltage	Entering Signal*	Left Connector
7	LOWER YELLOW	Entering Signal	Left Connector
8	+ Voltage	Entering Signal*	Left Connector

Right Connector

1	RED	Siding leaving signal	Right Connector
2	GREEN	Siding leaving signal	Right Connector
3	RED	main track leaving signal	Right Connector
4	YELLOW	main track leaving signal	Right Connector
5	GREEN	main track leaving signal	Right Connector
6	+ Voltage	main track leaving signal*	Right Connector
7	YELLOW	Siding leaving signal	Right Connector
8	+ Voltage	Siding leaving signal*	Right Connector

- Note all the + supply pins are connected internally.

Suggested starting resistor values (10mA):

+ Voltage (DC)	RED	YELLOW	GREEN
5	330	220	270

12	1K	680	820

You can buy “Resistor Substitution Boxes” which allows you to easily change values in circuit which may be handy for A/B testing with your crew: https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.elenco.com/wp-content/uploads/2017/10/RS400-3.pdf&ved=2ahUKEwih0aCOz62LAxURAjQIHVngGj8QFnoECGUQAQ&usg=AOvVaw0spB0gfzDhKon2KOBNv8f3

[ ] LEDs. Use standard 5mm LEDs (available from all the usual suspects. Note that as of this writing – early 2025 before whatever trade war plays out – you can buy 100 each for out $0.01 ea, from the Chinese marketplaces so for $3 you can build 25 of these repeaters, this may be smarter than buying them in smaller quantities. Be sure to align the flat side of the LED with the silk screen. Check carefully if your signal approaches from the left as there’s no silk on the back.

External connections to the Remote Signal Repeater?

Note that each of the connector positions at the bottom of the board is 8 x 0.100. You can use any 0.100 connector you like (you need to allow for the size and clearance in your enclosure design) or you can just solder your cables in. I like CAT5/CAT5e/CAT6 as it is ubiquitous and inexpensive (buy on Amazon or any big box hardware store).

I suggest the following color code using CAT5

Head	Position	Cat5 color	Designation
Top/main	3	White/Blue	RED
Top/main	4	Blue/White	YELLOW
Top/main	5	White/Orange	GREEN
Top/main	6	Orange/White	+ voltage (usually 5 or 12)
Bottom/Siding	1	White/Green	RED
Bottom/Siding	7	Green/White	YELLOW
Bottom/Siding	2	White/Brown	GREEN
Bottom/Siding	8	Brown/White	+ voltage (usually 5 or 12)

Figure 2- External Connections