

Report Data Link Application Guide

The *WeighStation™ Track Scale* has a Report Data Link output that transmits packets of information to the outside world. This guide goes beyond the Product Manual and describes connections, setup, and testing for common applications.

1. Physical Connection

WeighStation™ Track Scale transmits on its **Report Data Link** output, labeled **BELL 2**. The Ground reference for this signal is labeled **DETECT –**. To power an interface circuit such as RS-232, +5 volts DC is available from the terminal labeled **DETECT +**. (**DETECT +** and **DETECT –** are the power connections for the *NightScope™ Infrared Train Detector*.) See **Table 1** and **Figure 1**.

Table 1: WeighStation™ Track Scale Report Data Link Connection

Label	Name	Function
BELL 2	Report Data Link	<u>Output:</u> Pulled to Ground and open circuit to drive data signal. Do not exceed 20 volts or 40 mA.
DETECT –	Ground	<u>Power:</u> Common with other connected electronics.
DETECT +	+5V	<u>Power:</u> +5 VDC for interface circuit. Do not exceed 100 mA.

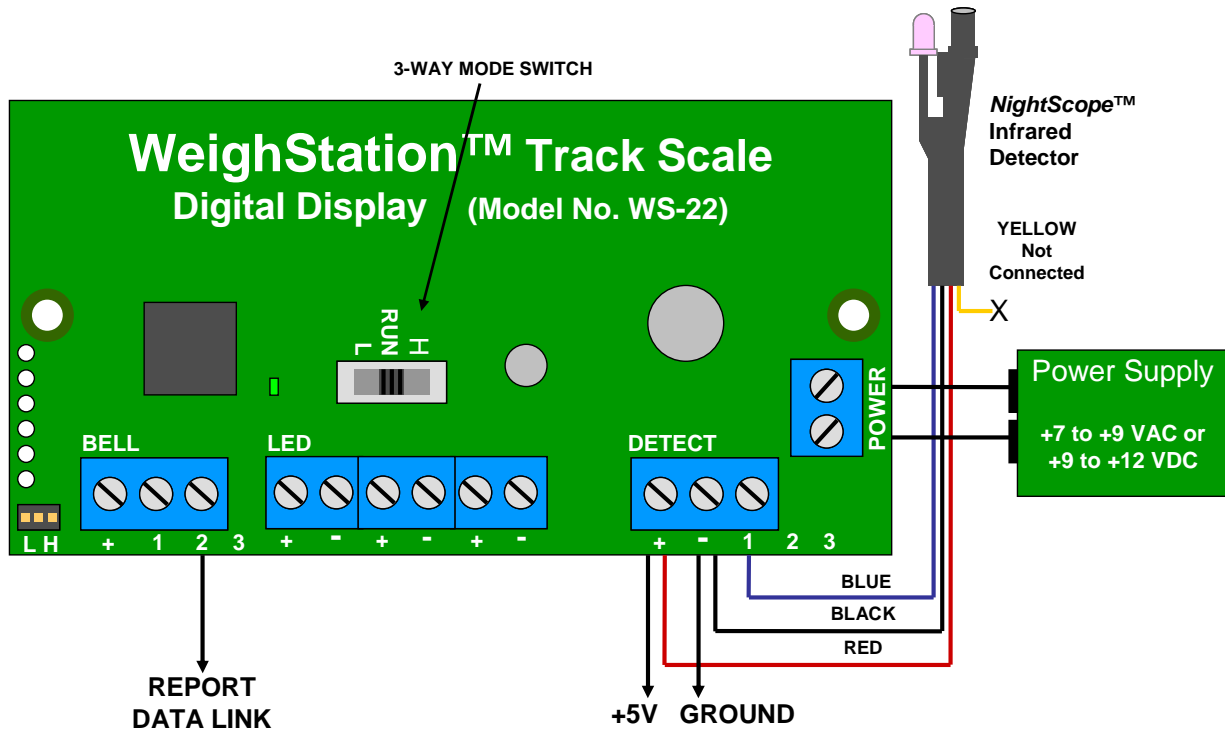


Figure 1: Data Link Connections

Figure 2 shows the simple connection to C/MRI or other active-low circuits. Note that a suitable pull-up resistor is needed on that circuit's input.

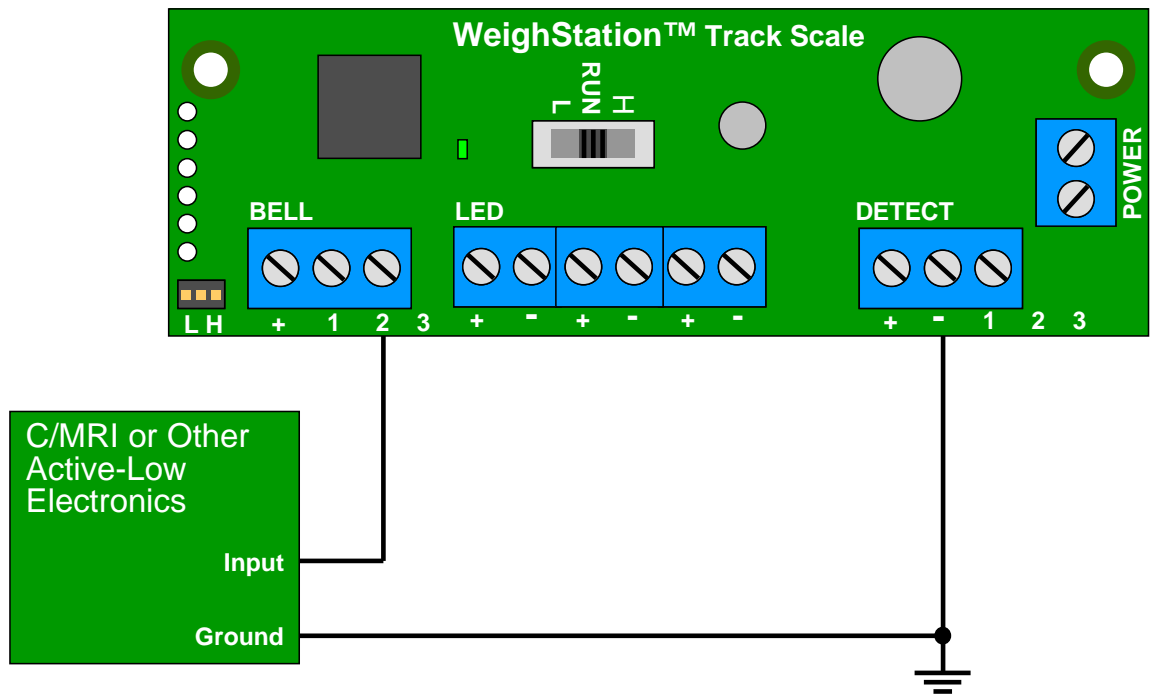


Figure 2: C/MRI Connection

Figure 3 shows the connection to a Level Shifter interface for an RS-232 serial link, like those found on point-of-sale printers and older personal computers. The example shown is a shifter from SparkFun Electronics. (<https://www.sparkfun.com/products/449>).

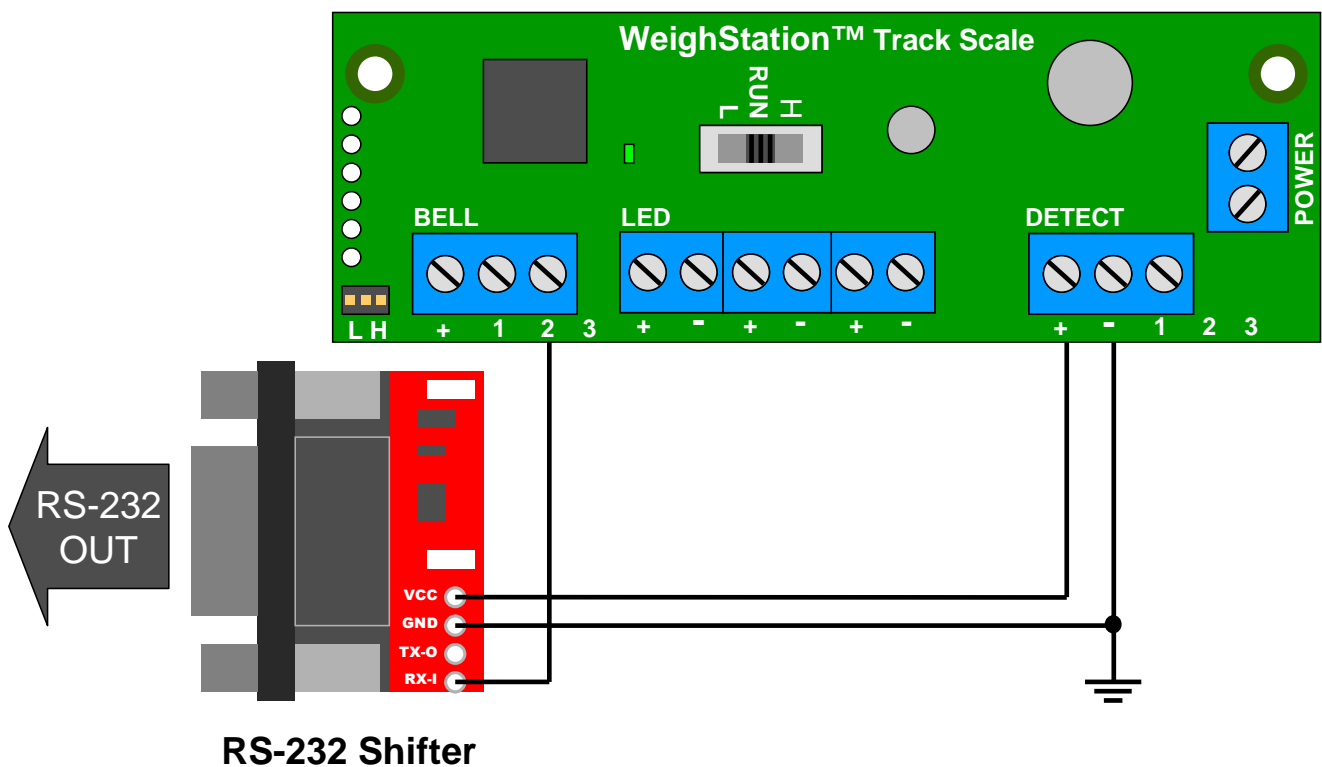


Figure 3: RS-232 Level Shifter Connection

2. Data Transmission

The Report Data Link transmits one 8-bit byte of data at a time, with an 8/N/1 format. Specifically:

- Speed (baud rate): 2400
- Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

Logic 0 is ground. Logic 1 is determined by the receiving electronics, typically pulled up to its power rail. For example, standard C/MRI has pull up resistors to +5 volts, so Logic 1 is +5 volts.

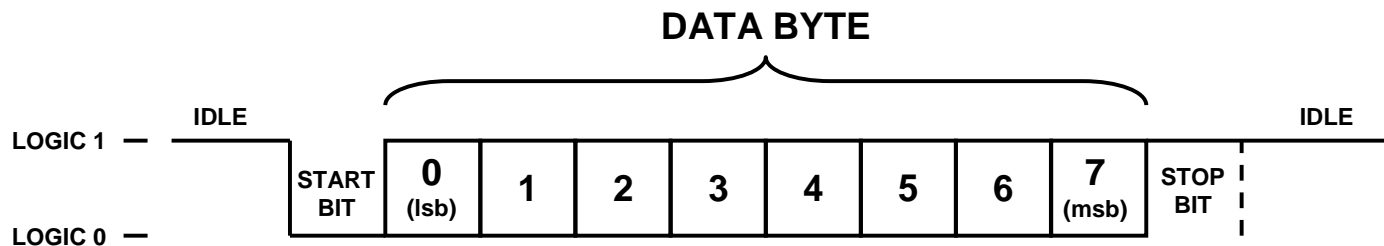


Figure 4: Data Bit Transmission Order (l to r)

As shown in **Figure 4**, the Data Link is a Logic 1 when idle. Byte transmission begins with a “start bit” of Logic 0. The 8 bits of data are then transmitted, beginning with the least significant bit (lsb), and finishing with the most significant bit (msb). The last bit transmitted is the “stop bit”, a Logic 1. The Data Link then returns to idle, which is also a Logic 1.

The above is the standard formatting for an RS-232 serial link, although not the RS-232 voltage levels. The addition of a simple Level Shifter, as shown in **Figure 3**, takes care of this last detail. With an RS-232 link, **WeighStation™ Track Scale** can communicate with a variety of existing computers and data peripherals.

3. ASCII Characters & Packet Format

Transmitting data bytes as above, the Report Data Link sends one ASCII character at a time. ASCII characters are 7 bits and are sent in the lowest 7 bits of the 8-bit data byte. The msb is always a Logic 0. See the table in **Section 6** for a list of ASCII characters transmitted by the Data Link.

The Data Link sends a sequence of ASCII characters in two different types of packets, a W (Weigh) Packet or an R (Range) Packet:

1. After a completed weighing, the Report Data Link transmits a **W Packet**:

[W X nnnnnn] where X the current Display Range (A, B, or C), and nnnnnn is the 6-digit weight
 For example, [W A 145600] if 145,600 is the weight on the “A” Range.

2. After the Display Range is changed, and also at power up, the Data Link transmits an **R Packet**:

[R X aaaaaa:bbbbbb] where X the new Display Range (A, B, or C), aaaaaa is the minimum weight in the Range, and bbbbbbb is the maximum weight in the Range

For example, [R B 060000:120000] if 60,000 lbs. is the minimum weight and 120,000 lbs. is the maximum weight on the “B” Range. (Notice that leading zeros are included to print six digits.)

Both packet types begin with an open bracket character ([) and end with a close bracket character (]). Following each packet, the Data Link transmits ASCII carriage return (CR) and linefeed (LF) characters. Thus the two example packets above would print out on a point-of-sale printer like this:

```
[W A 145600]
[R B 060000:120000]
```

4. Testing with a Personal Computer

Older personal computers typically have an RS-232 9-pin D-connector serial port that can easily test your Report Data Link connections and set up. This is especially helpful for making Data Link speed adjustments, if necessary. You will need to connect your Data Link as in **Figure 3**.

Begin by configuring your PC's serial port and terminal software to receive data from the Data Link. There are a number of good tutorials about this on the Internet. Here is one:

<http://www.instructables.com/id/The-serial-port---software-setup/>

Note: Be sure to set up the PC terminal options as shown in Section 2.

Once you can type and receive looped back characters on the PC, connect your serial cable to the Report Data Link as in **Figure 3**. Simply change the Display Range and you should see an R Packet displayed on your PC screen. If you receive garbled characters, or none at all, you will need to adjust your Data Link's speed as described in the next section.

5. Adjusting Data Link Speed

Your Data Link can run slightly slower or faster than required for good transmission. Your **Track Scale Product Manual** describes how to adjust Data Link speed in the section **Selecting Typewriter, Bell & Data Link Options**. See Steps 7 and 8 for details.

Begin by setting the Data Link Speed to its normal setting: The “dL” option should be set to “AVE”.

Note: Be sure to set up your connected system's serial link options as shown in Section 2.

Determine the needed speed adjustment based on the characters received from the Data Link:

- If you **accurately** receive the characters over the Data Link, no speed adjustment is required. The “dL” option should still be set to “AVE”.
- If you receive **no** characters, your Data Link is too slow. Adjust your Data Link speed to run faster. The “dL” option should be set to “FAST”.
- If you receive **garbled** characters, your Data Link is too fast. Adjust your Link speed to run slower. The “dL” option should be set to “SLO”.

You should only need to make this adjustment once for your Track Scale.

6. ASCII Character Table

Symbol	Meaning	Hex Value
LF	Line Feed	0A
CR	Carriage Return	0D
	Space	20
0	Numeral 0	30
1	Numeral 1	31
2	Numeral 2	32
3	Numeral 3	33
4	Numeral 4	34
5	Numeral 5	35
6	Numeral 6	36
7	Numeral 7	37

Symbol	Meaning	Hex Value
8	Numeral 8	38
9	Numeral 9	39
:	Colon	3A
A	Letter A	41
B	Letter B	42
C	Letter C	43
R	Letter R	52
W	Letter W	57
[Open Bracket	5B
]	Close Bracket	5D