

# Serial Protocol

8408-14788-01

SCP-01

## WEIGH-TRONIX

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*This document defines the standard (general purpose) serial communications protocol that is used to interface Avery Weigh-Tronix/NCI scales to other computing equipment (eg. personal computers).*

*Communications interface may be via RS-232 or Ethernet (Client or Server) as determined by the scale hardware configuration.*

TITLE:  
SERIAL COMMUNICATIONS PROTOCOL:  
SCP-01 (NCI STANDARD, and 3825)

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## OVERVIEW

The purpose of this document is to define the standard (general purpose) serial communications protocol that is used to interface Avery Weigh-Tronix/NCI scales to other computing equipment (eg. personal computers).

The serial communications interface may be via RS-232 or Ethernet (Client or Server) depending on the scales hardware configuration.

For serial RS-232 interfaces; unless otherwise specified, baud rate and parity will be configurable. Start and stop bits will each be fixed at one (1). Data bits will typically be fixed at seven. Modem lines will not be supported. Baud rates supported will be 1200, 2400, 4800, 9600 and 19200 (if possible). Other serial configuration settings will be allowed based on the model of the scale.

Unless otherwise specified, responses to serial commands will be immediate, or within one weight meter cycle of the scale. One second should be more than adequate for use as a time-out value by the remote (controlling) device.

There are two types of serial commands: *mandatory* and *optional*. Mandatory commands must be supported by all products. However, technical feasibility (e.g., memory constraints) and application requirements will determine the implementation of optional commands.

## NCI GENERAL SERIAL COMMUNICATIONS PROTOCOL

**TITLE:** NCI General Serial Communications Protocol  
**Desc:** NCI's general purpose scale interface.

**Comm:** RS-232, No-Handshake, Bi-Directional  
**Prot:** **nci (or H-100), (or 3825)**  
**Baud:** Selectable  
**Note:** Used in scales other than for ECR interface.  
NCI and H-100 protocols are the same except for the 'H' command. In the H-100 protocol, the 'H' command returns weight with 100x resolution.

### Key to symbols used:

<ETX>	End of Text character (0x03).
<LF>	Line Feed character (0x0A).
<CR>	Carriage Return character (0x0D).
<SP>	Space (0x20).
x	Weight characters from display including minus sign and out-of-range characters.
c	Message/menu (ie non-weight) characters from display.
hh...	Two or more status bytes.
uu	Units of measure (lb, kg, oz, g, etc. using ANSI standard abbreviations).

### Mandatory Commands

#### Command      Scale Response

**Name:**      **Request weight**

**Command:** **W<CR>**

**Response:** Returns decimal weight (x1), units and status.  
**<LF>xxxx.xxuu<CR><LF>hh...<CR><ETX>**

Returns lb-oz weight, units plus scale status.  
**<LF>xxlb<SP>xx.xoz<CR><LF>hh...<CR><ETX>**

Returns contents of display (other than wt) with units and scale status.  
**<LF>ccccccuu<CR><LF>hh...<CR><ETX>**

**Name:** Request status  
**Command:** S<CR>  
**Response:** Returns scale status.  
 <LF>hh...<CR><ETX>

**Name:** Zero the scale  
**Command:** Z<CR>  
**Response:** Scale is zeroed, returns scale status.  
 <LF>hh...<CR><ETX>

### Optional Commands

Command	Scale Response
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**Name:** Request high-resolution weight *(NCI Protocol Selected)*  
**Command:** H<CR>  
**Response:** Returns decimal wt in 10x resolution with units plus scale status.  
 <LF>xxxx.xxxuu<CR><LF>hh...<CR><ETX>

Returns lb-oz wt in 10x with units plus scale status  
 <LF>xxlb<SP>xx.xxoz<CR><LF>hh...<CR><ETX>

Returns contents of display (other than wt) with units and scale status.  
 <LF>ccccccuu<CR><LF>hh...<CR><ETX>

**Name:** Request H-100 high-resolution weight *(H-100 Protocol Selected)*  
**Command:** H<CR>  
**Response:** Returns decimal wt in 100x resolution with units plus scale status.  
 <LF>xxxx.xxxxuu<CR><LF>hh...<CR><ETX>

Returns lb-oz wt in 100x with units plus scale status  
 <LF>xxlb<SP>xx.xxxoz<CR><LF>hh...<CR><ETX>

Returns contents of display (other than wt) with units and scale status.  
 <LF>ccccccuu<CR><LF>hh...<CR><ETX>

**Name:** Change units of measure  
**Command:** U<CR>  
**Response:** Changes units of measure, returns new units and scale status.  
 <LF>uu<CR><LF>hh...<CR><ETX>

**Name:** Request metrology raw counts  
**Command:** M<CR>  
**Response:** Returns normalized raw counts and scale status.  
<LF>xxxxxxxMM<CR><LF>hh...<CR><ETX>

**Name:** Request about  
**Command:** A<CR> (7600 series models only)  
**Response:** Returns Model, Software Version/Revision, Scale Capacity, and QDT Load Cell Serial Number. Fields are comma delimited.  
<LF>MMMM, VV-RR, CCCC, xxxxxx<CR><ETX>

**Name:** Request diag  
**Command:** D<CR> (7600 series models only)  
**Response:** Returns Scale Power on Starts, Number of Calibrations, Number of Overcapacity Occurances, Normalized Raw Counts, Span Counts, Zero Counts, Cal Gravity, and Calibration Span Weight Value. Fields are comma delimited with leading zeros suppression.  
<LF>SSS, CCC, OOO, nnnnnn, ssssss, zzzzzz, x.xxxx, SWT<CR><ETX>

**Name:** Tare the scale  
**Command:** T<CR>  
**Response:** Scale is tared, returns scale status.  
<LF>hh...<CR><ETX>

**Name:** unrecognized command  
**Command:** all others  
**Response:** Unrecognized command  
<LF>?<CR><ETX>

### Weight Command: W

This command causes the scale to return a WYSIWYG (What You See Is What You Get) of its display when it is in normal weighing mode. That is, the scale will send whatever is showing on its display including any minus sign and/or decimal point plus units of measure. The length of the weight field will be equal to the length of the scale's display plus three (one for the decimal point, and two for the units, e.g., "lb"). For pounds-ounce weight, the length of the weight field will be equal to the length of the scale's display plus five (one for the decimal point, two for the "lb" and two for the "oz"). Units of measure will appear in their ANSI standard abbreviated form ("lb" for pounds, "kg" for kilograms, etc.). If the scale is displaying all upper bars (over capacity), the weight field will be filled with carets "^^^^^^uu". If the scale is displaying all lower bars (under capacity), the weight field will be filled with underscores "\_\_\_\_\_uu". If the scale is displaying middle bars (zeroing error), the weight field will be filled with dashes "-----uu". These examples are for a scale with a 6-digit display.

### **Zero Command: Z**

If zeroing criteria are met, the scale is zeroed. In any case, scale status is returned.

### **Tare Command: T**

If tare criteria are met, the scale is tared. In any case, scale status is returned.

### **High-Resolution Command: H (NCI and H-100 Modes)**

This is the same as the **W** command except that when weight is returned, it is returned with ten times the scale's displayed resolution when the NCI protocol mode is selected. Thus, for decimal weight, the length of the weight field is equal to the length of the scale's display plus three or four, and for pounds-ounce it will be the display length plus five or six (depending on the presence of a decimal point). If the H-100 protocol mode is selected the weight returned will be 100 times the normal resolution.

### **Metro Command: M**

This will cause the scale to return normalized raw counts used for metrology verification. The count value is the same number displayed in the scale's division test in its diagnostics mode.

For example, this number ranges up to 120,000 for the 67xx, 100,000 for the 78xx and 1,000,000 for QDT™ scales.

### **Change Units Command: U**

The effect of this command will be the same as if the *UNITS* key on the scale were pressed, causing the scale to change its units of measure. In response, the scale will return the new units of measure and scale status.

## Scale Status Command: S

There will be at least two status bytes. If bit 6 of the second status byte is set then there will be a third byte. Bit 6 of each successive byte will indicate whether or not another status byte follows. The bit will be clear (0) in the last status byte. At this time only the first three bytes are defined. Others may be added in the future. Bit 0 is the least significant bit in the byte while bit 7 is the most significant bit.

Responses to commands will be the same for the NCI and 3825 protocols except for the number of status bytes returned.

The 3825 protocol will always have two status bytes.

The NCI protocol may have two or more status bytes.

The status bits are defined as follows:

Bit	Status Byte 1	Status Byte 2	Status Byte 3 (opt)
0	1 = Scale in motion 0 = Stable	1 = Under capacity 0 = Not under capacity	} 00 = Low range   01 = (undefined) } 10 = (undefined)   11 = High range
1	1 = Scale at zero 0 = Not at zero	1 = Over capacity 0 = Not over capacity	)
2	1 = RAM error 0 = RAM okay	1 = ROM error 0 = ROM okay	1 = Net weight 0 = Gross weight
3	1 = EEPROM error 0 = EEPROM okay	1 = Faulty calibration 0 = Calibration okay	1 = Initial zero error 0 = Initial zero OK
4	<b>Always 1</b>	<b>Always 1</b>	<b>Always 1</b>
5	<b>Always 1</b>	<b>Always 1</b>	<b>Always 1</b>
6	<b>Always 0</b>	1 = Byte follows 0 = Last byte	1 = Byte follows 0 = Last byte
7	Parity	Parity	Parity