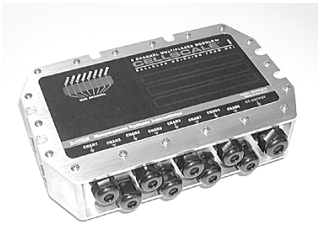
MSI9008

CellScale Multiplexer

User Guide

Quality Industrial Weighing and Force Measurement Equipment



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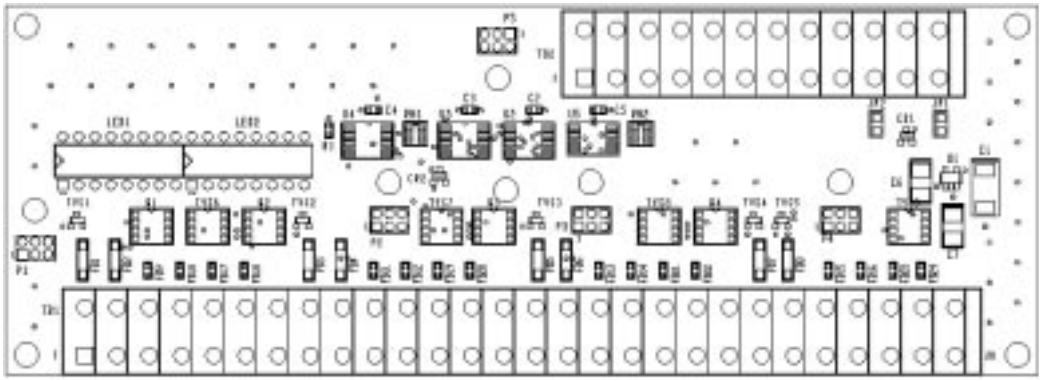
Introduction

The MSI-9008 Multiplexer is an input switching device that is digitally controlled by the MSI-9000 CellScale to switch between eight possible input sources. The Multiplexer features an LED indicator designating which channel is currently being switched to the output. The MSI-9000 CellScale controls the switching via three digital lines (Digital 0,1,2) on the CellScale load cell connector. Excitation is passed from the control unit through the Multiplexer to each of the individual input sources. At any one time, there are only two input sources being supplied power. All other inputs are turned off to reduce power consumption.

The signal returned from the transducer (typically a load cell) is multiplexed or switched into a single channel input on the CellScale (i.e. channel 1-x, 2-x, etc). This signal is then measured and processed according to the setup of the CellScale.

The following is an image of the circuit board. Note the spring-loaded terminal blocks for connecting the CellScale, load cells, and additional Multiplexers.



Load Cell Connections

The MSI-9008 Multiplexer can control up to eight individual transducer inputs. These inputs can be taken directly from a load cell or from junction/summing boxes combining multiple load cell signals. Devices such as load cells are connected to the Multiplexer via four lines as summarized in the table below.

Load Cell Connections

Function	Description
+EXC	Positive Excitation
- EXC	Negative Excitation
+ SIG	Positive Signal
-SIG	Negative Signal

An additional shield connection is provided for terminating cable shields. For details regarding wire color codes, please refer to the load cell manufacturer's documentation.

Cable Parameters

The devices being connected to the Multiplexer should have a cable that will be connected via the feed through PG9 connectors on the MSI-9008 Multiplexer box. The feed through connectors are designed to accept cables with the following parameters:

Load Cell Cable Specifications

Cable Diameter	Accommodates .16 to .31 diameter cable
Pressure Rating	IP-68; 150 PSIG (10 Bar) external pressure
Operating Temperature	*Continuous exposure* – Static: -40° to +212° F (-40° to +100° C) Dynamic: -4° to +176° F (-20° to + 80° C) *Short term exposure* – Static: 248° F (120° C) Dynamic: 212° F (100° C)

The larger PG11 feed through connector is for wiring the 501802 cable from the Multiplexer to the CellScale.

Load Cell Terminal Block

The load cell terminal block on the MSI-9008 Multiplexer PCA is divided into four sections; TB1A, TB1B, TB1C, and TB1D.

When connecting load cells, excitation and shielding are shared connections for two channels at a time; i.e. - 1 + 5, 2 + 6, 3 + 7 and 4 + 8. The individual signal lines are separated for each channel. The following table shows the pin out for the input connector TB1:

Load Cell Terminal Block (TB1) Pin Out

TB1 Pin No.		Pin Label	Function		Description
1	TB1A	1	+ EXC		Positive Excitation for Channels 1 + 5
2		2	- EXC		Negative Excitation for Channels 1 + 5
3		3	+ SIG	CH 1	Positive Signal for Channel 1
4		4	- SIG		Negative Signal for Channel 1
5		5	+ SIG	CH 5	Positive Signal for Channel 5
6		6	- SIG		Negative Signal for Channel 5
7		7	Shield		Shield for Channel 1 + 5
8	TB1B	1	+ EXC		Positive Excitation for Channels 2 + 6
9		2	- EXC		Negative Excitation for Channels 2 + 6
10		3	+ SIG	CH 2	Positive Signal for Channel 2
11		4	- SIG		Negative Signal for Channel 2
12		5	+ SIG	CH 6	Positive Signal for Channel 6
13		6	- SIG		Negative Signal for Channel 6
14		7	Shield		Shield for Channel 2 + 6
15	TB1C	1	+ EXC		Positive Excitation for Channels 3 + 7
16		2	- EXC		Negative Excitation for Channels 3 + 7
17		3	+ SIG	CH 3	Positive Signal for Channel 3
18		4	- SIG		Negative Signal for Channel 3
19		5	+ SIG	CH 7	Positive Signal for Channel 7
20		6	- SIG		Negative Signal for Channel 7
21		7	Shield		Shield for Channel 3 + 7
22	TB1D	1	+ EXC		Positive Excitation for Channels 4 + 8
23		2	- EXC		Negative Excitation for Channels 4 + 8
24		3	+ SIG	CH 4	Positive Signal for Channel 4
25		4	- SIG		Negative Signal for Channel 4
26		5	+ SIG	CH 8	Positive Signal for Channel 8
27		6	- SIG		Negative Signal for Channel 8
28		7	Shield		Shield for Channel 4 + 8

MSI-9020 DC Connector Pin Diagram

CellScale Connections

The MSI-9008 Multiplexer must be controlled by an MSI-9000 CellScale. A single CellScale can control up to four (4) multiplexer devices at one time. This is accomplished by the three digital control line outputs from the CellScale and the two signal inputs per A/D Converter (ADC) on the CellScale (maximum of 2 A/D Converters per CellScale).

As described in the MSI-9000 CellScale User Guide, there are six channels each with eight sub-channels in a CellScale. The eight sub-channels are accessed by using the MSI-9008 Multiplexer. The CellScale channels are summarized as follows:

CellScale Channel Summary

Channel	Function
1	ADC1, Input 1
2	ADC1, Input 2
3	ADC2, Input 1
4	ADC2, Input 2
5	Slave CellScale Channels
6	Math Channels

This system provides for five possible ways to connect MSI-9008 Multiplexers (Mux) to a single MSI-9000 CellScale. These connections are described below.

- Connecting one Mux to CS - maximum of 9 load cell inputs.
- Connecting two Mux to CS with one ADC - maximum of 16 load cell inputs.
- Connecting two Mux to CS with two ADC - maximum of 18 load cell inputs.
- Connecting three Mux to CS (two ADC inputs required) - maximum of 25 load cell inputs.
- Connecting four Mux to CS (two ADC inputs required) - maximum of 32 load cell inputs.

Multiplexer Cable #501802

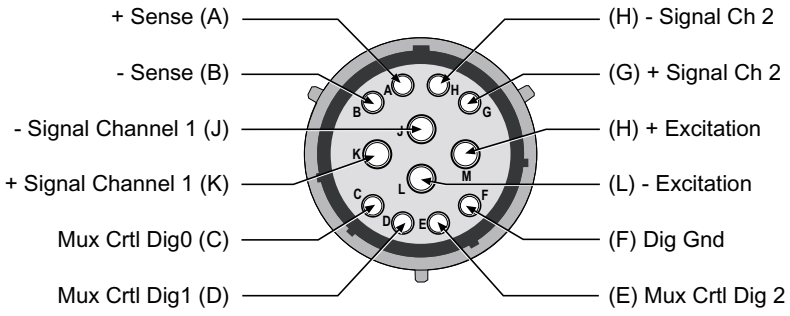
The Multiplexer requires a shielded 12-conductor cable (MSI part number 501802-00XX) to connect to a master CellScale Device. The cable assembly is pictured below.

The following table designates the pin out of the CellScale load cell connector, the 501802 cable wire color code, and the TB2 connector pin out on the 501967 PCA.

CellScale Connector Terminal Block Pinout

TB2 Pin #	Label	Description	Wire Color	Cable Pin #
1	DIG2	Digital Control 2	Gray	E
2	DIG1	Digital Control 1	White/Orange	D
3	DIG0	Digital Control 0	White/Gray	C
4	GND	Circuit Ground	Orange	F
5	- SIG Pass	Negative Signal Pass thru	White/Black	H
6	+ SIG Pass	Positive Signal Pass thru	Green/White	G
7	- SIG Act	Negative Signal Active Output	White	J
8	+ SIG Act	Positive Signal Active Output	Green	K
9	- EXC	Negative Excitation	Black	L
10	- Sense	Negative Sense	Brown	B
11	+ Sense	Positive Sense	Blue	A
12	+ EXC	Positive Excitation	Red	M

The following diagram shows the typical load cell connector for a CellScale device.



Multiplexer Cable #502305

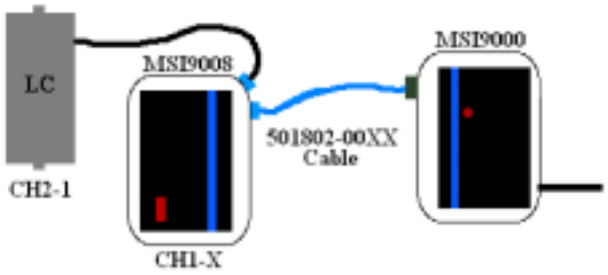
To connect a secondary Multiplexer to a primary Multiplexer requires the secondary cable assembly, MSI part number 502305. This cable connects from TB2 on the secondary Multiplexer to TB2 on the primary Multiplexer. The following table shows the connections.

Secondary Multiplexer Cable 502305 Connections

Secondary Mux TB2 Pin #	Secondary Mux Label	Wire Color	Primary Mux TB2 Pin #	Primary Mux Label
1	DIG2	Gray	1	DIG2
2	DIG1	White/Orange	2	DIG1
3	DIG0	White/Gray	3	DIG0
4	GND	Orange	4	GND
7	- SIG Act	White/Black	5	- SIG Pass
8	+ SIG Act	Green/White	6	+ SIG Pass
9	- EXC	Black	9	- EXC
10	- Sense	Brown	10	- Sense
11	+ Sense	Blue	11	+ Sense
12	+ EXC	Red	12	+ EXC

Connecting One Multiplexer to CellScale

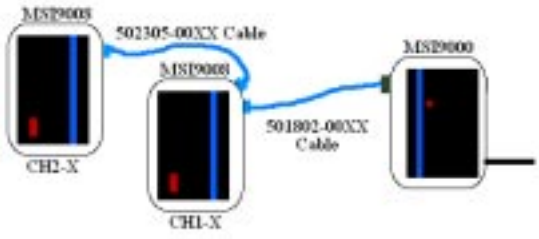
When connecting a single Multiplexer to a CellScale, the CellScale can control a maximum of nine load cells. This is accomplished by connecting a Multiplexer with up to eight load cells to one CellScale input and a single load cell to the second input. The following diagram illustrates this.



This connection requires the use of the pass thru signal to be used for the ninth load cell. This ninth load cell will be added to the CellScale scan list as channel 2-1. For information about how to setup the CellScale scan list for this configuration, see the ”Software Setup section.

Connecting Two Multiplexers to CellScale with One A/D

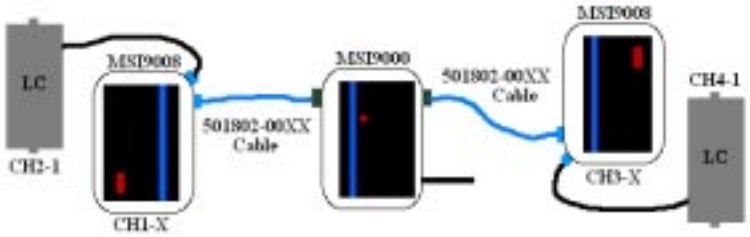
To connect two Multiplexer units to a CellScale with one A/D input requires the digital control lines and excitation lines be shared among the two MSI-9008 Multiplexers. The active signal output from the primary Multiplexer will be input to the CellScale signal input one. The active signal output from the secondary Multiplexer will be input to the pass thru connection on the primary Multiplexer; which intern, is connected to the CellScale channel two signal input.



For information about how to setup the CellScale scan list for this configuration, see the ”Software Setup” section.

Connecting Two Multiplexers to CellScale with Two A/D’s

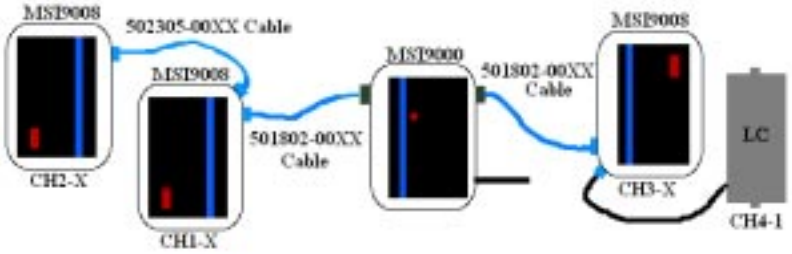
When connecting two Multiplexers to a CellScale, the CellScale can control a maximum of eighteen load cells. This is accomplished by connecting a Multiplexer with up to eight load cells to each CellScale input and a single load cell to the second inputs on each ADC. The following diagram illustrates this.



This connection requires the use of the pass thru signal to be used for the channel two and channel four load cells. For information about how to setup the CellScale scan list for this configuration, see the “ Software Setup” section.

Connecting Three Multiplexers to CellScale (Two A/D inputs required)

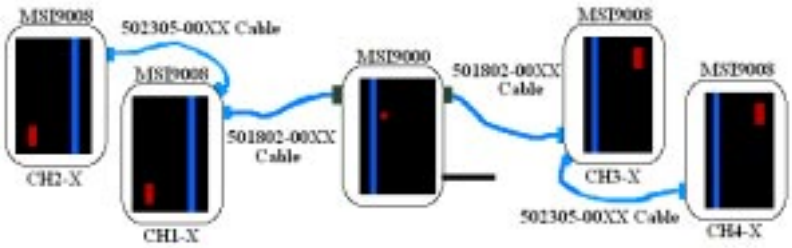
In order to connect three multiplexer units to a single CellScale, the CellScale will have to be equipped with the optional second A/D input. This connection will allow two Multiplexers to connect to one A/D input and the third Multiplexer to connect to the second A/D input on the CellScale. An additional load cell may be input directly to the CellScale on the second channel input of the second ADC. The following diagram illustrates this.



The last load cell will be added to the CellScale scan list as channel four. For information about how to setup the CellScale scan list for this configuration, see the “ Software Setup” section.

Connecting Four Multiplexers to CellScale (Two A/D inputs required)

A single CellScale can control, at most, four Multiplexers. The primary Multiplexers will connect directly to the two load cell inputs on the CellScale, typically as channel 1 and channel 3. The secondary Multiplexers will connect to the pass thru of the primary Multiplexers, then to the inputs on the CellScale, typically as channel 2 and 4. The following diagram illustrates this.



For information about how to setup the CellScale scan list for this configuration, see the " Software Setup" section.

Software Setup

For details of operating the CellScale software, please reference the CellScale owner's manual in addition to the content provided here.

Connecting One Multiplexer To CellScale

When connecting a single Multiplexer to a CellScale, the load cell's attached to the Multiplexer will be entered in the CellScale scan list as 1-X, where X corresponds to the labeled input on the Multiplexer. The ninth load cell input (if used) will be entered into the CellScale scan list as channel 2-1. An example scan list is shown below.

```
***** Channel ScanList *****

(1)     Add a specific channel-subchannel
(2)     Delete a scanList entry
(3)     Edit   a scanList entry
(4)     Move   a scanList entry
(ESC)   Exit
```

```
Position  = ch-subch, * indicates channel is active

  1 = 1-1 *       9 = 2-1 *      17 = ---        25 = ---
  2 = 1-2 *      10 = ---        18 = ---        26 = ---
  3 = 1-3 *      11 = ---        19 = ---        27 = ---
  4 = 1-4 *      12 = ---        20 = ---        28 = ---
  5 = 1-5 *      13 = ---        21 = ---        29 = ---
  6 = 1-6 *      14 = ---        22 = ---        30 = ---
  7 = 1-7 *      15 = ---        23 = ---        31 = ---
  8 = 1-8 *      16 = ---        24 = ---        32 = ---
```

For details about connecting the hardware for this configuration, see the "CellScale Connections" section.

Connecting Two Multiplexers To CellScale with One A/D

When connecting two Multiplexers to a CellScale with one ADC, the primary Multiplexer will be entered in the CellScale scan list as 1-X, where X corresponds to the labeled input on the Multiplexer. The secondary Multiplexer will be entered in the CellScale scan list as 2-X, where X corresponds to the labeled input on the Multiplexer. An example scan list is shown below.

```
***** Channel ScanList *****

(1)     Add a specific channel-subchannel
(2)     Delete a scanList entry
(3)     Edit   a scanList entry
(4)     Move   a scanList entry
(ESC)   Exit
----------------------------------------


Position  = ch-subch. * indicates channel is active

  1 = 1-1 *       9 = 2-1 *      17 = ---        25 = ---
  2 = 1-2 *      10 = 2-2 *      18 = ---        26 = ---
  3 = 1-3 *      11 = 2-3 *      19 = ---        27 = ---
  4 = 1-4 *      12 = 2-4 *      20 = ---        28 = ---
  5 = 1-5 *      13 = 2-5 *      21 = ---        29 = ---
  6 = 1-6 *      14 = 2-6 *      22 = ---        30 = ---
  7 = 1-7 *      15 = 2-7 *      23 = ---        31 = ---
  8 = 1-8 *      16 = 2-8 *      24 = ---        32 = ---
```

For details about connecting the hardware for this configuration, see the “CellScale Connections” section.

Connecting Two Multiplexers To CellScale with Two A/D’s

When connecting two Multiplexers to a CellScale with two ADC, the primary Multiplexer will be entered in the CellScale scan list as 1-X, where X corresponds to the labeled input on the Multiplexer. The load cell connected to the CellScale via the primary Multiplexer pass thru (if used) will be entered into the CellScale scan list as channel 2-1. The secondary Multiplexer will be entered in the CellScale scan list as 3-X, where X corresponds to the labeled input on the Multiplexer. The load cell connected to the CellScale via the secondary Multiplexer pass thru (if used) will be entered into the CellScale scan list as channel 4-1. An example scan list is shown below.

```
***** Channel ScanList *****

(1)     Add a specific channel-subchannel
(2)     Delete a scanList entry
(3)     Edit   a scanList entry
(4)     Move   a scanList entry
(ESC)   Exit
----------------------------------------


Position  = ch-subch. * indicates channel is active

  1 = 1-1 *       9 = 2-1 *      17 = 3-1 *      25 = 4-1 *
  2 = 1-2 *      10 = ---        18 = 3-2 *      26 = ---
  3 = 1-3 *      11 = ---        19 = 3-3 *      27 = ---
  4 = 1-4 *      12 = ---        20 = 3-4 *      28 = ---
  5 = 1-5 *      13 = ---        21 = 3-5 *      29 = ---
  6 = 1-6 *      14 = ---        22 = 3-6 *      30 = ---
  7 = 1-7 *      15 = ---        23 = 3-7 *      31 = ---
  8 = 1-8 *      16 = ---        24 = 3-8 *      32 = ---
```

For details about connecting the hardware for this configuration, see the “ CellScale Connections” section.

Connecting Three Multiplexers To CellScale (Two A/D inputs required)

When connecting three Multiplexers to a CellScale, the optional second ADC is required. The primary Multiplexer will be entered in the CellScale scan list as 1-X, where X corresponds to the labeled input on the Multiplexer. The secondary Multiplexer (connected via the primary Multiplexer pass thru lines) will be entered in the CellScale scan list as 2-X, where X corresponds to the labeled input on the Multiplexer. The tertiary Multiplexer will be entered in the CellScale scan list as 3-X, where X corresponds to the labeled input on the Multiplexer. The load cell connected to the CellScale via the tertiary Multiplexer pass thru (if used) will be entered into the CellScale scan list as channel 4-1. An example scan list is shown below.

```
***** Channel ScanList *****

(1)     Add a specific channel-subchannel
(2)     Delete a scanList entry
(3)     Edit   a scanList entry
(4)     Move   a scanList entry
(ESC)   Exit
----------------------------------------


Position  = ch-subch. * indicates channel is active

  1 = 1-1 *       9 = 2-1 *      17 = 3-1 *      25 = 4-1 *
  2 = 1-2 *      10 = 2-2 *      18 = 3-2 *      26 = ---
  3 = 1-3 *      11 = 2-3 *      19 = 3-3 *      27 = ---
  4 = 1-4 *      12 = 2-4 *      20 = 3-4 *      28 = ---
  5 = 1-5 *      13 = 2-5 *      21 = 3-5 *      29 = ---
  6 = 1-6 *      14 = 2-6 *      22 = 3-6 *      30 = ---
  7 = 1-7 *      15 = 2-7 *      23 = 3-7 *      31 = ---
  8 = 1-8 *      16 = 2-8 *      24 = 3-8 *      32 = ---
```

For details about connecting the hardware for this configuration, see the “CellScale Connections” section.

Connecting Four Multiplexers To CellScale (Two A/D inputs required)

When connecting four Multiplexers to a CellScale, the optional second ADC is required. The primary Multiplexer will be entered in the CellScale scan list as 1-X, where X corresponds to the labeled input on the Multiplexer. The secondary Multiplexer (connected via the primary Multiplexer pass thru lines) will be entered in the CellScale scan list as 2-X, where X corresponds to the labeled input on the Multiplexer. The tertiary Multiplexer will be entered in the CellScale scan list as 3-X, where X corresponds to the labeled input on the Multiplexer. The fourth Multiplexer (connected via the tertiary Multiplexer pass thru lines) will be entered in the CellScale scan list as 4-X, where X corresponds to the labeled input on the Multiplexer. An example scan list is shown below.

```
***** Channel ScanList *****

(1)     Add a specific channel-subchannel
(2)     Delete a scanList entry
(3)     Edit   a scanList entry
(4)     Move   a scanList entry
(ESC)   Exit
----------------------------------------


Position  = ch-subch. * indicates channel is active

  1 = 1-1 *       9 = 2-1 *      17 = 3-1 *      25 = 4-1 *
  2 = 1-2 *      10 = 2-2 *      18 = 3-2 *      26 = 4-2 *
  3 = 1-3 *      11 = 2-3 *      19 = 3-3 *      27 = 4-3 *
  4 = 1-4 *      12 = 2-4 *      20 = 3-4 *      28 = 4-4 *
  5 = 1-5 *      13 = 2-5 *      21 = 3-5 *      29 = 4-5 *
  6 = 1-6 *      14 = 2-6 *      22 = 3-6 *      30 = 4-6 *
  7 = 1-7 *      15 = 2-7 *      23 = 3-7 *      31 = 4-7 *
  8 = 1-8 *      16 = 2-8 *      24 = 3-8 *      32 = 4-8 *
```

For details about connecting the hardware for this configuration, see the “CellScale Connections” section.

Setting Up and Optimizing Readings

The CellScale defaults to take 16 readings per scan of each load cell. This setting can be adjusted in order to improve scan performance.

Adjusting the Number of Readings Per Dwell	
To adjust this setting, access the master CellScale device's terminal menu. From the main menu, select item one.	(1) Channels/Calibration
This will bring up the "Channel Setup" menu. From here select item four.	(4) Channel Scanlist functions
This will bring up the "Channel Scan List" menu. From here select item three.	(3) Edit a scanList entry
This will bring up the "Edit a Scan List entry" menu. From here select item six.	(6) # readings per dwell: 16
The CellScale will prompt for the new setting	Enter # samples to average before channel switch (1-255):
Type in the desired setting and press Enter to accept	"Enter"

For additional information on channel setup, please reference the MSI-9000 CellScale User Guide.

Scan Order

The scan list in the CellScale is the order in which the CellScale scans the channels that are monitored. If there is a situation in which there is a channel that requires extra monitoring, it is legitimate to add the channel into the CellScale scan list more than once. This will ensure that as the CellScale goes through the scan list, it checks the critical inputs more than once. Reference the CellScale owner's manual for details.

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