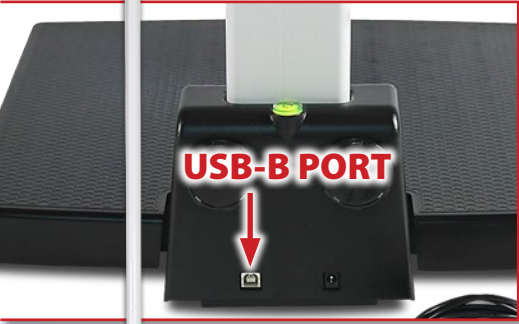


PERIPHERAL COMMUNICATION

FOR



See inside for details about apex peripheral communication.

USB-B PORT

The icon's USB-B port is located on the scale base, and it may be connected to a **WelchAllyn** device. Welch-Allyn's custom protocol (WACP) is used for sending data to any compatible Welch-Allyn monitor. Height, weight, and BMI will automatically be sent with each locked weight. Also, there is a hidden port on the display that is only intended to be used by service personnel as a bootloader.

icon Base USB

This USB device is configured for Welch-Allyn communication using the WACP protocol. The following WACP packets are sent for each new height/weight (upon locking):

- FmERROR_GnSTATUS_ERROR_CSS_SpREPORT_ERROR
Note: Errors include over capacity, analog high, and analog low
- FmWEIGHT_GnSTATUS_WEIGHT_CSS_SpREPORT_WEIGHT
- FmHEIGHT_GnSTATUS_HEIGHT_CSS_SpREPORT_HEIGHT
- FmBODYMASSINDEX_GnSTATUS_BODYMASSINDEX_CSS_SpREPORT_BMI

icon Display USB

The display's USB port is inaccessible to the end-user. Its only function is for providing a bootloader interface for maintenance purposes.



BLE / WI-FI

Wireless icon models will have a wireless transmitter inside the case of the display. It can be configured for Bluetooth Low Energy (BLE) or Wi-Fi.

Widely accepted BLE GATT profiles are used to transmit vitals to other devices/software that have implemented these profiles. Wi-Fi may be used if raw ASCII data is desired.

BLUETOOTH LOW ENERGY (BLE)

Data passed via BLE using GATT characteristic "Weight_Measurement" (0x2A9D) as defined by Bluetooth SIG. See the back page for the data table about Weight Measurement Characteristics.

Data includes:

- Weight
- Height
- BMI

WI-FI

If the wireless module is configured for Wi-Fi instead of BLE, then the raw ASCII output may be captured:

<RESPONSE>	
S<Status>	WWW.WUU,HHH.H,BBB.B<CR><LF>

<CMD>	<RESPONSE>
S	Literal 'S'
<Status>	Single Character
	'D' Motion
	'I' Over Capacity
	Blank No Error
W	Weight
U	Unit (lb or kg)
H	Height (ft./in. Or cm)
B	BMI



USB PORT

The apex's USB port is located on the back of the apex display. It is accessible by a USB-B micro. In the setup menu, one of three modes may be selected:

- (1) **PHDC** – This is a widely implemented USB standard in the medical field. Any device that “understands” PHDC will be able to gather information from the apex in this mode.
- USB device configured to send data to PHDC host per ISO 11073-10415

- The following information is sent continuously at a rate of 2 times per second:
 - Time
 - Weight
 - Height
 - BMI

- (2) **WelchAllyn** – This mode implements Welch-Allyn's custom protocol (WACP) for sending data to many Welch-Allyn monitors. Height, weight, and BMI will automatically be sent with each locked weight.

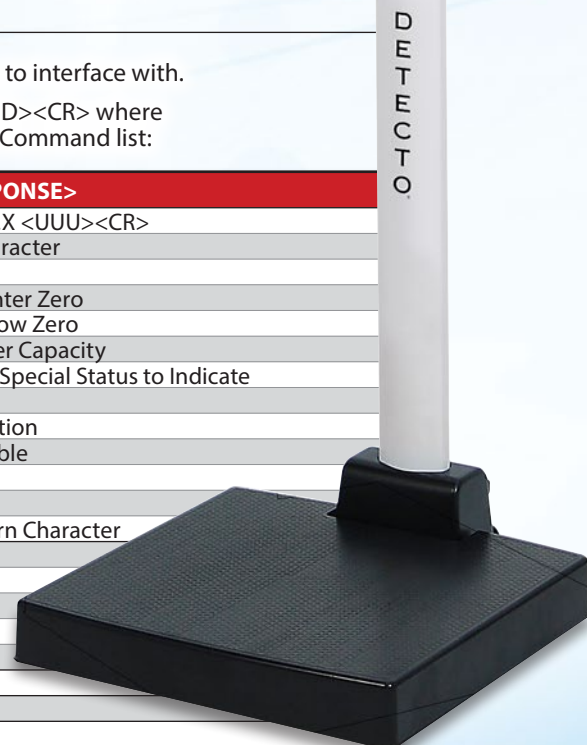
- USB device configured for Welch-Allyn communication using the WACP protocol. The following WACP packets are sent for each new height/weight (upon locking):
 - FmERROR_GnSTATUS_ERROR_CSS_SpREPORT_ERROR
Note: Errors include over capacity, analog high, and analog low
 - FmWEIGHT_GnSTATUS_WEIGHT_CSS_SpREPORT_WEIGHT
 - FmHEIGHT_GnSTATUS_HEIGHT_CSS_SpREPORT_HEIGHT
 - FmBODYMASSINDEX_GnSTATUS_BODYMASSINDEX_CSS_SpREPORT_BMI

- (3) **SMA** – A plain ASCII protocol that is easy to interface with.

SMA commands are of the form <LF><CMD><CR> where <CMD> may be single or multi-character. Command list:



<CMD>	<RESPONSE>
W	<LF><S>1G<M><SPACE>XXXXXXXX.X<UUU><CR>
	<LF> Line Feed Character
	<S> Scale Status
	'Z' Center Zero
	'U' Below Zero
	'O' Over Capacity
	Blank No Special Status to Indicate
	<M> Motion
	'M' Motion
	Blank Stable
	XXXXXXXX.X Gross Weight
	<UUU> Units String
	<CR> Carriage Return Character
P	<date> Date
	<time> Time
	<weight with unit> Weight
	<height with unit> Height
	<bmi> BMI
Z	Zero Scale – No Response
U	Toggle Units – No Response
Invalid	<LF>?<CR>



RS232 COM PORTS

The apex display has two wired serial ports on the back of the display. On a wireless indicator, only COM2 is available because the other port is used by the internal wireless module. These ports may be used to ask for and capture weight, send basic commands, or get diagnostics from the load cell.

Note: As you face the back of the indicator COM2 is on the left, COM1 is on the right.



SMA Continuous (COM2 ONLY)	
<LF><S><R><N><M><SPACE>XXXXXXXX.X<UUU><CR>	

<CMD>	<RESPONSE>
<S>	Scale Status
	'Z' Center Zero
	'U' Below Zero
	'O' Over Capacity
	Blank No Special Status to Indicate
<R>	'1'
<N>	Mode ('G')
	'G' Gross Normal
	'g' Gross Hires
<M>	Motion
	'M' Motion
	Blank Stable
<UUU>	Units String

SMA On-Demand for RS232 (Both Ports)

SMA commands are of the form <LF><CMD><CR> where <CMD> may be single or multi-character. Command list:

SMA On-Demand for RS232 (Both Ports)	
<LF><S><R><N><M><SPACE>XXXXXXXX.X<UUU><CR>	

<CMD>	<RESPONSE>
W	SMA Weight – Normal
	<LF><S>1G<M><SPACE>XXXXXXXX.X<UUU><CR>
	<LF> Line Feed Character
	<S> Scale Status
	'Z' Center Zero
	'U' Below Zero
	'O' Over Capacity
	Blank No Special Status
	<M> Motion
	'M' Motion
	Blank Stable
	XXXXXXXX.X Units String
	<CR> Carriage Return Character
H	SMA Weight – Hi-Res
	<LF><S>1g<M><SPACE>XXXXXXXX.X<UUU><CR>
	<LF> Line Feed Character
	<S> Scale Status
	'Z' Center Zero
	'U' Below Zero
	'O' Over Capacity
	Blank No Special Status
	<M> Motion
	'M' Motion
	Blank Stable
	XXXXXXXX.X Units String
	<CR> Carriage Return Character
Z	Zero Scale – No Response
R	Toggle Continuous Output mode – No response
A or I	<LF>SMA:2/1.1<CR>
B	Scroll through Multiple Scale Identification Messages.
	<LF><IDENTIFIER 1><CR>
	<LF><IDENTIFIER 2><CR>
	...
	<LF><IDENTIFIER FINAL><CR>
B	<LF>SMA:2/1.1<CR>
XM	Load cell Millivolt Reading
	<LF>V.V mV<CR>
XR	Load cell raw data
	<LF>DDDDDDDD<CR>
XB	Battery Level as Percentage
	<LF>BB.BB vdc<CR>
Invalid	<LF>?<CR>

BLE / WI-FI (COM1 ONLY)

Wireless apex models will have a wireless transmitter inside the case of the apex display. It can be configured for Bluetooth Low Energy (BLE) or Wi-Fi.

Widely accepted BLE GATT profiles are used to transmit vitals to other devices/software that have implemented these profiles. Wi-Fi may be used if raw ASCII data is desired.

BLUETOOTH LOW ENERGY (BLE)

Data is passed via BLE using GATT characteristic "Weight_Measurement" (0x2A9D) as defined by Bluetooth SIG. See the back page for the data table about Weight Measurement Characteristics.

Data includes:

- Weight
- Height
- BMI

WI-FI (or RS232 if module is not attached)

If BLE is not used then the continuous raw ASCII output may be captured by a Wi-Fi connection or by RS232 if the wireless module is not attached.

<RESPONSE>	
S<Status>	WWW.WUU,HHH.H,BBB.B<CR><LF>

<CMD>	<RESPONSE>
S	Literal 'S'
<Status>	Single Character
	'D' Motion
	'I' Over Capacity
	Blank No Error
W	Weight
U	Unit (lb or kg)
H	Height (ft./in. or cm)
B	BMI

BLUETOOTH INTERFACE STANDARD PROTOCOLS

Bluetooth Characteristic – Weight_Measurement: 0x2A9D

NAMES	FIELD REQUIREMENTS	FORMAT	MIN. VALUE	MAX. VALUE	ADDITIONAL INFORMATION									
					BIT FIELD									
					Bit	Size	Name	Definition		Requires				
								Key	Value					
Flags	Mandatory	8 bit	N/A	N/A	0	1	Measurement Units	0	SI (Weight and Mass in Units of Kilogram (kg) and Height in Units of Meter)	C1				
								1	Imperial (Weight and Mass in Units of Pound (lb) and Height in Units of inch (in))	C2				
							1	1	Time Stamp Present	0	False			
										1	True	C3		
							2	1	User ID Present	0	False			
										1	True	C4		
							3	1	BMI and Height Present	0	False			
										1	True	C5		
4	4	Reserved for Future Use												
Weight - SI	C1	unit16	N/A	N/A	Information: Unit is in kilograms with a resolution of 0.005 and is determined when bit 0 of the Flags field is set to 0. Unit: org.bluetooth.unit.mass.kilogram Exponent: Decimal, -3 Multiplier: 5									
Weight - Imperial	C2	unit16	N/A	N/A	Information: Unit is in pounds with a resolution of 0.01 and is determined when bit 0 of the Flags field is set to 1. Unit: org.bluetooth.unit.mass.pound Exponent: Decimal, 02.									
Time Stamp	C3		N/A	N/A	Information: Smallest unit in seconds Unit: org.bluetooth.characteristic.date.time									
User ID	C4	unit8	N/A	N/A	The special value of 0xFF (255 Decimal) for User ID represents "unknown user". Information: Unit is unitless with a resolution of 1 <table border="1"> <thead> <tr> <th>Key</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>255</td> <td>Unknown user</td> </tr> </tbody> </table> Unit: org.bluetooth.unit.unitless Exponent: Decimal, 0						Key	Value	255	Unknown user
Key	Value													
255	Unknown user													
BMI	C5	unit16	N/A	N/A	Information: Unit is unitless with a resolution of 0.1 Unit: org.bluetooth.unit.unitless Exponent: Decimal, -1									
Height - SI	C1 C5	unit16	N/A	N/A	Information: Unit is in meters with a resolution of 0.001 and is determined when bit 0 of the Flags field is set to 0. Unit: org.bluetooth.unit.length.meter Exponent: Decimal, -3									
Height - Imperial	C2 C5	unit16	N/A	N/A	Information: Unit is in inches with a resolution of 0.1 and is determined when bit 0 of the Flags field is set to 1. Unit: org.bluetooth.unit.length.inch Exponent: Decimal, 0-1									

DETECTO reserves the right to improve, enhance, or modify features and specifications without prior notice.



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