

A Reference Guide for School Nurses

for the Medtronic[®] Insulin Pumps and Continuous Glucose Monitoring Systems

Purpose

This guide is intended to assist school nurses with the basic operations of Medtronic insulin pumps and continuous glucose monitoring (CGM) systems while the student is at school.

It is recommended that signed orders from the student's healthcare provider include a back up plan if the insulin pump is not able to be used or deliver insulin. This backup plan should include a long-acting insulin vial and dosage, syringes (or insulin pens and pen needles), rapid-acting insulin vial, insulin to carbohydrate ratio, and insulin sensitivity factor or bolus doses for food and correcting high blood glucose. The responsibilities of the parents/guardian, school nurse, and other school personnel should also be established.

In the back of this guide you will find additional resources on insulin pump therapy and diabetes management in the school setting.

A Reference Guide for School Nurses

For the 522, 722, 523, 723, 523K, 723K, and MiniMed[®] 530G^{*} model insulin pumps and continuous glucose monitoring systems

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Insulin Pump and System Components

The insulin pump uses only rapid-acting insulin (such as Humalog® and Novolog®) to deliver insulin in two ways:

- **Basal:** The pump automatically delivers small amounts of insulin steadily, every hour. This is the insulin delivery that is required during sleep and in-between meals.
- **Bolus:** The user programs boluses of insulin to cover carbohydrates and to correct high blood glucose levels.

This mechanism of insulin delivery is intended to be similar to that of healthy beta cells of the pancreas.



*Quick-set® infusion set shown in illustration.

Inserting the Battery

The insulin pump is powered by a single AAA alkaline battery (Energizer® recommended). To insert a battery, you will need a thick coin (nickel or quarter).



1. Place the edge of the coin in the slot of the battery cap. Turn the cap to the left (counter-clockwise) until it comes off.



2. Place battery into the battery compartment with negative (flat) end of the battery in first and positive end facing out.



3. Replace the cap. Use the coin to turn the cap (no more than 4 half turns) to the right (clockwise) and tighten until the slot is horizontal, but do not overtighten or the cap may become damaged.

Viewing the Home Screen

The Home Screen is what the pump displays when the user is not programming the pump or navigating through the menus. It will display the insulin reservoir icon, the time, and the battery icon.



HOME SCREEN WITH TIME AND ICONS The pump is ON and ready to be programmed if the HOME screen is displayed.

1 Reservoir Icon	2 Time	3 Battery lcon		
50% to 75% left 25% to 50% left Up to 25% left	C:CO RT Time Display 12-Hr	50% to 75% left 25% to 50% left Up to 25% left		
Shows you approximately how much insulin is left in the reservoir.	Shows the time.	Shows you approximately how much battery life is left.		
The Low Reservoir warning allows you to program the pump to alert before your reservoir is empty. The warning works the same for both the 180 unit and the 300 unit reservoirs.		The icon is divided into four sections; each section represents		
The icon is divided into four sections; each section represents about 25% of a full reservoir.		about 25% of the battery life.		

Giving a Bolus – Using the Bolus Wizard® Calculator

The Bolus Wizard makes it easy to calculate the amount of insulin needed in order to cover food, blood glucose, or both at the same time.

In order to use the Bolus Wizard calculator the following settings are obtained by the healthcare provider and are programmed in the setup of the Bolus Wizard feature.

- Insulin-to-Carbohydrate Ratio (ICR): 1 unit of insulin to cover "X" grams of carbohydrates. For example, if a child uses an ICR of 15, then 1 unit of insulin is needed to cover every 15 grams of carbohydrates to be eaten.
- Insulin Sensitivity Factor (ISF): 1 unit of insulin to decrease blood glucose by "X" mg/dL. For example, an ISF of 50 means that 1 unit of insulin will decrease the BG by 50 mg/dL. To illustrate, if the BG is 200 mg/dL and the BG target is set at 100 mg/dL, then it will take 2 units of insulin to decrease the BG by 100 mg/dL to reach the BG target.
- **Blood Glucose Target(s):** The bolus amount is calculated in order to achieve the programmed BG target. The pump can be programmed with different BG targets for the day or night.
- Active Insulin Time: The length of time that the bolus remains active in lowering the blood glucose. For example, if the active insulin time is set for 4 hours, then a bolus that is delivered at 12pm will continue to lower the BG until about 4pm.

Carb Ratio Example		Insulin Sensitivity Factor Example		
Your Carb Ratio = 1:15		Your Sensitivity Factor = 1:30		
Total Carbs	90 g	Current glucose levels: 220 mg/dL		
Divide Total Carbs by YOUR Carb Ratio	90 g ÷ 15	Insulin Sensitivity Factor: 30 mg/dL		
TOTAL units of insulin needed	6 units of insulin	$\frac{220 - 100}{30} = 4.0$ units		



To Deliver a Food and Correction Bolus:

- 1. Press (B). Test BG. If using linked meter press ACT. Or, use arrows to enter BG. Press ACT.
- 2. Use (A) to enter grams of carb. Press ACT.
- 3. Review details. Press ACT.
- 4. Confirm bolus amount. Press Act to deliver.

To Deliver a Correction Bolus (no food):

- 1. Press (B). Test BG. If using linked meter press ACT. Or, use arrows to enter BG. Press ACT.
- 2. Leave grams of carbohydrates at zero. Press ACT.
- 3. Review details. Press Act.
- 4. Confirm bolus amount. Press Act to deliver.

To Deliver a Food Bolus (no BG):

- 1. Press (*B). Leave the Enter BG screen as dashes. Press ACT
- 2. Use \wedge to enter grams of carb. Press Act.
- 3. Review details. Press Act.
- 4. Confirm bolus amount. Press Act to deliver.

1:33рм ENTER BG 140 mg/dL

















Note: The BG and carb information in the screen shots are examples only

Giving a Manual Bolus – Without Using the Bolus Wizard® Calculator

If the student is not using the Bolus Wizard® calculator, then a Manual Bolus can be programmed using the following steps.

- 1. Press B until you see the SET BOLUS screen (may need to press (B) twice). It will appear with 0.0 flashing.
- 2. Press the Arrow until desired bolus amount is displayed.
- 3. Press Act to confirm. The pump will beep one time as it starts to deliver the bolus in small increments.



1:33PM

SET BOLUS

The pump will beep again when it has finished delivering the bolus. Then it will return to the HOME screen.



NOTE: If the Bolus Wizard settings have been programmed then the Active Insulin amount will appear on the screen during programming of a Manual Bolus.

Reviewing Bolus History

To verify that a bolus was delivered, the Bolus History is a useful feature that displays the time, date, and amount of the boluses delivered.



2. Select Bolus History. Press Act. (This screen will look different if using an X22 series pump).







Programming a Temporary Basal Rate

This feature allows the basal rate to be either lowered or raised for a selected period of time. In the school setting, a temporary basal rate may need to be programmed to prevent hypoglycemia associated with physical activity, for example. After the programmed duration has expired, the normally programmed basal rate will automatically resume.

To Set a Temporary Basal Rate:

- 1. From MAIN MENU, scroll to Basal. Press Act.
- 2. Set/Edit Temp Basal is highlighted. Press Act.
- 3. Use \Lambda to set duration of time. Press Act.
- 4. Use v to decrease the percentage of basal rate to deliver.
- 5. Press Act to start temp basal rate.
- 6. An open circle at top of screen and an hourly alert indicates temp basal is running.



NOTE: The Temporary Basal Type must already be set to Percent Basal to use the steps above. Otherwise, the setting defaults to using the Insulin Rate for a temporary basal.

To Cancel a Temporary Basal Rate:

- 1. From MAIN MENU, scroll to BASAL. Press Act.
- 2. Select Cancel Temp Basal. Press Act.
- 3. The open circle will disappear when temp basal has been cancelled.





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1:33

BASAL MENU

Set/Edit Temp Basal Basal Review Basal Setup

Manually Suspending Insulin Delivery

Insulin delivery may need to be interrupted during a bolus to prevent hypoglycemia associated with delaying a meal or deciding to eat less than is planned for the bolus dose that is delivering. Manually suspending insulin delivery is also recommended when disconnecting from the pump for contact sports or swimming to prevent damage to the pump.

From the HOME screen:

- 1. Press Act to access the MAIN MENU.
- 2. Press 🗸 to highlight Suspend.
- 3. Press Act the screen flashes SUSPEND.
- 4. Press are to confirm you want to Suspend insulin delivery.

Pump in SUSPEND; notice the alarm icon



- 5. SUSPEND appears on the pump screen. The time the pump was stopped is shown directly above SUSPEND, and the alarm icon (solid black circle) is displayed between the reservoir icon and the time. After 30 seconds (to conserve battery power), the pump returns to the HOME screen.
- 6. Press (a) to look at the Status screen. Notice that the first information on the Status screen tells you that the pump is suspended and shows the time the pump was set to suspend.
- 7. Press 🟟 to return to the HOME screen.

STATUS screen shows when

pump was suspended



Resuming Insulin Delivery After Manually Suspending

- 1. Press Act from the HOME screen.
- 2. RESUME flashes on the screen.
- 3. Press Act to confirm that you want to resume basal delivery.
- 4. The pump will return to the HOME screen, and the pump will begin to deliver basal insulin as programmed.

Press Act when pump is in SUSPEND





Pump will return to HOME screen

Continuous Glucose Monitoring

The pump displays sensor glucose trend graphs by pressing from the Home screen. 3-hour, 6-hour, 12-hour, and 24-hour trend graphs are available in the Paradigm[®] Revel[™] and the MiniMed[®] 530G pumps. 3-hour and 24-hour trend graphs are available in the Paradigm 522 and 722 pumps.



Calibrating the Sensor

Continuous Glucose Monitoring requires blood glucose (BG) meter readings in order to generate sensor glucose readings. These BG meter readings are entered in the pump and are used for sensor calibrations.

To calibrate, a BG value measured by a BG meter using a fingerstick blood sample, is entered into the pump at least once every 12 hours, but for best sensor performance it is recommended to calibrate 3 to 4 times a day. The pump will accept BG meter readings between 40 mg/dL and 400 mg/dL.

If using a Revel or X22 insulin pump and a Sof-Sensor[®], then it is best to calibrate at times when the glucose is likely to be stable: before meals, before giving a bolus, before exercise, and when there are no trend arrows on the pump's trend graph screen. However, if using a MiniMed 530G and Enlite, then calibrations can occur at any time. However, sensor accuracy may decrease if a calibration is entered when there are *llortt* on the screen. Calibrating at the right times can improve the accuracy of the sensor data.

There are two ways to calibrate:

Using the Bolus Wizard

- 1) Press 🕶 button
- 2) Use A and V buttons to enter BG meter value and press Act.
- You will receive a message "BG to update sensor?" Press the ♥ to select Yes and press Act.



**If you are using a linking meter, then the BG meter value will automatically appear on the pump screen. Then follow step 3 above.

Or

Using the Sensor Menu

- From the Home Screen:
 Press Act to open the Main Menu.
- 2) Press V to scroll to the Sensor menu and press Act.
- Press Act to select Calibrate. (You will only see the option to Calibrate if the sensor and transmitter are connected and after the first Meter BG Now alert).

	1:33PM	T	(IIII)
Suspend	MAIN HENO		
Basal			



Calibrating through the Sensor Menu can only occur if the pump's insulin delivery is not suspended.

After the first calibration, it will take about 10-15 minutes for sensor glucose readings to appear on the pump screen. To find when the next calibration is due press from the times from the Home Screen to view the Sensor Status screen.

Threshold Suspend

Threshold Suspend is a new feature that is available on the MiniMed 530G insulin pump when CGM is being used. When this feature is turned on and set, insulin delivery stops when the sensor glucose reading reaches or falls below the programmed Suspend Threshold (can be set between 60 - 90 mg/dL).

Important Tips:

- Threshold Suspend is not intended to be used to treat or prevent low blood glucose. Confirm the low blood glucose using a BG meter. Then treat the confirmed low blood glucose using the "15-15 Rule" or as directed by the student's healthcare provider:
- **Do not miss Calibrations.** Threshold Suspend requires that CGM is working.
- **Check the battery.** Change the pump battery if a "Low Battery" alert is received to avoid depleting the battery quickly during Threshold Suspend
- Avoid repeated nuisance alarms with the **two-step response** to the **Threshold Suspend siren:**

- First, <u>clear</u> the alarm (press 🗐, followed by 🖛)

- Then, <u>select</u> continue to "Suspend" or "Restart Basal" delivery

**Follow the healthcare provider's instructions on how to treat a low glucose or when Threshold Suspend is triggered.

Threshold

Two-step response to Threshold Suspend alarm:

When Threshold Suspend sirens all insulin delivery stops immediately. Step 1. Press (), followed by () to clear the alarm.



Pump and CGM Guide Suspend

Step 2. Select to continue "Suspend" or "Restart Basal" delivery.





If you select to continue "Suspend", then suspension will last two hours.*



If you select "Restart Basal", then pump will only suspend again after the set Low Repeat time has passed and sensor glucose is still at or below the Suspend Threshold.



* Note: If you decide to resume basal insulin delivery after you have selected **"Suspend"**, press (ACT) to show the **THRESHOLD SUSPEND** options screen again, and select **"Restart Basal"**.

WARNING: The Threshold Suspend feature will cause the pump to temporarily suspend insulin delivery for two hours when the sensor glucose reaches a set threshold. Under some conditions of use the pump can suspend again resulting in very limited insulin delivery. Prolonged suspension can increase the risk of serious hyperglycemia, ketosis, and ketoacidosis. Before using the Threshold Suspend feature, it is important to read the Threshold Suspend information in the MiniMed 530G System User Guide and discuss proper use of the Threshold Suspend feature with the healthcare provider."

Pump Alerts

If the pump is delivering insulin under a special feature such as a temporary basal rate or a condition such as low battery or low reservoir, an **O** will appear on the screen next to the time. The pump will beep or vibrate periodically as a reminder of this special feature or condition.

Alert/Alarm	What It Means	How to Respond
Low Reservoir		
C 1:33PM UND 128 P LOW RESERVOIR	Insulin remaining in reservoir is low.	Change as soon as possible.
Low Battery		
	Less than 10% battery life left.	Replace as soon as possible, and before going to sleep.

Pump Alarms

If the pump is not delivering insulin due to a depleted battery, empty reservoir, or occlusion, then a ● will appear on the screen next to the time. The pump will beep or vibrate to alarm the user and will siren if the issue has not been resolved.

Alert/Alarm	What It Means	How to Respond
Weak Battery 	Battery less than full strength.	After clearing alarm, pump will continue to deliver insulin, but battery life will be shorter than normal. Clear the alert by pressing (), followed by Act.
Empty Reservoir	No insulin left in the reservoir.	Change the reservoir immediately.
Failed Battery Tes	t Battery too weak to operate pump.	Install a new battery.
No Delivery	Blockage or empty reservoir detected: insulin delivery stopped	Check blood glucose and ketones. Change reservoir and infusion set or implement back up plan.

CGM Alarm and Alerts

When the pump beeps or vibrates notifying you that an alert condition exists, press V, read and follow the instructions on the screen. Press (), then () to silence an alert.

Alert/Alarm	What It Means	How to Respond
Weak Signal	No communication between pump and transmitter for the amount of time selected in Weak Signal setting of Sensor menu. Communication needs to be re-established or "Lost Sensor" alert will follow.	Move pump closer to transmitter and sensor site.
Lost Sensor	Communication between pump and transmitter has stopped and sensor glucose readings will not be displayed.	Check that sensor is still inserted in the skin. Check that transmitter is properly connected to sensor. Go to: Home Screen > Main Menu > Sensor > Link to Sensor > Find Lost Sensor
Meter BG Now	A calibration is needed in order to receive sensor glucose readings.	Test BG with meter and enter BG value into pump to calibrate. Refer to page 11 in this guide for steps to calibrate.
Cal Error	BG meter value entered as calibra- tion is too different compared to sensor glucose readings.	Wait at least 15 minutes. Wash hands and test BG again with meter. Enter BG value into pump as calibration. Refer to page 11 in this guide for steps to calibrate.
High SG	Sensor glucose reading is equal to or greater than programmed high glucose limit value.	Do not treat glucose based on sensor reading. Confirm it using BG meter. Treat based on instructions from healthcare provider.
Low SG 1:33PM T 0000 128P LOW I 70 MG/DL	Sensor glucose reading is equal to or less than programmed low glucose limit value.	Do not treat glucose based on sensor reading. Confirm it using BG meter. Treat based on instructions from healthcare provider.
High Predicted	Sensor glucose reading is expected to reach programmed high glucose limit in length of time programmed for high predicted alert.	Do not treat glucose based on sensor read- ing. Confirm it using BG meter and continue to monitor. Treat based on instructions from healthcare provider.

Alert/Alarm	What It Means	How to Respond
Low Predicted	Sensor glucose reading is expected to reach programmed low glucose limit in length of time programmed for low predicted alert.	Do not treat glucose based on sensor read- ing. Confirm it using BG meter and continue to monitor. Treat based on instructions from healthcare provider.
Rise Rate	Sensor glucose reading is increasing at rate equal to or faster than programmed rate alert setting.	Do not treat glucose based on sensor read- ing. Confirm it using BG meter and continue to monitor. Treat based on instructions from healthcare provider.
Fall Rate	Sensor glucose is decreasing at rate equal to or faster than programmed rate alert setting.	Do not treat glucose based on sensor read- ing. Confirm it using BG meter and continue to monitor. Treat based on instructions from healthcare provider.
Threshold Suspend THRESH I SUSPEND	The programmed Suspend Threshold has been reached and insulin delivery has stopped.	Test BG and treat based on instructions from healthcare provider. Press (), then (). Se- lect continue to "Suspend" or "Restart Basal" insulin delivery.
Sensor Error	Sensor electrical signals are not within expected range.	Clear alert by pressing (a) then (c) and ignore it if it occurs during 2-hour sensor ini- tialization. If alert occurs repeatedly, then sen- sor should be replaced. Refer to instructions from parent/guardian or healthcare provider on handling CGM issues while in school.
Change Sensor	System has detected sensor may not be working properly. For more information, please see "Alarms and alerts" chapter, in the section "Alerts" of the MiniMed 530G User Guide.	If alert occurs after two "CAL ERROR" messages in a row, replace the sensor. If alert happens without two "CAL ERROR" screens, use the transmitter's tester to make sure the transmit- ter is working properly. If alert occurs during initialization, call Medtronic for assistance.

Additional Resources

myLearning classes

Medtronic's myLearning is an online, interactive tutorial designed to help patients begin using an insulin pump and CGM. The same tutorial may also be helpful to you. Classes on carbohydrate counting, calculating boluses, and programming settings are also included.

To access the healthcare provider version of myLearning, please go to **professional.medtronicdiabetes.com/mylearning**.

Medtronic Diabetes

Visit the Medtronic Diabetes website at www.medtronicdiabetes.com for more information on products, customer support, and living with diabetes therapies.

myMedtronic app

The myMedtronic app for Apple[®] mobile devices is available free of charge on iTunes and allows easy access to the pump and CGM user guides, video tutorials, troubleshooting guides and more

Other Helpful Resources

- National Association of School Nurses www.nasn.org
- National Diabetes Education Program www.ndep.nih.gov
- American Diabetes Association www.diabetes.org
- Juvenile Diabetes Research Foundation www.jdrf.org

IMPORTANT SAFETY INFORMATION

Medtronic Diabetes insulin infusion pumps, continuous glucose monitoring systems and associated components are limited to sale by or on the order of a physician and should only be used under the direction of a healthcare professional familiar with the risks associated with the use of these systems. Successful operation of the insulin infusion pumps and/or continuous glucose monitoring systems requires adequate vision and hearing to recognize alerts and alarms.

Medtronic Diabetes Insulin Infusion Pumps

Insulin pump therapy is not recommended for individuals who are unable or unwilling to perform a minimum of four blood glucose tests per day. Insulin pumps use rapid-acting insulin. If your insulin delivery is interrupted for any reason, you must be prepared to replace the missed insulin immediately.

Medtronic Diabetes Continuous Glucose Monitoring (CGM) Systems

The information provided by CGM systems is intended to supplement, not replace, blood glucose information obtained using a home glucose meter. A confirmatory finger stick is required prior to treatment.

Insertion of a glucose sensor may cause bleeding or irritation at the insertion site. Consult a physician immediately if you experience significant pain or if you suspect that the site is infected. Please visit www. medtronicdiabetes.com/about/safety.html for additional safety information and details.

Pump and CGM Guide Notes

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www.medtronicdiabetes.com

Medtronic Diabetes 18000 Devonshire Street Northridge, CA 91325 1.800.646.4633

